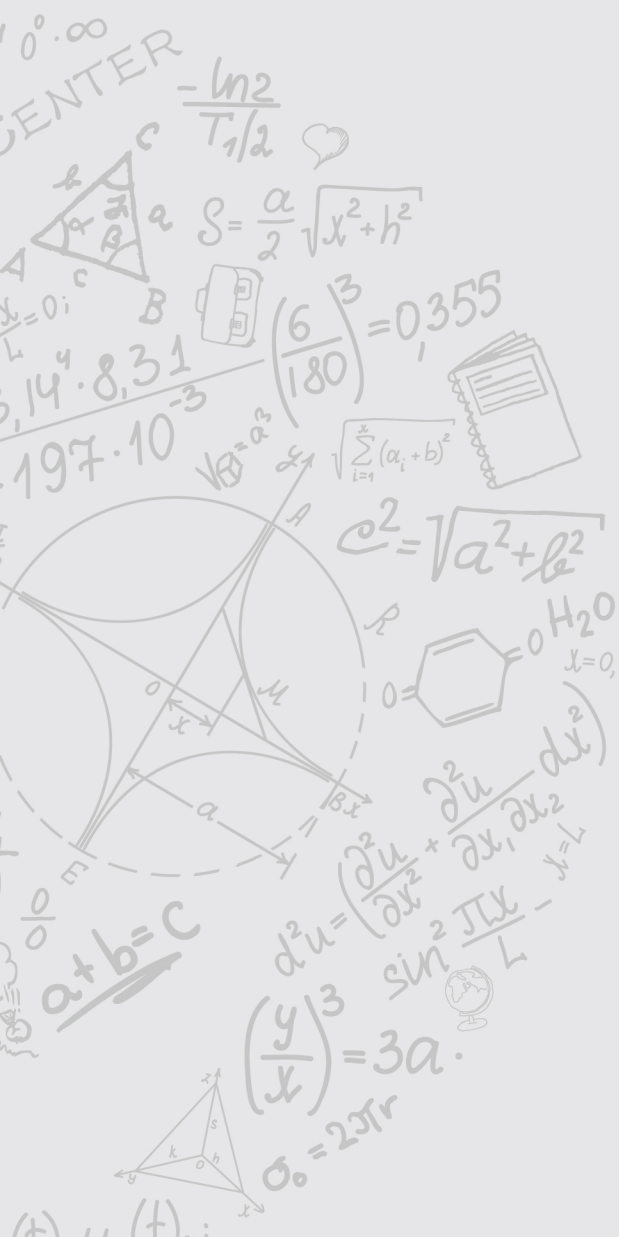
2009 - 2019

ANNIVERSARY REPORT

十周年报

BEIJING
COMPUTATIONAL
SCIENCE
RESEARCH
CENTER



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本册所列所有信息为2009年至2019年期间

① CSRC BUILDING 中心办公楼效果图
② COURTYARD 中庭院
③ AUDITORIUM 学术报告厅
④ SEMINAR ROOM 学术会议室
⑤ COMMON 三角休闲/学术讨论区
⑥ COFFEE CORNER 咖啡角
⑦ VISITOR OFFICE 客座教授办公室

CSRC

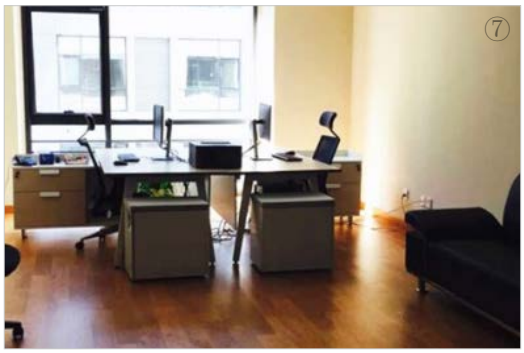
Beijing Computational Science Research Center (CSRC) is a multidisciplinary fundamental research organization under the auspices of the China Academy of Engineering Physics (CAEP). Established in August 2009, CSRC positions itself as a center of excellence in computational science research addressing current and critical issues in multidisciplinary of Mathematics, Mechanics, Physics, Chemistry, Materials Science, and Computational Science.

Mission of CSRC:

◎ carry out fundamental, frontier, critical, and multidisciplinary research with advanced computational approaches, thereby attract talents worldwide and train highly qualified research personnel, to support grand scientific development and technology innovation in China;

◎ develop and maintain collaboration with research institutes elsewhere by building a comprehensive and internationalized research platform, to support academic and technological exchange and advancement;

◎ innovate and reform organizational structures, management policies and methods for enabling creative and effective scientific research, to raise our national competence in technology innovation and enhance our comprehensive strength in science and technology.



Specifically, CSRC supports the development and implementation of grand challenging projects in natural science and engineering where computational modeling and simulation play a key role. CSRC also encourages its members to engage in the development of computational algorithms and software.

北京计算科学研究中心

（以下简称中心）是隶属于中国工程物理研究院的独立法人单位，是以计算科学为牵引的多学科基础研究机构。中心成立于2009年8月。中心的定位是开展计算科学研究，促进科技发展，打造一个国际一流的开展计算科学及相关学科交叉研究的综合平台。

中心定位与目标

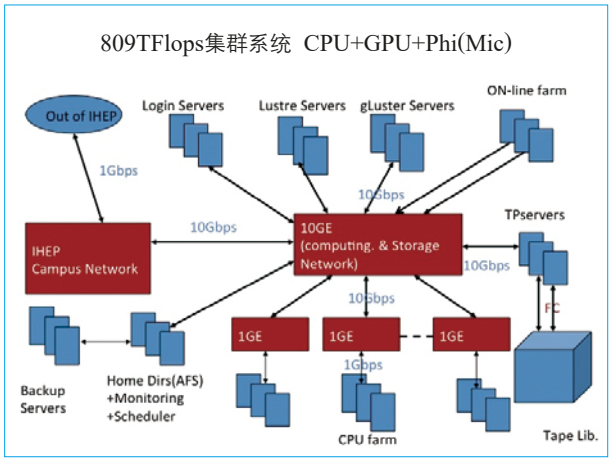
开展科学前沿研究

- 以计算科学研究为手段，以重大科学技术工程的实施和发展需求为牵引，积极引进海内外高层次人才，促进人才培养，开展基础性、前沿性、关键性和交叉性的研究工作；
- 加强对外学术技术交流，促进与国际知名科研机构的合作，搭建开放式、综合性、国际化的科研平台；
- 探索适于科研创新的管理体系，落实机制改革创新，提升我国科技自主创新能力，增强我国科技综合实力。

发挥科学支撑效能

- 将科学前沿研究获取的新知识、新思想、新概念、新方法新手段通过多种方式转移到中物院其他研究机构；
- 与中物院其他机构合作，开展国家安全领域所需的新技术、新方法、新思路、新手段，乃至产生新工艺、新机理、新材料、新体系的研究；
- 拓展育新，根据中物院战略发展需求，布局和开展探索性、先导性研究，服务于院和国家未来发展的需要。

作为一个基础性、跨学科、开放式的综合研究平台，中心将成为中物院在各个研究领域开展创新研究的重要支撑，开展对外科学技术交流合作的桥梁和纽带，高层次人才引进与培养的摇篮，同时填补我国计算科学相关学科交叉研究领域的空白。

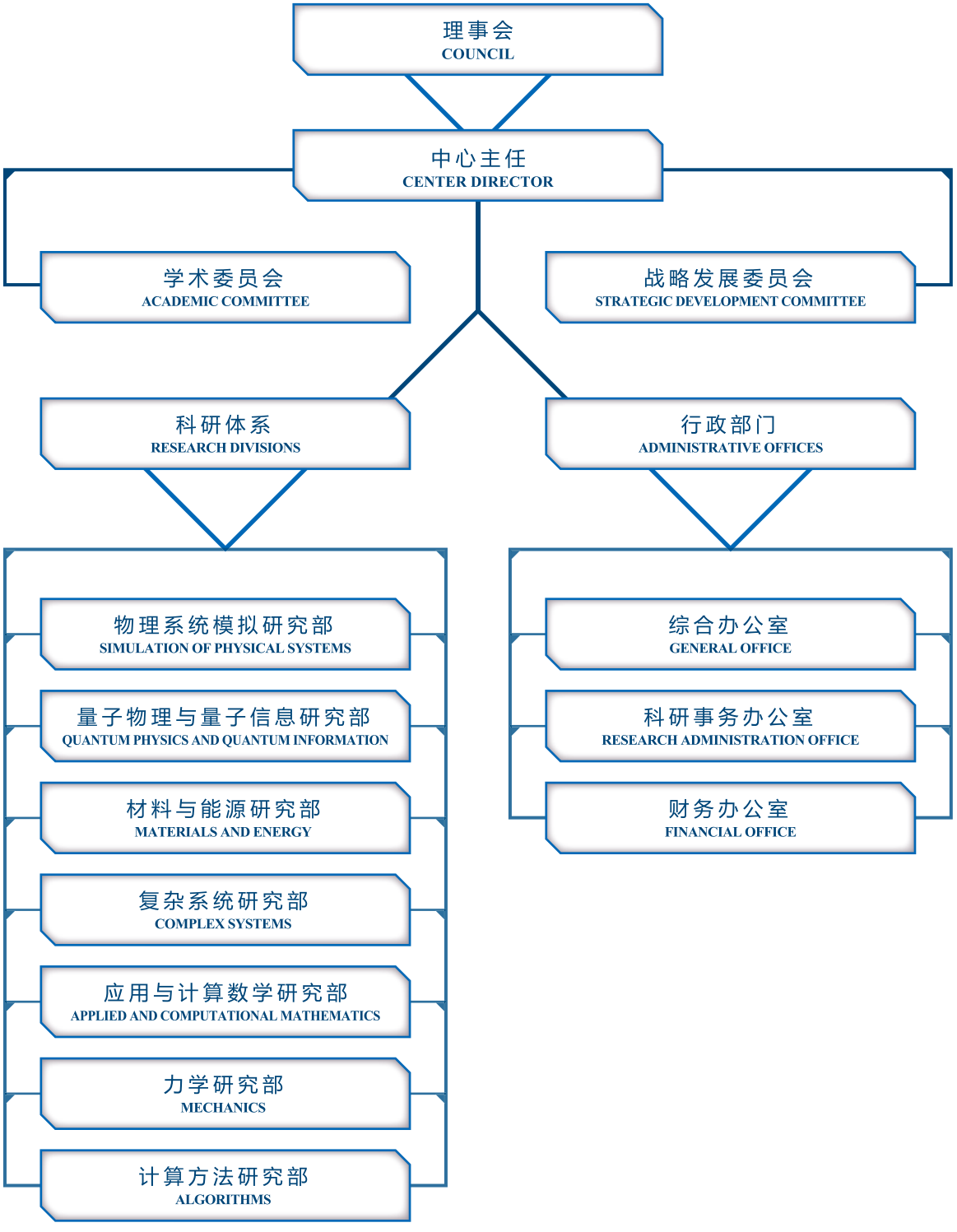


The CSRC is equipped with the state of art high performance computing facilities, which include a dedicated in-house 14,000+ core cluster TianHe2-JK in addition to many smaller clusters.

For more details about CSRC Computing, please visit: http://www.csrc.ac.cn/en/facility/cmpt/

天河二号-计科中心集群系统
CLUSTER TIANHE2-JK

ORGANIZATION 中心组织构架



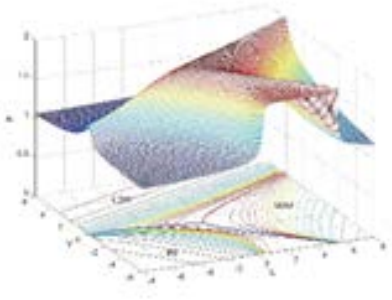
科研部门
RESEARCH DIVISIONS

CSRC is comprised of 7 research divisions, which are conducting computational science research in diverse areas including condensed matter physics, functional and Green energy materials, quantum optics and information, material sciences and mechanics, complex systems in biology and active matters, applied mathematics, and algorithm developments.

中心目前有7个研究部，分别在凝聚态物理、功能与绿色能源材料、量子光学与信息、材料科学与力学、生物与活性物质复杂系统、应用数学、算法开发等多个领域开展计算科学研究。

The main research areas of this division are condensed matter physics and computational physics, with emphasis on solving many-body problems with the state-of-the-art approaches. Currently the division is carrying out the following research: magnetism, superconductivity and novel spin-related phenomena in new materials such as graphene and topological insulator; electron spins in semiconductor quantum dots; theory of spin decoherence in the solid state, coherence protection, and their applications; realistic description of spin-orbit coupling and its effects in semiconductor nano-structures, and the control of transport and long-range spin-spin coupling; stain tunable electronic and phonon properties of low dimensional materials; transport via atomistic molecular dynamics; development of many-body theory and novel simulation techniques.

SIMULATION OF PHYSICAL SYSTEMS DIVISION
物理系统模拟研究部

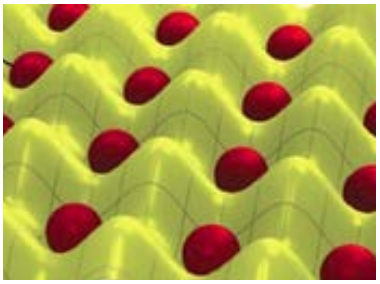


该研究部的主要研究领域是凝聚态物理和计算物理，重点是用最先进的方法解决多体问题。目前，该部门正在开展以下研究:石墨烯和拓扑绝缘体等新材料中的磁性、超导性和与自旋相关的新现象;半导体量子点中的电子自旋;固体自旋退相干理论、相干保护及其应用自旋轨道耦合及其在半导体纳米结构中的作用、输运控制和远程自旋-自旋耦合；着色低维材料的可调电子和声子特性；原子分子动力学运输;多体理论和新型仿真技术的发展。

This division focuses on fundamental problems of quantum theory and advanced applications of quantum technologies. For the fundamental part, we are currently interested in problems including quantum measurement theory, quantum thermal dynamics, quantum uncertainty relation, and quantum information of black hole; for the application part, we study atomic magnetometer/gyroscope, quantum walk, optomechanics and quantum computing using both theoretical and experimental methods.

QUANTUM PHYSICS AND QUANTUM INFORMATION DIVISION

量子物理与量子信息研究部

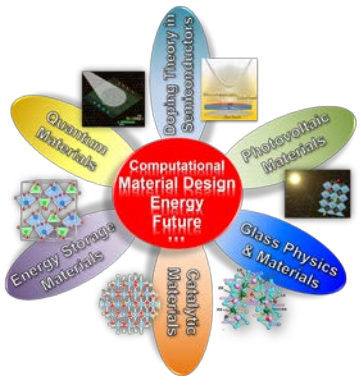


该研究部主要研究量子物理的基本问题和量子技术的前沿应用。基本问题方面，主要研究量子测量理论、量子热动力学、量子不确定性关系和黑洞量子信息等问题；量子技术方面，通过理论和实验相结合，对原子磁强计、陀螺仪、量子行走、光力学和量子计算等进行研究。

This division focuses on exploring novel functional materials for mechanical, electronic, optoelectronic and energy related applications and unraveling their underlying physics and chemical process. We perform quantum mechanical calculations and beyond to test fundamental theories by using high performance computers and provide useful insights, fresh perspective and new design principles to accelerate the scientific discovery of innovative functional materials.

MATERIALS AND ENERGY DIVISION

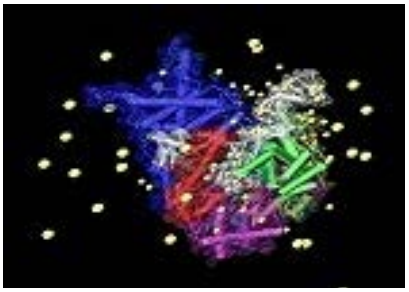
材料与能源研究部



该研究部依托高性能计算平台，运用从电子层次的量子力学计算、原子尺度的分子动力学模拟到宏观尺度数值仿真的多尺度模拟手段，探索和发现在机械工程、微电子、新能源等领域有广泛应用前景的新材料；通过揭示物质优异特性的物理本质，测试并建立基础理论模型，为基于高通量筛选、机器学习等方法的材料研究新范式提供可靠的设计原理和高效的研发思路，以加快对高性能材料的科学发现。

The research focus of the Complex Systems Lab at CSRC is the development and application of methods of statistical physics in the treatment of complex physical and biological phenomena. We are particularly interested in the construction and analysis of simple yet quantitative models that expose the key factors responsible for the system's functionality and behavior. Current research topics include stochastic processes arising from the cell, fluctuation phenomena, molecular dynamics simulation of enzymatic reactions, molecular motors and transcriptional machinery, multiscale modeling and algorithmic development. We seek close collaboration with domestic and overseas research groups and institutions in the area of single-molecule and single cell imaging, metabolic regulation, bioinformatics, advanced computational methods and nonequilibrium statistical physics.

COMPLEX SYSTEMS DIVISION 复杂系统研究部



该研究部的研究重点是统计物理方法在复杂物理和生物现象处理中的发展和应用，特别是构建和分析简单但定量的模型，这些模型揭示了负责系统功能和行为的关键因素。目前的研究主题包括细胞产生的随机过程、波动现象、酶反应的分子动力学模拟、分子马达和转录机制、多尺度建模和算法开发。在单分子和单细胞成像、代谢调节、生物信息学、先进计算方法和非平衡统计物理等领域寻求与国内外研究团体和机构的密切合作。

The research focus of the Division of Mechanics is computational mechanics in its broadest sense, which may involve solids, fluids, soft matter, and their interfaces, with a particular interest in multi-scale and multi-physics theories and methodologies across macro-, meso-, and micor-scales. Computational mechanics requires physical modeling, mathematical analysis, and numerical algorithms with a specific emphasis on using modern computer architectures to perform challenging large-scale scientific computations for systems of great significance in science and engineering.

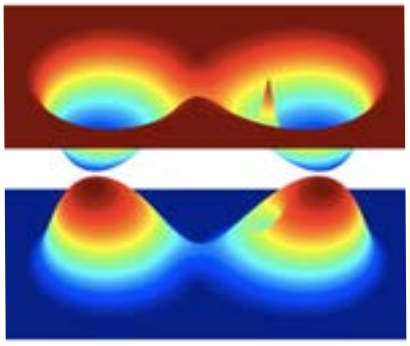
MECHANICS DIVISION 力学研究部

该研究部的研究重点是广义的计算力学，涉及到固体、流体、软物质及其界面等，特别是在宏观、细观和微观尺度上的多尺度和多物理理论和方法方面。计算力学要求物理建模、数学分析和数值算法，特别强调使用现代计算机体系结构，为在科学和工程中具有重大意义的系统执行具有挑战性的大规模科学计算。

The research of the applied mathematics lab covers a broad spectrum of basic research topics of applied and computational mathematics such as numerical analysis and numerical partial differential equations, to interdisciplinary research topics of mathematical modeling and scientific computing such as uncertainty quantification and flow control. Much of the ongoing and planned research places emphasis on the development of fundamental mathematical concepts and innovative numerical algorithms towards the mathematical analysis, multiscale and stochastic modeling and simulations of problems in fluid and solid mechanics, atomic and soft matter physics, biological and materials sciences, data and image analysis, and other application domains.

APPLIED AND COMPUTATIONAL MATHEMATICS DIVISION

应用与计算数学研究部

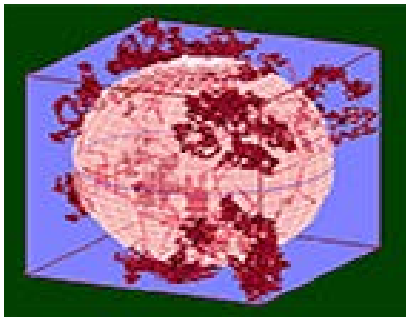


该研究部的研究涵盖了数值分析、数值偏微分方程等应用与计算数学的基础研究课题，以及不确定性量化、流量控制等数学建模与科学计算的交叉研究课题。正在进行和计划中的许多研究都将重点放在基础数学概念和创新数值算法的开发上，以进行流体和固体力学，原子和软物质物理学，生物和材料科学中的问题的数学分析，多尺度和随机建模和模拟，数据和图像分析以及其他应用领域的研究。

Computation Algorithms Division focuses on the development of new advanced algorithms, the support on algorithms and software, and the management of high performance computing facility for the computational science research in CSRC.

ALGORITHMS DIVISION

计算方法研究部



该研究部致力于新高级算法的开发，算法和软件的支持，以及对计科中心高性能计算设施的管理。

科研亮点

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PHOTOINDUCED ENHANCEMENT OF BOND ORDER IN THE ONE-DIMENSIONAL EXTENDED HUBBARD MODEL

(By **Can Shao**, Hantao Lu, **Hong-Gang Luo**, and **Rubem Mondaini**)

The half-filled one-dimensional extended Hubbard model has been extensively investigated over the past decades, especially for its ground-state phase diagram, not only for its interesting basic aspects but also as a way to understand the correlated phases of a variety of organic crystals. The model takes into account Coulomb interactions on a local (on-site) and nearest-neighbor levels, with magnitudes U and V, respectively. These generically favor spin-density-wave (SDW) and charge-density-wave (CDW) orders when they are individually strong, while in the weak and intermediate regime, due to the competition of U and V, there exist another phase called bond-order-wave (BOW) phase. Up to now, the BOW state has not been observed in materials, neither in cold atom experiments because of its strict demand of the combination of U and V, which need to be comparable. A recent investigation [1] involving Can Shao, Hong-Gang Luo and Rubem Mondaini from CSRC, and Hantao Lu from Lanzhou University, offers an indirect and optical way to confirm its existence.

The authors investigate the real-time dynamics of this model after a time perturbation corresponding to a ultrafast photoirradiation. Starting from a wide regime displaying a charge-density-wave in equilibrium ($V = 7$ in Fig. 1), a robust photoinduced in-gap state appears in the optical conductivity, depending on the parameters of the pulse.

Meanwhile, the pump could also increase the overlap of the time-evolving wave function with the first excited state $|1\rangle$ in the zero-momentum subspace which displays the elusive bond-ordered wave. Through the calculation of optical conductivity from the time-evolving wave function and the first excited state, the authors have made a clear connection between the emergence of this order and the formation of the in-gap state.

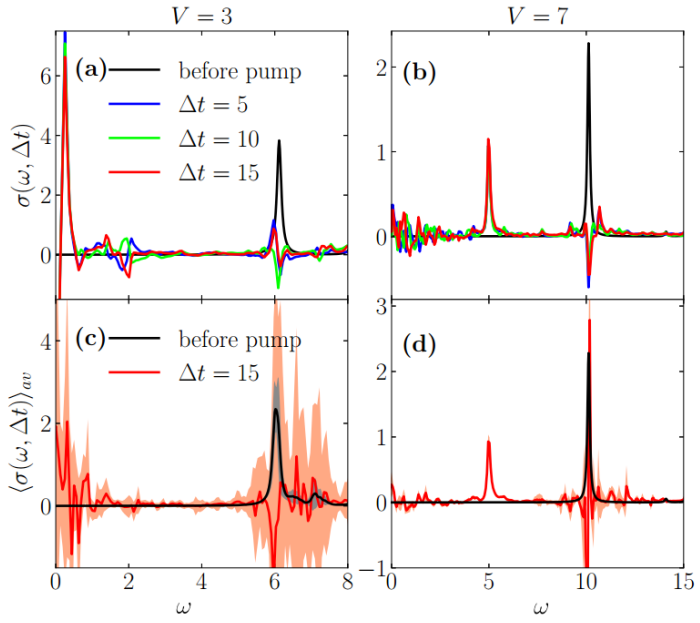

Fig. 1. Re $\sigma(\omega, t)$ for a lattice with $L = 14$ and $U = 10$. The standard periodic BC (TBC averaging) is used in (a) [(c)] with $V = 3$ in SDW and (b) [(d)] with $V = 7$ in CDW. The black (red) solid line in (c) and (d) is the averaged result before (after) the pump over ten equidifferent twisted phases $\varphi \in [0, 2\pi)$, with the shading marking the corresponding error bar. Parameters of the pump: $A_0 = 0.4$ and $t_d = 0.5$, with $\omega 0$ matching the position of the main peak in equilibrium. The broadening factor η is taken to be 1/L.

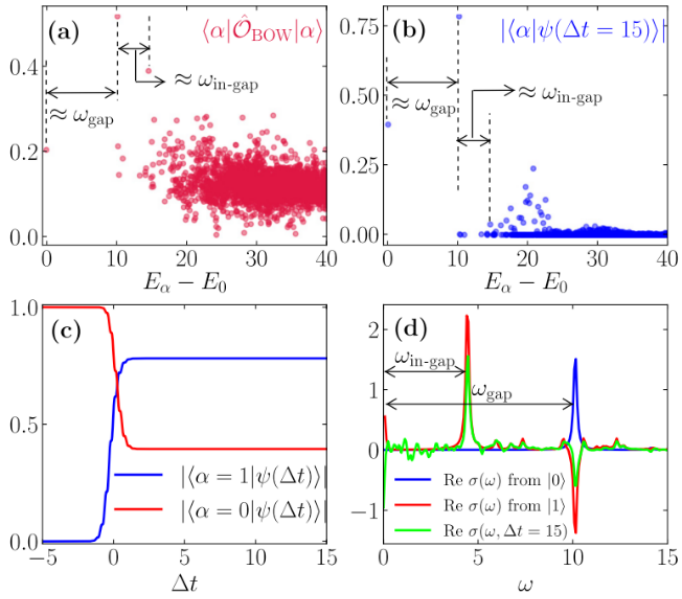

Fig. 2. Full-ED calculation, restricted to the k = 0 subspace, of a ten-site lattice with parameters U = 10 and V = 7. E_α - E0 is the energy difference between the corresponding excited states |α>s and the GS. (a) <α|OBOW|α>, eigenstate expectation values of the normalized BOW structure factor vs Eα - E0 ∈ [0, 40]. (b) |<α|ψ(t = 15)>|, overlap between |ψ(t = 15)> and eigenstates |α>s vs Eα - E0 ∈ [0, 40]. (c) | <α|ψ(t)>|, overlap between |ψ(t) > and the eigenstates |α = 0, 1> of the equilibrium Hamiltonian vs t. (d) σ (ω) calculated from the GS (blue) and first excited state (red), as well as σ (ω, t = 15) (green) lines. Parameters of the pump: A0 = 0.5, td = 0.5, and ω0 = 10.12 matches the optical gap.

Finally, by using the exact diagonalization, the authors perfomed a finite-size scaling on the order parameter of bond order from both the ground state and first excited state within the CDW phase. As expected, results indicate that in the thermodynamic limit, only the first excited state displays a finite BOW order parameter. This finding suggests the potential observation of purely electronic (i.e., not associated with a Peierls instability) bond-ordered waves in pump-probe experiments. The authors argue that in the background of alternating doublons and holons, the bond (dimerization) of electrons among the double occupied sites and their nearest empty site is one of the lowest-order excitations, which, under appropriate photoexcitation, can be dynamically accessed. This provides an unique framework for the observation of the elusive BOW order in experiments involving molecular crystals under ultrafast photoirradiation. Fundamentally, the emergent dimerization observed is intrinsic and not associated with electron-lattice couplings as observed in alkali-TCNQ compounds.

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[1] Can Shao, Hantao Lu, Hong-Gang Luo, and Rubem Mondaini, Phys. Rev. B 100, 041114(R) (2019)

BUILDING EGG-TRAY-SHAPED GRAPHENES THAT HAVE SUPERIOR MECHANICAL STRENGTH AND BAND GAP

(By **Liu Wei**, Zhao Lei, Zurek Eva, Xia Jing, Zheng Yong-Hao, **Lin Hai-Qing**, Liu Jing-Yao, **Miao Mao-Sheng**)

A family of 2D egg-tray graphenes possessing superior mechanical and electronic properties were constructed by arranging defects in the graphene lattice topologically. The work was co-led by Haiqing Lin from the Beijing Computational Science Research Center, Maosheng Miao from the California State University Northridge, and Jingyao Liu from the Jilin University, and was carried out primarily by Wei Liu who is currently working in Zhejiang A&F University. They reported that a new family of 2D carbon allotropes (egg-tray graphenes) possessing hillocks and trenches are obtained by arranging pentagons and heptagons in the graphene lattice following varies topological orders. The rational design of these novel graphene allotropes will result in materials with enhanced mechanical strength and a rich variety of electronic properties. Depending on the structure, the egg-tray graphenes can be semi-metallic or semiconducting with either direct or indirect gaps. Some allotropes have Dirac cones in their band structures. Remarkably, some of the allotropes also show negative Poisson's ratios. This work provides an effective way to improve both the mechanical and electronic properties of graphene. It will enable the rational design of new graphene-based materials with a wide variety of superlative properties.

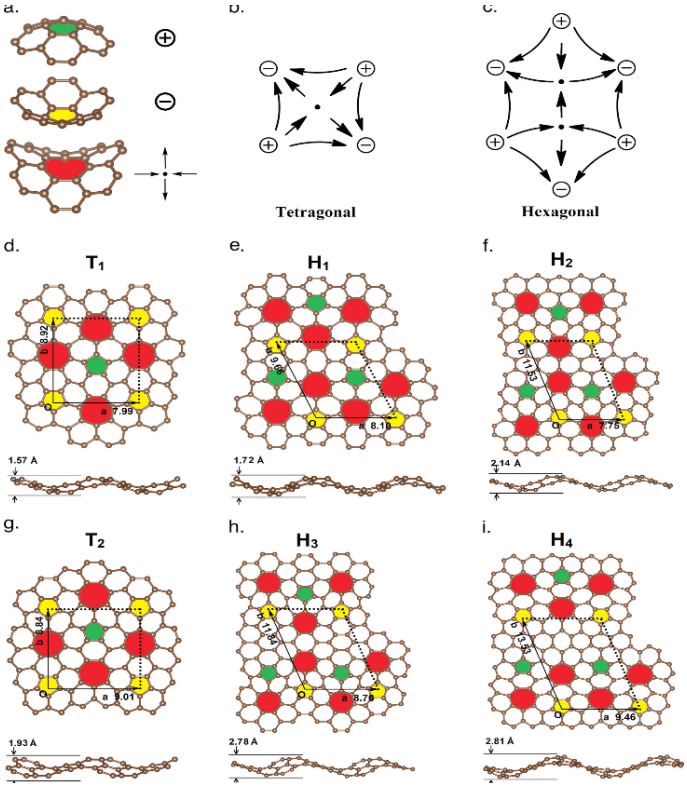

Fig. 1. Schematic illustration of the construction of egg-tray graphenes and the obtained optimized structures. a Green and yellow pentagons surrounded by five hexagons denote the maximum and the minimum points, whereas one heptagon surrounded by seven hexagons denotes a saddle point in the topological graphs. b, c Tetragonal and hexagonal topological graphs. d–i Top and side views of the optimized structures of egg-tray graphenes T_1, T_2, H_1, H_2, H_3, and H_4. Their unit cells are marked by the black lines, and the lattice parameter is given in Angstrom (Å). Brown balls represent carbon atoms

References:

[1] Liu Wei, Zhao Lei, Zurek Eva, Xia Jing, Zheng Yong-Hao, Lin Hai-Qing, Liu Jing-Yao, Miao Mao-Sheng, npj Comput. Mater. 5, 71 (2019)

MIXED-ORDER SYMMETRY-BREAKING QUANTUM PHASE TRANSITION FAR FROM EQUILIBRIUM

(By **Tharnier Puel O.**, **Stefano Chesi**, Stefan Kirchner, Pedro Ribeiro)

Phase transitions are a traditional subject which continues to be a source of new discoveries in a broad range of physical systems. While an early classification of phase transitions is attributed to Paul Ehrenfest (1880–1933), and the distinction between first- and second-order phase transitions is now well established, a general conceptual framework for such collective phenomena only exists in equilibrium. Non-equilibrium stationary states realized, for example, in driven-dissipative systems or with non-thermal reservoirs, can also display a discontinuous dependence on external control parameters. However, such out-of-equilibrium phase transitions can give rise to more complex behavior.

Some of these intriguing non-equilibrium phenomena were recently investigated by a collaboration [1] involving Tharnier O. Puel and Stefano Chesi from CSRC, together with Stefan Kirchner (Zhejiang University) and Pedro Ribeiro (University of Lisbon). The system considered in their work is a spin chain, schematically illustrated in Fig. 1(a) and described by an Ising model in a transverse field. Such model is paradigmatic for equilibrium quantum phase transitions (i.e., driven by quantum fluctuations at zero temperature) but here the researchers also include a coupling to two reservoirs held at different thermodynamic potentials, which generate in the long-time limit a current-carrying steady-state.

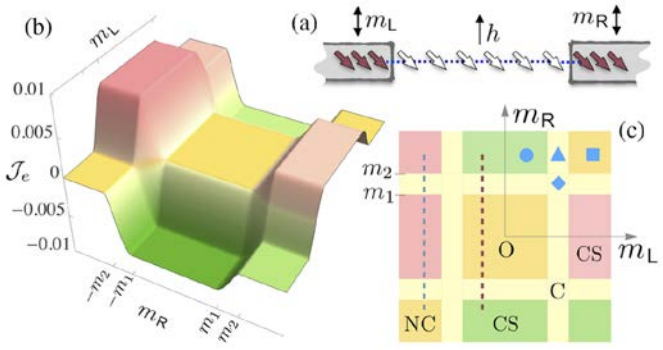

Fig. 1. (a) Sketch of the model: transverse field Ising chain coupled at its edges to magnetic reservoirs, L and R, held at magnetizations m_L and m_R respectively. (b) Energy current, Je, flowing through the chain as function of mL and mR. (c) Phase diagram.

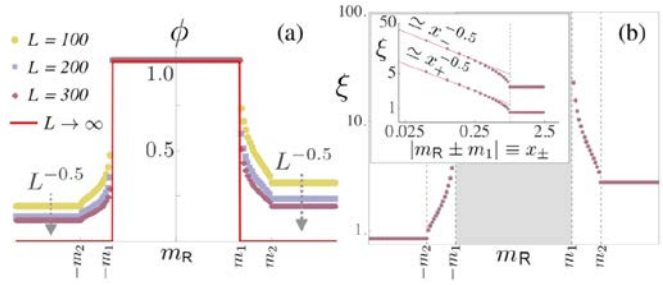

Fig. 2. (a) Magnetization, computed along the red-dashed line of Fig. 1(c) at different system sizes. In the thermodynamic limit the magnetization is discontinuous. (b) Correlation length, along the same line of panel (a). The inset shows the log-scaling near the two order-disorder transition points.

It is found that the familiar order-disorder transition of the equilibrium case generalizes to a complex phase diagram which, as shown in Fig. 1(b-c), can be mapped out by the energy current. In the parameter space of the reservoir magnetizations (m_L and m_R) one can distinguish an ordered phase (O) and three types of disordered phases: conducting (C), non-conducting (NC), and current-saturated (CS). A perhaps more striking observation is that the discontinuous jump of the magnetic order parameter at the O-C phase boundary coincides with a diverging correlation length. The coexistence of such defining features of first- and second-order phase transitions demonstrates a new type of critical point (a mixed-order phase transition) which is usually not allowed in equilibrium conditions. The authors have also characterized the different phases from the point of view of entanglement entropy and discovered a bias-dependent logarithmic correction which violates the well-known equilibrium area law.

Besides nicely exemplifying how out-of-equilibrium conditions allow for novel critical phenomena, the exactly solvable model presented here should prove useful in developing a general theory of non-equilibrium phase transitions in interacting systems. Furthermore, through the associated fermionic mapping (which allows for the exact solution of the problem) a direct link with topological superconductivity and Majorana modes in Kitaev chains can be established.

References:

[1] T. O. Puel, S. Chesi, S. Kirchner, and P. Ribeiro, Phys. Rev. Lett. 122, 235701 (2019).

SUPERCONDUCTIVITY AND ITS ENHANCEMENT IN POLYCYCLIC AROMATIC HYDROCARBONS

(By Guo-Hua Zhong, Xiao-Jia Chen and **Hai-Qing Lin**)

The discovery of superconductivity above 100 K in aromatic hydrocarbons in the past years has been an exciting event in condensed matter physics, chemistry, and materials. Superconductivity was realized by simply introducing electrons in the network made by carbon and hydrogen - the two components for organic systems. However, the accurate amount of doped electrons and their positions have not been established experimentally. No agreement has been reached for the mechanism of their superconductivity.

Haiqing Lin of the Beijing Computational Science Research Center, Xiaojia Chen of the Center for High Pressure Science and Technology Advanced Research and Guohua Zhong of the Shenzhen Institutes of Advanced Technology of the Chinese Academy of Sciences, have studied systematically structures and physical properties of aromatic hydrocarbons and addressed these problems by the first-principles theory with the combination of electron correlations method.

The results show that both the single-ring compound (benzene) and the two-benzene rings compound (naphthalene) are superconductors with transition temperatures (Tc's) of 6.2 K and 5.8 K respectively after upon doing of potassium. By examining the theoretical predictions and summarizing the existing experimental data, researchers found that there exists a unique superconducting phase with Tc in the range of 5 - 7 K range for all aromatic hydrocarbons. The almost constant low density of states at Fermi level with about two electrons doping accounts for this unified phase. The high density of states at Fermi level upon three-electron doping seems responsible for the high-Tc phase in these hydrocarbons with long benzene rings. Meanwhile, the electronic correlations also increase with increasing the number of benzene rings. Researchers suggested that both the electron-phonon interaction and electron-electron correlations work together to enhancement the superconductivity. These findings offer clues to the understanding of the superconductivity as well as to the search of new superconductors in this family.

References:

[1] Guo-Hua Zhong, Xiao-Jia Chen and Hai-Qing Lin, Frontiers in Physics 7, 52 (2019)

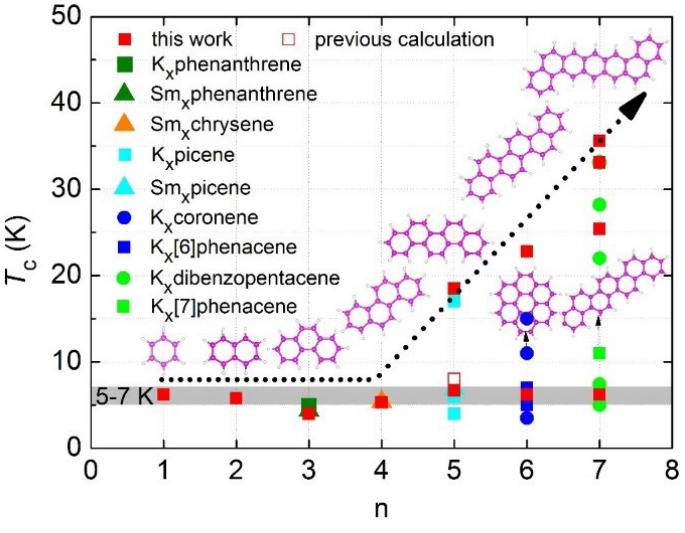

Fig. 1. Superconducting transition temperatures of aromatic hydrocarbons. Variation of superconducting transition temperature T_c with the number of benzene rings (n) for various aromatic hydrocarbons. The gray region is the guide for eyes. Solid red squares represent our predicted results, while the hollow red square implies the predicted result by Casula et al. [PRL 107, 137006 (2011)]. Other data are taken from experiments.

IMPROVING QUANTUM PARAMETER ESTIMATION BY MONITORING QUANTUM TRAJECTORIES

(By Yao Ma, Mi Pang, Libo Chen, and **Wen Yang**)

The precise measurement of physical parameters characterizing various dynamical processes has widespread application in many fields, such as interferometric phase estimation, frequency spectroscopy, and magnetometry. Using quantum probes, non-classical resources can be utilized to improve the measurement precision beyond the classical $1/\sqrt{N}$ scaling and even attain the fundamental Heisenberg $1/N$ scaling allowed by quantum mechanics. However, environmental noises decohere the quantum probes and severely degrade the measurement precision, posing a critical challenge to the practical realization of quantum-enhanced ultrasensitive sensing.

Recently, the research group led by Prof. Wen Yang at Beijing Computational Science Research Center in collaboration with Prof. Yao Ma at Xi'an University of Technology, develops a general theory for improving the measurement via continuous monitoring of a general environment. Monitoring the noise-induced quantum trajectory (MQT) can be achieved in two ways: (i) Any quantum trajectories can be monitored by monitoring the environment, but certain quantum trajectories can also be monitored by monitoring the quantum probe alone via ancilla-assisted encoding and error detection, i.e., the first two steps of quantum error correction (QEC). This QEC-based MQT makes certain MQT experimentally feasible and establishes a connection between MQT and the full QEC-based protocol. The QEC-based MQT is less powerful than QEC when perfect error correction is available. Nevertheless, MQT itself provides insight into how the information leaks into the quantum trajectories and how it is recovered. For certain models where corrective operations are not necessary, MQT becomes advantageous because it avoids faulty corrective operations. Application of this method to a spin 1/2 demonstrates its capability of significantly improving the measurement precision under three typical decoherence channels: spin relaxation, spin flip, and spin dephasing.

References:

[1] Yao Ma, Mi Pang, Libo Chen, and Wen Yang, Phys. Rev. A 99, 032347 (2019)

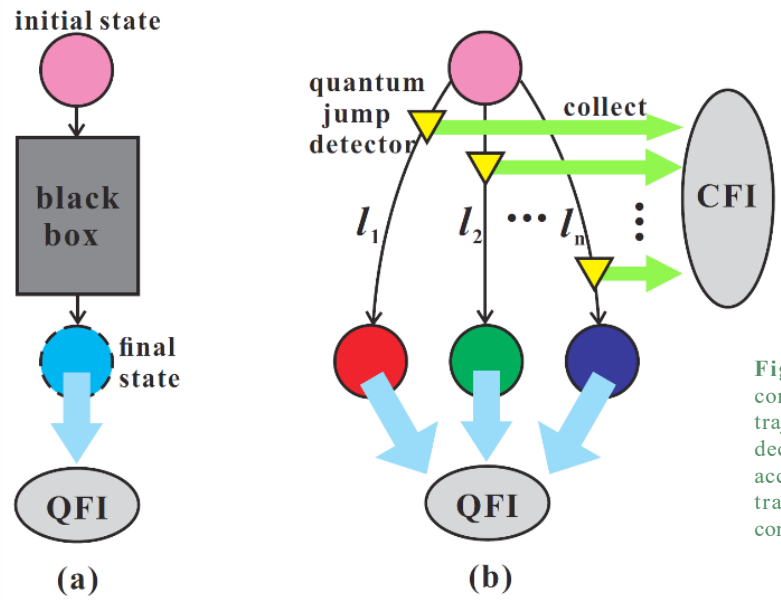

Fig. 1. Quantum parameter estimation by (a) conventional method and (b) monitoring quantum trajectories: The former treats the noise-induced decoherence as a black box, while the latter gains access to the quantum Fisher information of every trajectory and the classical Fisher information contained in the timings of all the quantum jumps.

MAGNETIC PLASMON-ENHANCED SECOND-HARMONIC GENERATION ON COLLOIDAL GOLD NANOCUPS

(By Si-Jing Ding, Han Zhang, **Da-Jie Yang**, Yun-Hang Qiu, Fan Nan, Zhong-Jian Yang, Jianfang Wang, Qu-Quan Wang, and **Hai-Qing Lin**)

Second-harmonic generation (SHG) is a second-order nonlinear optical process, whereby two photons of an incident laser at the fundamental frequency (ω0) are absorbed simultaneously and then one photon at the second-harmonic frequency (2ω0) is emitted. SHG offers an approach for photon up-conversion and has applications in photonic devices and biological spectroscopy. SHG is forbidden in centrosymmetric materials within the electric dipole approximation. Therefore, great efforts have been made to design and fabricate plasmonic-metal nanostructures with various non-centrosymmetric geometries. So far, most studies on SHG enhancements have focused only on electric plasmon resonances. Magnetic plasmon resonances have been successfully used to enhance the SHG of symmetry-broken metal nanostructures fabricated by physical methods, which permit high excitation powers and give high SHG efficiencies. However, magnetic plasmon resonances in threedimensional (3D) metal nanostructures fabricated by physical methods are hard to optimize and have not been used in dualresonance antennas for nonlinear enhancement.

Da-Jie Yang, Hai-Qing Lin of CSRC, Si-Jing Ding, Han Zhang and Jianfang Wang of The Chinese University of Hong Kong, Yun-Hang Qiu, Fan Nan and Qu-Quan Wang of Wuhan University, and Zhong-Jian Yang of Central South University, have successfully optimized the magnetic plasmon resonance of colloidal Au nanocups, created nonlinear dual-resonance antennas (DRAs) using Au−Ag heteronanocups for the first time, and demonstrated strikingly enhanced SHG [1]. The colloidal Au and Au−Ag nanocups with controlled asymmetric geometry are synthesized by facile chemical methods. The magnetic plasmon resonance and the correspondingly enhanced SHG are optimized by adjusting the normalized depth of the nanocups (see Fig. 1). The maximal SHG of the Au nanocups is observed and revealed to be caused by the joint action of the magnetic plasmon resonance and the "lightningrod effect". Furthermore, the Au−Ag heteronanocups with Ag nanoparticles attached on the edge of the Au nanocups are prepared. They own dual resonances, respectively, at the excitation and second-harmonic wavelengths and exhibit 21.8-fold enhancement of SHG compared with the bare Au nanocups. This largely enhanced SHG is caused by the cooperative magnetic and electric plasmon resonances at the same hot spot.

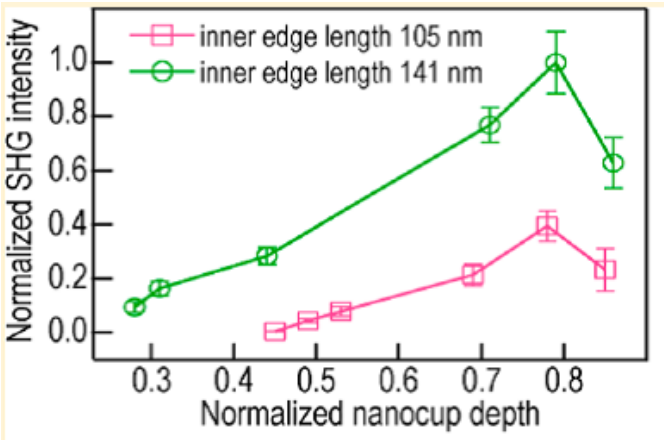

Fig. 1. Normalized SHG intensities of the Au nanocups with b = 105 and 141 nm and different h/b values.

These findings provide a new strategy for the design of nonlinear plasmonic antennas based on magnetic plasmon resonance. Such nonlinear antennas integrate the highly desired multifunctionalities of multifrequency resonances and high scattering-to absorption ratios. They will find diverse promising applications ranging from nanophotonics to biological spectroscopy.

References:

[1] Si-Jing Ding, Han Zhang, Da-Jie Yang, Yun-Hang Qiu, Fan Nan, Zhong-Jian Yang, Jianfang Wang, Qu-Quan Wang, and Hai-Qing Lin, Nano Lett. 19, 2005 (2019)

MOLECULAR TUNNEL JUNCTION-CONTROLLED HIGH-ORDER CHARGE TRANSFER PLASMON AND FANO RESONANCES

(By Ximin Cui, Feng Qin, Yunhe Lai, Hao Wang, Lei Shao, Huanjun Chen, Jianfang Wang, **Hai-Qing Lin**)

Nanocavities formed by metal nanostructures and with ultra-small gap distances are an important type of plasmonic devices. Such cavities provide a powerful material platform for interesting plasmonic applications such as surface-enhanced molecular spectroscopy, plasmon–exciton strong coupling and ultimate miniaturization of photonic components for quantum optics. Bridging a plasmonic gap with conductive molecular junctions has recently been shown to increase the electron tunneling rate significantly at both DC and optical frequencies and allow for the excitation of charge-transfer plasmons at moderate gap distances. The molecular tunnel junctions thus help to address the fabrication challenges of quantum plasmonic devices. The tunneling barrier width and height of molecular tunnel junctions can further be tuned by varying the molecular type, structure and functional groups. The molecular tunnel junctions provide solutions to controlling plasmons by molecular electronic means, therefore opening up a promising route towards molecular plasmonic devices and on-chip integrated plasmonic electronic circuits. Although the feasibility of using molecular junctions to modulate the quantum plasmonic properties, including the first-order tunneling charge-transfer plasmon (CTP) mode, has been clearly demonstrated in very recent works, many challenges remain, including facile fabrication of molecular tunnel junctions, active control of quantum plasmons via adjusting the molecular properties, and theoretical modeling of quantum plasmons in molecular tunnel junctions.

H.-Q. Lin from CSRC and his collaborators, L. Shao and J. F. Wang from The Chinese University of Hong Kong, investigated the excitation of high-order CTP modes in a molecular-tunnel-junctions-bridged plasmonic nanocavities. A large-scale bottom-up fabrication of the molecular-tunnel-junctions-bridged plasmonic nanocavities with high quality from single-crystalline metal nanostructures is developed as a platform for the quantum plasmonics study. They observed a strong, well-controlled, higher-order CTP mode in molecular junction-bridged Au nanoplate–Au nanosphere heterodimers on Si substrates. The higher-order CTP mode, together with the spectral features of Fano resonance, of the heterodimers can be tailored by varying the molecular junction in the plasmonic gap. The use of high-dielectric-constant Si substrates allows for the excitation of strong higher-order plasmon modes in the Au NPLs. The small gap between the Au nanocrystals is created with a self-assembled monolayer of molecules. When nonconductive molecules in the gap are replaced with chemically equivalent, conductive ones differing by only one atom, a strong blue-shift of the scattering spectral peak is produced. The blue-shift is ascribed to the emergence of a higher-order CTP mode due to the electron tunneling across the molecular junction. This tunneling effect also largely modifies the Fano resonance feature in the scattering spectra of the heterodimers. FDTD simulations reveal the nature of the higher-order CTP and the evolution from the bonding higher-order dimer plasmon to the higher-order CTP. The molecular conductance at optical frequencies was therefore estimated by matching the simulation-obtained results with the experiments. In parallel, the electron tunneling across the molecular junctions was confirmed by surface-enhanced Raman scattering (SERS) measurements. The reduced SERS signals of the conductive molecules in the plasmonic gap demonstrate that the charge transfer across the molecular junction quenches the plasmonic near-field enhancement.

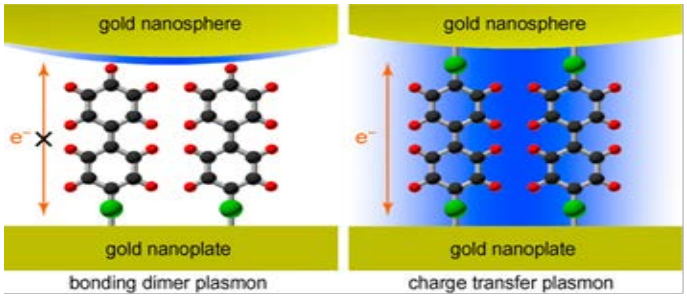

Fig. 1. Plasmonic junctions formed with the different molecules. When nonconductive molecules in the gap are replaced with chemically equivalent, conductive ones differing by only one atom, a higher-order CTP mode emerges due to the electron tunneling across the molecular junction.

This work provides a facile and effective platform for generating higher-order CTP modes in plasmonic structures connected by molecular junctions, which will help to deepen the understanding of the charge transfer effect in plasmonic structures and provide a rich area of exploration on molecular–plasmonic devices.

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SINGLET PAIRING AND SUPERCONDUCTIVITY IN t-J LADDERS WITH MOTT INSULATING STRIPES

(By **Chen Cheng**, **Rubem Mondaini**, and Marcos Rigol)

Despite being one of the most studied phenomena in condensed matter physics over the past three decades, consensus has not yet been reached as to which is(are) the underlying mechanism(s) for high temperature superconductivity [1,2]. In high-temperature superconductors, pairing occurs between electrons in the presence of strongly repulsive interactions. A complex competition of different orders makes it difficult to separate which ones aid and which ones are inimical to superconductivity [3]. One of the orders that has been observed in a variety of experiments in the doped cuprates family is related to the formation of charge density waves (CDW's), dubbed stripes [4-6].

While a general conclusion is not yet reached from investigations on stripes, C. Cheng, R. Mondaini from CSRC and M. Rigol from Pennsylvania State University [7] try to investigate its influence on superconductivity in a simple example. More specifically, they are interested in the properties of the conducting regions that surround Mott insulating stripes in ladder geometries. Since Mott insulators exhibit antiferromagnetic correlations, negative binding energies can occur, and novel superconducting phases can develop, because of proximity effects to an antiferromagnet

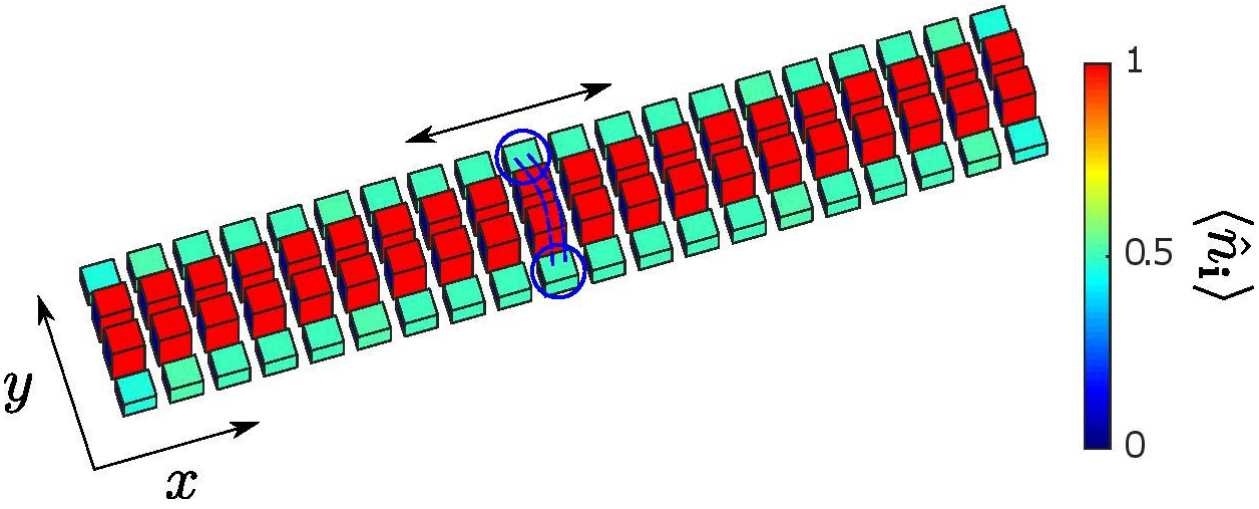

Fig. 1. (a) Numerically obtained site-occupation profile by DMRG, depicted as color bars, in a four-leg ladder with $L_x = 20$, $N_\uparrow = N_\downarrow = 30$, $V = -40$, for isotropic couplings $J = 0.33$. A robust Mott stripe (on-site density $\langle n_i \rangle$ close to 1) is present in the inner two legs, while the two outer legs exhibit an average site occupation $\langle n_i \rangle \approx 0.5$. The blue circles, connected by the dashed lines, show the interleg pairing investigated. The arrows indicate the pairs' motion in the superconducting state.

By unbiased numerical results from density matrix renormalization group (DMRG) method, the authors have found that a novel singlet-pair superconducting phase can occur in inhomogenous t-J ladders with Mott insulating stripes in the inner legs. Pairing is mediated by the antiferromagnetic correlations present in the Mott stripe (replacing the Mott insulating stripe by a band insulating one would result in no pairing). What is most remarkable about the superconducting phase discussed here, and contrasts the superconductivity induced by proximity effects to magnetic insulators discussed in other studies, is that the pairs are composed of fermions that are on different sides of the Mott stripe. Hence, the superconducting current involves the two legs on the sides of the Mott stripe. Blocking one of those legs would destroy the supercurrent, an effect that could be used to reveal the existence of the nonlocal pairing across the Mott stripe.

In experiments with ultracold gases, the fermionic ladder with inhomogeneous trapping potentials is not hard to realize. The implementation has the possibility of being emulated using cold atoms trapped in optical lattices experimentally and could inspire experimentalists in exploring stripes and superconductivity in highly tunable cold atom experiments.

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CRITICAL LEVEL CROSSINGS AND GAPLESS SPIN LIQUID IN THE SQUARE-LATTICE SPIN-1/2 J1-J2 HEISENBERG ANTIFERROMAGNET

(By **Ling Wang** and Anders Sandvik)

The spin-1/2 frustrated J1-J2 Heisenberg model on the two-dimensional (2D) square lattice (where J1 and J2 are the strengths of the first and second neighbor couplings S_i - S_j, respectively) has been studied and debated since the early days of the high-Tc cuprate superconductors. The initial interest in the system stemmed from the proposal that frustrated antiferromagnetic (AFM) couplings could lead to a spin liquid (SL) in which preformed pairs (resonating valence bonds) become superconducting upon doping. Later, with frustrated quantum magnets emerging in their own right as an active research field, the J_1-J_2 model became a prototypical 2D system for theoretical and computational studies of quantum phase transitions and nonmagnetic states. Of primary interest is the transition from the long-range Neel AFM ground state at small $g = J_2/J_1$ to a nonmagnetic state in a window around g=0.5 (before a stripe AFM phase at g>0.6). The nature of this quantum phase transition has remained enigmatic. The nonmagnetic state may be one with spontaneously broken lattice symmetries due to formation of a pattern of singlets (a valence-bond-solid, VBS) or a SL. The quantum phase transition out of the AFM state may possibly be an unconventional "deconfined" transition. However, because of the small system sizes accessible, previous calculations was not possible to rule out a direct AFM–VBS transitions.

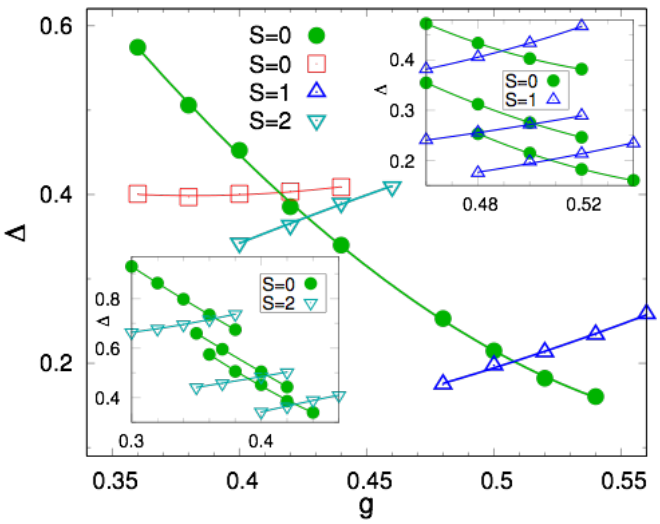

Fig. 1. Gaps to the relevant S= 0, 1, and 2 excitations vs g for L = 10. The insets show the regions of the level crossings of interest for L = 6,8,10 (gaps decreasing with increasing L). The curves show polynomial fits.

L. Wang from CSRC and her collaborator A. Sandvik from Boston University demonstrated an intervening gapless SL by locating the AFM–SL and SL-VBS transitions using a numerical level-spectroscopy approach, where finite-size transition points are defined using excited-level crossings. These crossing points exhibit smooth size dependence and can be more reliably extrapolated to infinite size than the order parameters and gaps used in past studies. They use a variant of the DMRG method to calculate the ground state energy as well as several of the lowest singlet, triplet and quintuplet excited energies. They demonstrated a singlet-triplet level crossing in the J_1-J_2 model which for 2L by L cylindrical lattices shifts as g_{c2} - g_{c2} (L) $\propto 1/$ (L*L) and converges to g_{c2}=0.52. In addition they observed a singlet-quintuplet level crossing, which converges to a different point, gc1=0.46. Given an analogy in a Heisenberg spin chain with long rang interactions, where singlet-quintuplet and singlet-triplet level crossings are associated with AFM-SL and SL-VBS transitions respectively, they interpret both g_{c1} and g_{c2} as quantum-critical points. For $g_{c1} < g < g_{c2}$ the system appears to be a gapless SL with algebraically decaying correlations.

Their work demonstrated a new powerful generic way to use the DMRG method, with the demonstration itself solving a long-standing important problem in quantum magnetism and presenting new spectral properties that should be useful for understanding SLs beyond the one studied there.

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GEOMETRIC ENERGY TRANSFER IN A STUECKELBERG INTERFERENCE OF TWO PARAMETRICALLY COUPLED MECHANICAL MODES

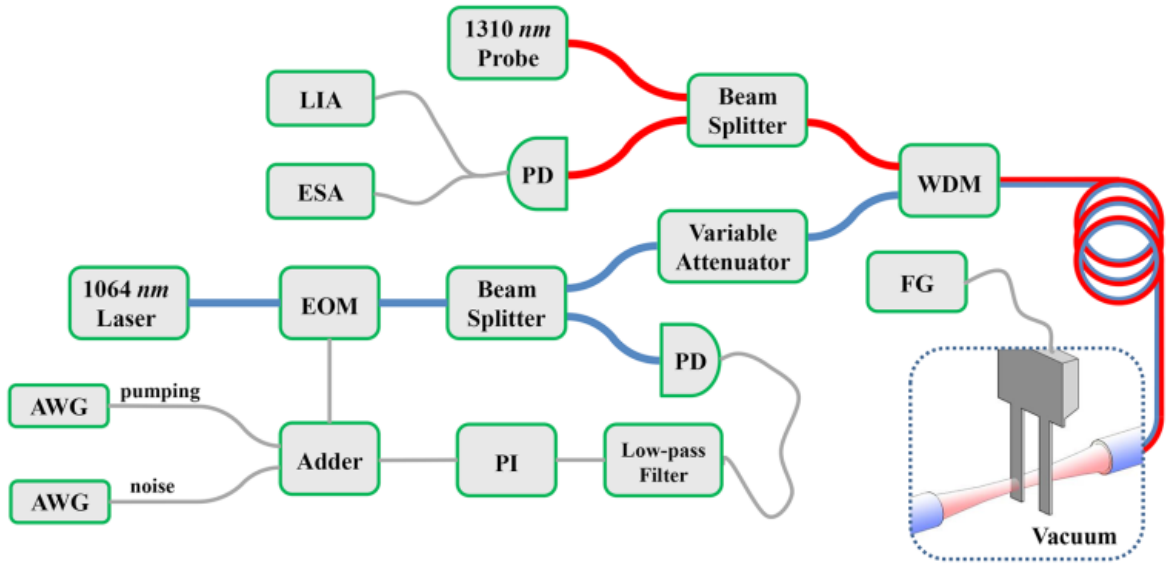
(By Hao Fu, Zhi-Cheng Gong, Tian-Hua Mao, Cheng-Yu Shen, **Chang-Pu Sun**, Su Yi, **Yong Li,** and Geng-Yu Cao)

Strongly coupled resonators have been intensively investigated in various distinct physical systems [1,2], in which coherent control of the transport phenomena has been realized using the rich toolbox developed for the quantum systems. Specifically, for example, a two-mode mechanical system has been demonstrated as a classical analogy of a quantum two-level system, where Rabi physics was applied for full control of mechanical motion in the Bloch sphere [2].

A continuous challenge in developing coherent mechanical devices and further extending their applications is improving the coherence of operations. So far, significant efforts have been devoted to developing noise-resilient protocols for coherent control of energy transfer in mechanical systems (e.g., topological energy transfer between two mechanical modes by adiabatically encircling the exceptional point [3]). Alternatively, when a system undergoes cyclic evolution in Hilbert space by adiabatically changing the control parameters, it acquires a geometric phase in addition to the dynamical one [4]. Because it depends only on the global properties of the evolution path, the geometric phase is believed to be robust against certain noises and has practical applications in fault-tolerant quantum-information processing. In order to overcome the operation speed limited by the adiabaticity, which typically requires the evolution in the parametric space at a rate significantly smaller than the typical coupling strength, the nonadiabatic geometric protocol [5] has also been proposed. Quantum logic gates based on the nonadiabatic geometric phases have been extensively implemented in the systems [6] of magnetic resonances, superconductor qubits, and trapped ions.

A recent investigation [7] involving Hao Fu, Zhi-Cheng Gong, Tian-Hua Mao, Cheng-Yu Shen & Geng-Yu Cao (in charge of the experimental part) from Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, and Chang-Pu Sun

Fig. 1. Schematic illustration of experimental setup. The motion of the cantilever is analyzed by a lock-in amplifier (LIA) and electro spectrum analyzer (ESA) through measuring the intensity of the reflected 1,310 nm laser. An additional 1,064 nm laser, which is combined with the 1,310 nm laser after the wavelength division multiplexer (WDM), is used as a trapping laser.



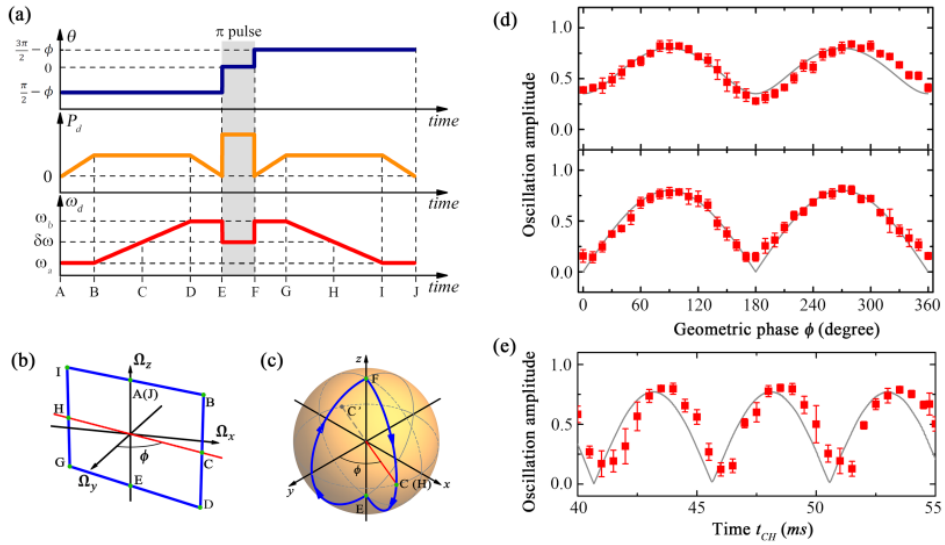


Fig. 1. Stückelberg interferometry with two parametrically coupled modes. (a) The control sequence of the pump pulse for the geometric Stückelberg interferometry. (b) The trajectory of the effective parametric field in parametric space. (c) The evolution path of the system on the Bloch sphere. (d) Geometric and (e) Dynamical Stückelberg interference.

& Yong Li (in charge of the theoretic part) from CSRC, and Su Yi from Institute of Theoretical Physics, Chinese Academy of Sciences, presents and achieves the geometric energy transfer of phonons between two optical-pumping parametrically coupled mechanical modes in an optomechanical system (see Fig. 1). The parametric pump is controlled along a closed loop [see Fig. 2(a,b)] to implement geometric Stückelberg interferometry of mechanical motion [see Fig. 2(c)], in which the dynamical phase is eliminated using the Hahn-echo technique. The authors demonstrate that the interference based solely on the geometric phase is robust against certain noises [see Fig. 2(d,e)]. More remarkably, it has been shown that the all-geometric approach can achieve a high-energy-transfer rate that is comparable to those using conventional dynamical protocols. This protocol offers a fast and highly controllable method for noise-resilient control of mechanical energy transfer, which can be generally implemented in most electromechanical and optomechanical systems using currently available technology.

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SENSITIVITY OF DISPLACEMENT DETECTION FOR A PARTICLE LEVITATED IN THE DOUGHNUT BEAM

(By **Lei-Ming Zhou**, **Ke-Wen Xiao**, Zhang-Qi Yin, Jun Chen and **Nan Zhao**)

Displacement detection of a spherical particle in focused laser beams with a quadrant photodetector provides a fast and high precision way to determine the particle location. In contrast to the traditional Gaussian beams[1-3], the sensitivity of displacement detection using various doughnut beams is investigated in a recent work [4] by Lei-Ming Zhou, Ke-Wen Xiao and Nan Zhao from CSRC and their colleagues from Tsinghua University and Shanxi University. In this work, the sensitivity improvement for large spherical particles along the longitudinal direction is reported. They discover that, with appropriate vortex charge of the doughnut beams, the doughnut beams outperform the Gaussian beam to get more than one order of magnitude higher sensitivity and, thus, have potential applications in various high-precision measurements (see Fig. 1). By using the levitating doughnut beam to detect the particle displacement, the result will also facilitate the recent proposal of levitating a particle in doughnut beams to suppress the light absorption.

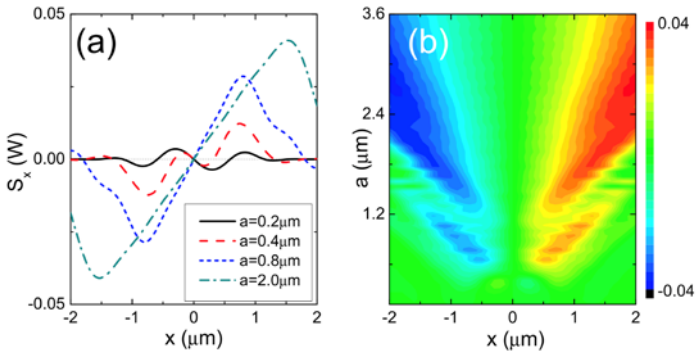

Fig. 1. (a) Response of the QPD for a silica particle particle moving along the x axis in a linearly polarized LG01 beam. The response is significantly different from the Gaussian beam case. (b) Response signal of the QPD for particles with various radii in the linearly polarized LG01 beam.

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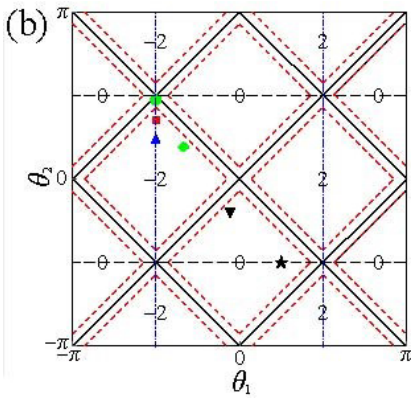
DYNAMIC TOPOLOGICAL PHENOMENA IN PARITY–TIME-SYMMETRIC QUENCH DYNAMICS

(By **K. K. Wang**, X. Qiu, **L. Xiao, X. Zhan**, Z. H. Bian, B. C. Sanders, W. Yi*, and **P. Xue***)

Topological phases feature a wealth of fascinating properties governed by the geometry of their ground state wave functions at equilibrium, but topological phenomena also manifest as non-equilibrium quantum dynamics in driven-dissipative and Floquet systems, as well as in quench processes. The study of phase transitions lies at the core of the description of equilibrium states of matter. Besides conventional continuous phase transitions that are signaled by symmetry breaking, topological phase transitions, characterized by the change of topology in their ground-state wavefunctions, have attracted much attention since the discovery of quantum Hall effects.

Recently, the research team led by Prof. Peng Xue at Beijing Computational Science Research Center, reported an experiment on simulating dynamic quantum phase transitions in photonic quantum walks, which was published *Physical Review Letters* (2019, 122: 020501).

Prof. Xue's group and their collaborators report the first experimental study of dynamic quantum phase transitions using discrete-time quantum walks of single photons. They simulate many-body quench dynamics between distinct Floquet topological phases using photonic quantum-walk dynamics, and experimentally characterize dynamic quantum phase transitions and the underlying dynamic topological order parameters through interference-based measurements. Their experiment directly confirms the relation between dynamic quantum phase transitions and dynamic topological order parameters in quench dynamics of topological systems. This experiment opens up the avenue of investigating dynamics quantum phase transitions and related dynamic topological phenomena using quantum walk dynamics, whose flexible



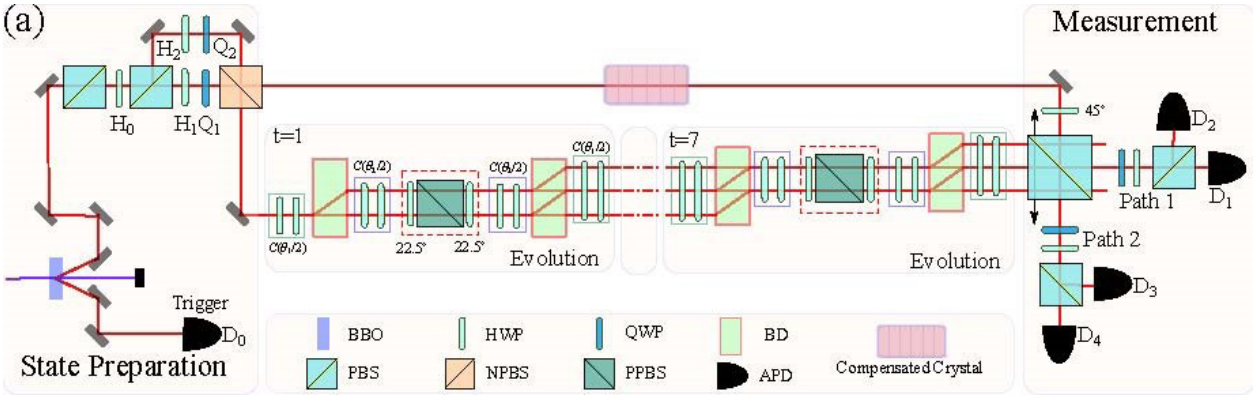
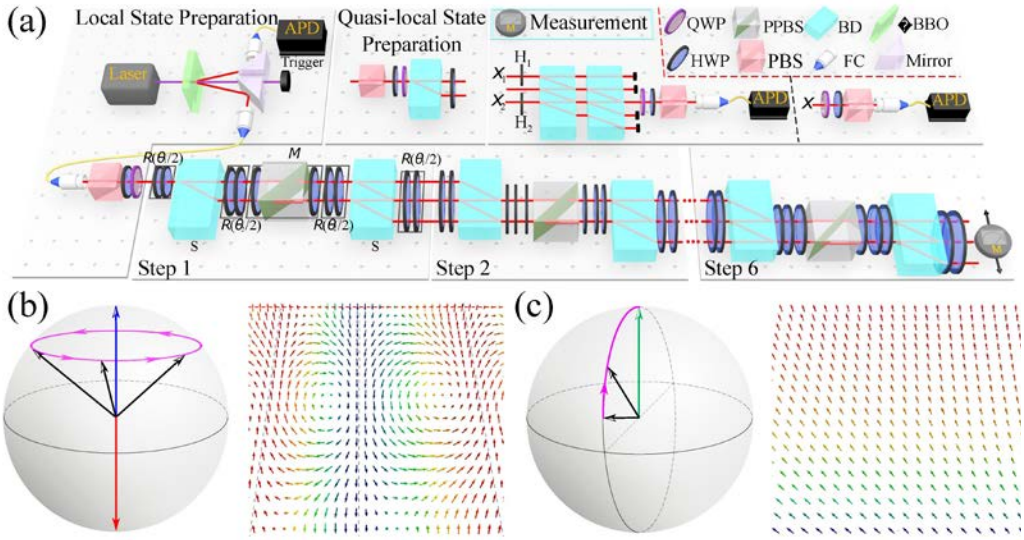


Fig. 1. Experimental setup for the simulation of dynamic quantum phase transitions using quantum walks. Pairs of single photons are generated via type-I spontaneous parametric down conversion. Coin rotations and conditional translations are realized by two half-wave plates (HWPs) and a beam displacer (BD), respectively. For non-unitary quantum walks, a sandwich-type HWP-PPBS-HWP setup is inserted to introduce the partial measurement. Avalanche photodiodes (APDs) detect the signal and heralding photons.



(a). Experimental setup for detecting momentum-time skyrmions in non-unitary quantum walks. (b). Momentum-time skyrmions in parity-time-symmetric-unbroken regime. (c). Dynamics in the parity-time-symmetry-broken regime.

control paves the way for future studies in novel contexts such as engineered non-unitary dynamics, with decoherence, or in higher dimensions.

Furthermore, they also reported an experiment on observation of emergent momentum-time skyrmions in parity-time-symmetric non-unitary quench dynamics, which was published in *Nature Communication* (2019, 10:2293).

Skyrmions, a two-dimensional topological object featuring a three-component vector field, was originally proposed by Tony Skyrme and later experimentally observed in magnetic and optical configurations. The small size and low energy consumption of the skyrmions in magnetic make them a great candidate for data storage and other spintronics devices, and thus, attracted tremendous attentions in recent year.

In their study, Prof. Xue's Group and their collaborators theoretically characterize and experimentally detect momentum-time skyrmions in single photon discrete-time quantum walks for the first time. They simulate the quench dynamics of topological systems and devise an experimental scheme where time-dependent momentum-space density matrices can be constructed by the interference-based measurements and projective measurements in position space. Such a practice allows for the measurements of the momentum-time spin vector of the density matrix. Their experiment confirms the emergence of dynamic skyrmion structures when quantum walk dynamics correspond to quenches between distinct Floquet topological phases in the parity-time-symmetric-unbroken regime. Their experiment not only provide a new evidence that the photonic quantum walks represent a powerful platform for the quantum simulation but also opens up a new avenue of investigating topological quantum computation.

FORMATION OF DY CENTER AS N-TYPE LIMITING DEFECT IN OCTAHEDRAL SEMICONDUCTORS

(By **Jin-Ling Li**, **Jingxiu Yang**, Tom Wu and **Su-Huai Wei**)

It is well known that the DX center is a kind of defect that limits the n-type doping in some tetrahedral coordinated semiconductors. It is a deep negatively charged defect complex converted from a nominal shallow donor defect, which can serve as a trap center of electrons, thus is detrimental to the performance of optoelectronic devices. Recently, using first-principles calculations, Prof. Su-Huai Wei's group in CSRC found that similar to the DX center, a donor-yielded complex center (DY center) also exists in six-fold coordinated semiconducting materials [1]. For example, Bi is commonly expected as a shallow n-type dopant in perovskite $APbX_3$. However, first-principles calculations show that the DY center is formed in Bi-doped $MAPbBr_3$ when the Fermi level is high in the gap, but, interestingly, it does not form in $MAPbI_3$. Their detailed theoretical analyses show that the reason that the DY center is formed in $MAPbBr_3$ instead of MAPbI3 can be attributed to the high conduction band minimum (CBM) of $MAPbBr_3$ as shown in Fig.1(a).

Their theoretical studies also show that under light illumination, the photoexcited electrons would raise the quasi-Fermi energy to be close to the CBM. Therefore, the normal α^0 state is expected to convert into the α^- state at first due to the little distortion on accepting the additional electrons. However, the α^- state is metastable and could easily transform into the DY^- state after overcoming the small energy barrier of 0.17 eV, as shown in Fig.1(b). On the other hand, the DY^- state could hardly convert back into the α- state due to the large 0.45 eV energy barrier for back conversion. These results are able to explain recent puzzling experiment observations that show the suppressed PL and decreased photocurrent in Bi-doped $MAPbBr_3$ [2]. The thorough discussions of the formation and the properties of the DY center in perovskites provide enlightening insights to the defect study in six-fold coordinated semiconductors.

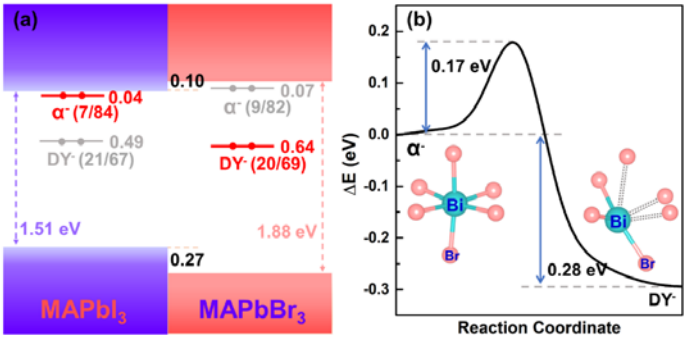


Fig. 1. (a) The alignment of the band edges of $MAPbI_3$ and $MAPbBr_3$ and the relative single electron energy levels of α^- and DY^- states. The red lines represent the stable states, while the grey lines represent the metastable states. The numbers in brackets represent the projected p orbital percentage of (anion/cation). (b) The transition path of Bi-doped $MAPbBr_3$ from the metastable α^- state to the stable DY^- state.

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ANALYTICAL ANALYSIS OF SPECTRAL SENSITIVITY OF PLASMON RESONANCES IN A NANOCAVITY

(By **D.-J. Yang**, S. Zhang, S.-J. Im, Q.-Q. Wang, H. Xu* and **S. Gao***)

Surface plasmons are collective excitations of the free electrons in metallic structures at the metal/dielectric interface. Metallic nanocavities exhibit extremely high spectral sensitivity to geometrical variations and are promising for sensing applications. Recently, cavity plasmon polaritons of a cubic metal dimer gap have drawn significant attention due to the experimental observations that their optical spectra could be able to resolve ultra small gap variations (~1 picometer) in the cavity. The ultrahigh sensitivity is interesting and holds promise for novel plasmonic rulers beyond the optical diffraction limit. So far, the origin of the high sensitivity has been explained as the plasmon coupling in the individual nanoparticles, which is far from satisfactory because plasmon coupling of individual nanoparticles can never induce such a large spectra shift. In addition, the study of quantum limit of the high sensitivity in the sub-nanometer regime, which is of great value of theory and practice, remains scarce.

Recently, Shiwu Gao's group in CSRC [1] has explored the ultrahigh spectral sensitivity of a cubic dimer cavity, to picometer gap variation, and developed an analytical model to reveal its origin. They explain the high sensitivity as the result of the extremely strong coupling of surface plasmon polaritons (SPPs) supported by the two closely packed interfaces. Interfaces of the cubic dimer offer a relatively large coupling area and at the boundaries of the interfaces SPPs will be reflected to form standing wave and be further amplified. To prove their idea, they developed an analytical model, which takes into account the phase shift of light scattering at the open boundaries and the quantum electron tunneling effect in the small gap limit. It shows nanometer spectral shifts to picometer gap variation, as observed by recent experiments. While the resonance wavelengths depend on the metal dielectric functions, the sensitivity is found to scale universally as a function of gap distance. Besides, electron tunneling across the gap starts to suppress the plasmonic field in the sub-nanometer regime, setting the quantum limit of sensitivity. The results given by the analytical model are compared and supplemented by numerical simulations. This study provides insight and guidance to the design of new sensitive rulers at the picometer scale.

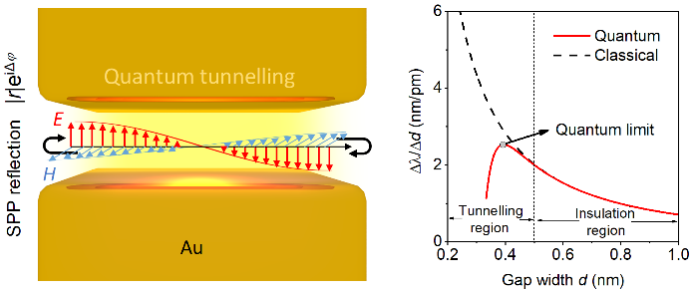

Fig. 1. Schematic illustration of the surface plasmon polariton standing wave formed at the interfaces of a metallic dimer (left) and the quantum limit of the ultrahigh spectra sensitivity to the gap width variation (right).

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DISCOVERY OF DEEP-ULTRAVIOLET NONLINEAR OPTICAL MATERIALS

(By **L. Kang**, Z. S. Lin, **B. Huang**)

Wavelength-tunable deep-ultraviolet (DUV, less than 200 nm) lasers are highly desirable in various fields, for example lithography, medicine, and spectroscopy. One of the most effective ways to generate DUV light is applying nonlinear optical (NLO) frequency conversion processes to the output of all-solid-state lasers, for example the most practical Nd:YAG lasers of 1064 nm. The conversion efficiency of this process is mainly determined by the input light intensity, the length of optical medium, and its NLO coefficient. Currently, the realization of high-power practical DUV output has become one of the most important issues in the field of laser technology, as there is only one DUV NLO material, i.e., $KBe_2BO_3F_2$ (KBBF) available for practice.

A recent investigation [1-5] involving L. Kang and B. Huang from CSRC, and Z. S. Lin from Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, systemically investigate the possibility to realize high-efficiency DUV NLO materials beyond KBBF. Firstly, based on analysis of the DUV NLO effect induced by the A-site alkali and alkaline earth metal cations, a useful strategy is proposed to design densely stacked layered structures without A-site cations as new and promising DUV NLO materials. The authors propose that Be_2BO_3F, $Be_2CO_3F_2$, $AlCO_3F$, $SiCO_3F_2$, $AlNO_3F_2$, PBO_3F_2, and $PB_3O_6F_2$, whether real or hypothetical, exhibit excellent DUV NLO performances [1-2]. Secondly, on the basis of analysis of microstructure and macro optical property, the authors discover that one-dimensional chained CN and MCO motif can exhibit sufficiently large optical anisotropy and SHG effect from IR to UV regions. Therefore, it is reasonable to believe that they can be considered as novel NLO material genes, which was totally ignored in the previous studies [3-4]. Finally, assembling of one-dimensional (1D) polar motifs into quasi-1D polymer patterns, the authors have successfully discovered an excellent DUV NLO polymer, i.e., poly(difluorophosphazene), with the chemical formula of $(PNF_2)n$. Calculations reveal that PNF_2 has a larger band gap, a stronger second harmonic generation effect, a larger birefringence, and a shorter phase-matching cutoff than KBBF. These findings not only demonstrate that the PNF_2 is the first reported DUV NLO polymer, but also could open a new direction to discover novel DUV NLO materials in polymer systems [5].

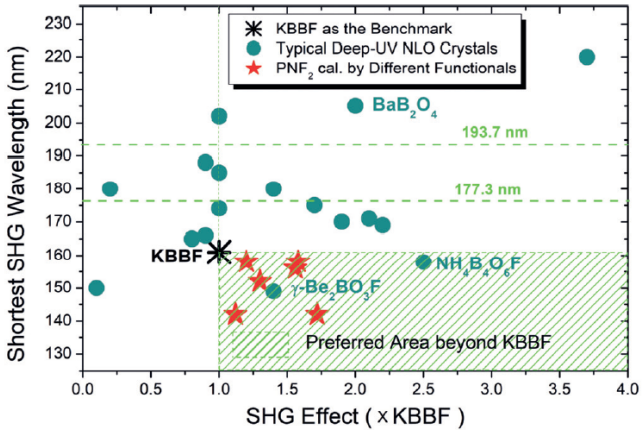

Fig. 1. Comparison of DUV NLO capability of PNF_2, KBBF, and other typical NLO materials.

In conclusion, for a decade, it is widely believed that KBBF could be the best DUV NLO material in the world. However, the authors have proposed several routines to design or search better DUV NLO materials beyond KBBF. Importantly, a series of new compounds have been proposed. It is expected that these studies could have significant impact in this field.

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THE UNIFORM LOCAL AND GLOBAL STRETCHED MECHANICAL RESPONSE IN A SUPERCOOLED LIQUID NEAR THE GLASS TRANSITION

(By **Baoshuang Shang**, Jorg Rottler, **Pengfei Guan***, Jean-Louis Barrat*)

Amorphous materials have a rich relaxation spectrum, which is usually described in terms of a hierarchy of relaxation mechanisms. Nonexponential or stretched exponential relaxation is ubiquitous in amorphous materials and is recognized as one of the key features in supercooled liquid and glassy states. It appears in many relaxation processes at equilibrium or out of equilibrium, such as aging, stress relaxation, and dielectric or mechanical relaxation spectra. However, the origin of the stretching is still controversial. Two hypotheses are typically put forward to explain the stretching: One identifies the stretched relaxation as resulting from dynamic heterogeneity in different regions of space, and the other assumes that the relaxation in amorphous material is uniform, with stretched relaxation being a local feature. According to the now widely accepted concept of dynamical heterogeneity, it is then a natural hypothesis to assume that the slow and fast regions associated with dynamical heterogeneity each have a simple exponential relaxation and that the global stretching results from the different relaxation times associated with different regions, which may be broadly distributed. However, this assumption that the stretched exponential relaxation arises from simple exponential relaxation in local regions has not, to our knowledge, been proven in direct investigations.

Recently, Dr. Pengfei Guan's group in CSRC, in collaboration with Prof. Jean-Louis Barrat at University Grenoble Alpes, and Prof. Jörg Rottler at University of British Columbia develop a methodology that allows us to obtain the dynamic modulus spectrum in a supercooled liquid near the glass transition at different length scales and find that different dynamical spectra can be well fitted by a Cole-Davidson expression, with a distribution of relaxation times that evolves with the measurement scale. However, surprisingly, the stretching exponent does not change with increasing the spatial scale and is nontrivial at the smallest scale investigated. Furthermore, we find a strong correlation between the local modulus and relaxation time, which can be rationalized within an elastic shoving model at the local scale, and the size dependence of the average relaxation time and shear modulus can be well explained by confinement effects, which reflect the nature of elastic interactions in supercooled liquids. Our findings suggest that the stretching exponent is essentially insensitive to the scale and a nontrivial scale dependence emerges due to the elastic nature of energy barriers that govern relaxation in supercooled liquids. However, in contrast to the description of the stretched exponential relaxation based on the concept of dynamical heterogeneity, further studies are required to uncover the correlation between the dynamic heterogeneity and the stretched exponential relaxation.

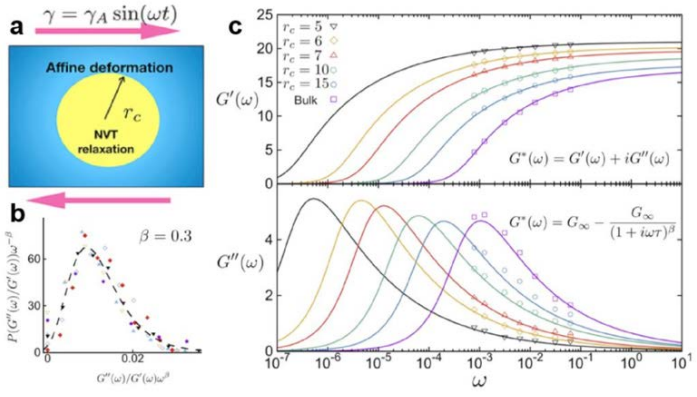

Fig. 1. (a) Schematic representation of the local mechanical spectroscopy analysis for a selected region (r_c) with sinusoidal strain loading. (b) Collapse of the probability distribution of loss and storage modulus ratio by rescaling the data with ω^β for different loading frequencies. (c) Dynamic moduli spectra for different sizes. The upper panel shows the storage moduli and the lower panel the loss moduli, and the solid lines are a fit to the modified Cole-Davidson formula with almost similar stretch exponent β as the bulk value.

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LOW-FREQUENCY VIBRATIONAL MODES OF STABLE GLASSES

(By **Lijin Wang**, A. Ninarello, **Pengfei Guan***, L. Berthier, G. Szamel, E. Flenner*)

Amorphous solids exhibit universal low-temperature properties, seen for instance in the heat capacity and thermal conductivity, that differ remarkably from crystal physics. These properties are related to the vibrational density of states $D(\omega)$. For a continuous elastic medium in three dimensions, low-frequency excitations are phonons, and the density of states follows $D(\omega) = AD\omega^2$, where A_D is given by Debye theory. A well-known universal feature of amorphous solids is an excess in vibrational modes over the Debye prediction that results in a peak in $D(\omega)/\omega^2$ at an intermediate frequency, called the boson peak. More recently, another source of 'excess modes' has been identified in computer simulations of model glasses. It is composed of quasi-localized low-frequency modes with a density obeying $Dloc(\omega) \sim \omega^4$. Quasi-localized modes are observed at frequencies significantly lower than the boson peak and the link between the two phenomena is not immediate, despite some indications that they may be connected.

Recent numerical insights were obtained for glasses that are very different from the ones studied experimentally, since they are prepared with protocols operating on timescales that differ from experimental ones by as many as ten orders of magnitude. It is therefore unknown whether any of the vibrational, thermal, or mechanical properties derived from earlier computational study of the density of states is experimentally relevant. For example, it was reported that $Dloc(\omega) \sim \omega^\beta$ with β ranging from 3 to 4 depending on the glass's stability, with $\beta = 4$ for the two most stable simulated glasses created by cooling at a constant rate. It remains unclear, however, whether β would be different for glasses with stability comparable to that of the experimental glasses.

Recently, Dr. Pengfei Guan's group in CSRC, in collaboration with Prof. Grzegorz Szamel and Elijah Flenner at Colorado State University, and Prof. Ludovic Berthier at University of Montpellier, report on $D(\omega)$ of zero-temperature glasses with kinetic stabilities ranging from poorly annealed to ultrastable glasses. For all preparations, the low-frequency part of $D(\omega)$ splits between extended and quasi-localized modes. Extended modes exhibit a boson peak crossing over to Debye behavior ($D_{ex}(\omega) \sim \omega^2$) at low-frequency, with a strong correlation between the two regimes. Quasi-localized modes obey $D_{loc}(\omega) \sim \omega^4$, irrespective of the stability. The prefactor of this quartic law decreases with increasing stability, and the corresponding modes become more localized and sparser. Our work is the first numerical observation of quasi-localized modes in a regime relevant to experiments, and it establishes a direct connection between glasses' stability and their soft vibrational modes。

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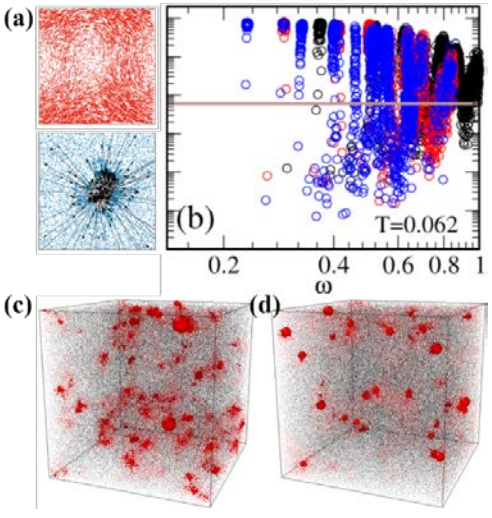
Fig. 1. (a) Eigen-vector fields of low-frequency modes. (b) Participation ratio $P(\omega)$ as a function of frequencies ω combined from ultra-stable system. The horizontal line marks the threshold $P_0 = 0.006$ between extended and quasi-localized modes. (c) Softness of quasi-localized modes. Snapshots obtained for $T_p = 0.200$ (c) and $T_p = 0.062$ (d). The particles are shown with their radius given by the vibrational amplitude A(i) calculated from the lowest quasi-localized modes.



BUILDING VIRUS MODEL FROM X-RAY SINGLE PARTICLE IMAGING DATA

(By **Yingchen Shi**, Ke Yin, **Xuecheng Tai**, **Haiguang Liu**)

X-ray free-electron lasers (XFELs) enable the determination of three-dimensional structures of nanoscale particles using single-particle imaging methods. Classification algorithms are needed to sort out the single-particle diffraction patterns from the large amount of XFEL experimental data. However, different methods often yield inconsistent results. This study compared the performance of three classification algorithms: convolutional neural network, graph cut and diffusion map manifold embedding methods. The identified single-particle diffraction data of the PR772 virus particles were assembled in the three-dimensional Fourier space and subsequently real-space model reconstruction. Although three classification methods lead to different datasets and result in different electron density maps of the reconstructed models, the common dataset improves the quality of the merged diffraction volume, as well as the resolutions of the reconstructed maps. The virus model was built to the resolution of 8.8 nm, demonstrating the potential of X-ray coherent imaging technology for nanoscale system research.

The ultrashort and bright X-ray pulses from free-electron lasers (XFELs) make it possible to determine the structure of single particles or even single molecules. Femtosecond coherent X-ray pulses are used to take snapshots of individual particles before the samples are destroyed by the intense X-rays; this approach is known as `diffraction before destruction' [1,2]. In these experiments, reproducible particles (often assumed to be identical) in random orientations are injected into the radiation region and scattering signals of the particle can be collected by detectors for one orientation each time. Three-dimensional structure reconstruction requires a large number of scattering patterns from particles in random orientations in order to obtain sufficient sampling. The determination of electron density maps from raw datasets needs to undergo a procedure composed of single-particle scattering pattern classification, orientation recovery and phase retrieval.

Available programs are effective at filtering out blank patterns or weakly scattering objects (such as small water droplets) but the challenges in excluding multiple hits remain along with other more complicated cases. Advanced algorithms are needed to further classify the filtered data and identify a clean set of single-particle scattering patterns to improve data quality for structure recovery.

Convolutional neural network method and Graph-

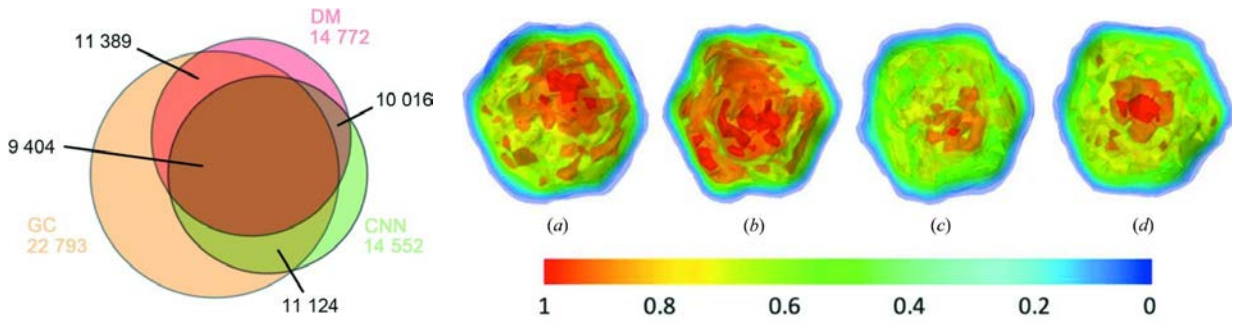


Fig. 1. (a)The Venn diagram for the three datasets selected using different methods. The common data set is composed of 9404 images, and produced the best 3D model of the PR772 virus. (b) The reconstructed models using the three datasets and the common dataset: (a) CNN; (b) GC; (c) DM; and (d) Common dataset.

Cut method were developed for data classification [3]. The CNN method extracts features from data that are significant for distinguishing the classes by training the designed network against a labelled dataset and then sorting the data to the appropriate class based on the evaluation of the extracted features. The GC method utilizes the measures of data similarity to group the data in a similar manner to image partitioning (or image segmentation) [4]. The results are compared with the published dataset classified using the diffusion map manifold embedding approach.

The models reconstructed using the three datasets selected by the individual methods are 11.6nm, 9.2nm and 11.8nm. The common dataset, although contains only 9404 images, yielded the highest resolution of 8.8nm. This results might be due to that the common subset formed by the consensus of three methods might be less biased towards any particular conformational state. It may therefore be possible to use the consensus subset to determine the most populated state (often the ground state), serving as the first step for studying the conformational changes using model-based approaches. For example, using the model obtained from the common subset as the starting point, a series of models could be generated using structure perturbation or dynamic simulation methods. Then each generated model could be used as a reference to classify the experimental data. This model-based data classification approach could be improved iteratively by refining the initial models with the classified data.

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EXOTIC STATIONARY STATES IN AC-DRIVEN OPEN QUANTUM SYSTEMS: BREAK-DOWN OF THE FLOQUET-GIBBS DISTRIBUTION

(By **Georg Engelhardt**, Gloria Platero, **Jianshu Cao**)

Periodic driving has been shown to be a flexible tool to control and probe states of matter in various quantum systems. For instance, in cold-atom experiments periodic driving gives rise to widely arbitrary control of the system dynamics, e.g., for a quantum simulation of topological insulators [1], and superconducting circuits [2].

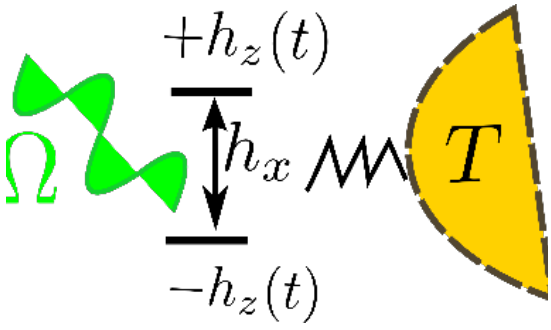

Fig. 1. Illustration of a periodically driven two-level system, which is coupled to a thermal environment at temperature T. Because of the interaction with the driving field $h_z\ t\ = h_{z\,1}\cos(\Omega\, t)$, the incoming driving field is scattered into a blueshifted field (with frequency $\Omega + \Delta$), an unshifted field (with frequency Ω), and a redshifted field (with frequency $\Omega - \Delta$)

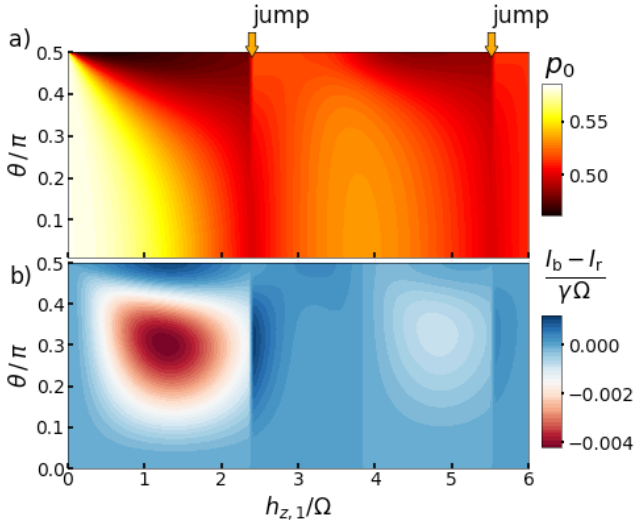

Fig. 2. (a) Probability p_0 to be in one of the characteristic periodic states of the system. The parameter θ controls the coupling to the bath and determines if the system is in a Floquet-Gibbs state $\theta = 0$ or not $\theta > 0$.
(b) The difference of the blue- and redshifted intensities can exhibit a jump depending on the values θ and $h_{z\,1}$.

The freedom in control gives rise to theoretically challenges. Only few general statements can be made about stationary states of periodically driven system, which are coupled to an environment. One theorem says that the system state synchronizes with the driving period [3]. In Ref. [4], it has been shown that under special conditions, the system approaches a Floquet-Gibbs state, which is a straightforward generalization of the Gibbs ensemble to periodically driven systems.

Georg Engelhardt, Gloria Platero and Jianshu Cao have addressed the question, which exotic effects can appear in open, periodically driven quantum systems, when the special conditions, which lead to a Floquet-Gibbs state, are not fulfilled. This research project is an international collaboration involving the CSRC (Beijing, G. E. and J.C.), the CSIC (Madrid, G.P.) and the MIT (Boston, J.C.) Surprisingly, once the Floquet-Gibbs state condition is broken, the stationary state can exhibit a probability inversion, even for very small external driving. Moreover, the probability distribution can exhibit jump discontinuities at special parameters, which are related to a quantum localization effect termed 'coherent destruction of tunneling'. This behavior can be observed in Fig. 2(a), which shows the probability to be in one of the characteristic quantum states of the system. The jumps depend on the parameter θ, which is a parameter controlling the deviation from a Floquet-Gibbs states, and the driving field amplitude h_(z,1). The jumps in the probabilities can be observed in the red- and blue shifted intensities of the scattered field, which is depicted in Fig. 2(b). Because of the sensitivity on the driving field, the authors suggest to employ this effect as a photonic transistor, similar to a transistor in electronic devices.

In another project, Georg Engelhardt and Jianshu Cao have studied another way of nonequilibrium quantum control [6]. In an electronic transport setup, e.g., a molecular junction, the researchers found that the phase information of the charges being transported is surprisingly robust, even if the transport setup is subject to strong dephasing. This protection of phase information is thereby related to the formation of a polaron, a quasiparticle consisting of an electron and a phonon of the bath. This finding as well as the exotic stationary states explained above, could serve as a guideline to explore and create quantum effects in open quantum systems, where they have not been expected, such as in biological systems.

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SUPERCONVERGENCE OF DG METHODS FOR HYPERBOLIC EQUATIONS: LINEAR PROBLEMS WITH DEGENERATE VARIABLE COEFFICIENTS AND NONLINEAR PROBLEMS

(By **Waixiang Cao**, Chi-Wang Shu and **Zhimin Zhang**)

The superconvergence behavior of DG methods has been a hot research topic in recent years. However, there has been no superconvergence result in the literature when they are applied to problems with general variable coefficients which may degenerate. Recently, Zhimin Zhang in CSRC in collaboration with W.X. Cao in Beijing Normal University and C.-W. Shu from Brown University, investigate their superconnvergence properties for linear hyperbolic problems with degenerate variable coefficients and nonlinear problems(alternating and fixed wind directions) . It is proved that the superconvergence rate may depend upon the specific property of the variable coefficient function. Optimal superconvergence rate and superconvergence phenomenon for DG flux function and the DG solution itself are discussed.

Consider the Linear hyperbolic equations with degenerate coefficient:

$$u_t + (\alpha u)_x = g, x \in (0,2\pi) \quad u(0,t) = u(2\pi,t), \quad u(x,0) = u_0(x),$$

and Nonlinear hyperbolic equations:

$$u_t + f(u)_x = 0, x \in (0,2\pi) \quad u(0,t) = u(2\pi,t), \quad u(x,0) = u_0(x).$$

The partition and finite element space is defined as:

$$0 = x_{\frac{1}{2}} < x_{\frac{1}{2}} \text{L} < x_{N+\frac{1}{2}} = 2\pi, V_h = \{v_h : v_h|_{\tau_j} \in P_k(\tau_j), \tau_j = (x_{j-\frac{1}{2}}, x_{j+\frac{1}{2}})\}.$$

Therefore the numerical schemes is: Find $u_h \in V_h$ such that for all $v \in V_h$,(1) is satisfied.

$$\int_{\tau_j} (\partial_t u_h v - \alpha u_h v_x)dx + \alpha \hat{u}_h v^-|_{j+\frac{1}{2}} - \alpha \hat{u}_h v^+|_{j-\frac{1}{2}} = \int_{\tau_j} gv dx,$$

$$\int_{\tau_j} (\partial_t u_h v - f(u_h) v_x)dx + \hat{f}(u_h)v^-|_{j+\frac{1}{2}} - \hat{f}(u_h)v^+|_{j-\frac{1}{2}} = 0. \quad (1)$$

The upwind flux for linear problems and nonlinear problems are taken as fixed wind direction,i.e.(2)

$$\hat{u}_h|_{j+\frac{1}{2}} = \begin{cases} u_h(x^+_{j+\frac{1}{2}}), \text{if } \alpha_{j+\frac{1}{2}} < 0, \\ u_h(x^-_{j+\frac{1}{2}}), \text{if } \alpha_{j+\frac{1}{2}} \geq 0, \end{cases} \quad \bar{f}(u_h) = \begin{cases} f(u_h^-), \text{if } f'(u) > 0, \\ f(u_h^+), \text{if } f'(u) \leq 0. \end{cases} \quad (2)$$

If $f'(u)$ changes its sign in the computational domain, the Godunov flux is chosen as the numerical flux,i.e.(3)

$$\hat{f}(u_h) = \hat{f}(u_h^-, u_h^+) = \begin{cases} \min_{u_h^- \leq \mu \leq u_h^+} f(\mu), & \text{if } u_h^- < u_h^+, \\ \min_{u_h^+ \leq \mu \leq u_h^-} f(\mu), & \text{if } u_h^- \geq u_h^+. \end{cases} \quad (3)$$

Suppose the flux function $f'(u_0(x))$ or $\alpha(x)$ satisfies the following condition:

$$v(x_0) = \partial_x v(x_0) = \text{L} = \partial_x^{m-1} v(x_0) = 0, \quad \partial_x^m v(x_0) \neq 0, \quad v = f(u_0(x)), \alpha(x).$$

Let $\nu = 1, m' = \min(m, k+3)$, then there hold the following results:

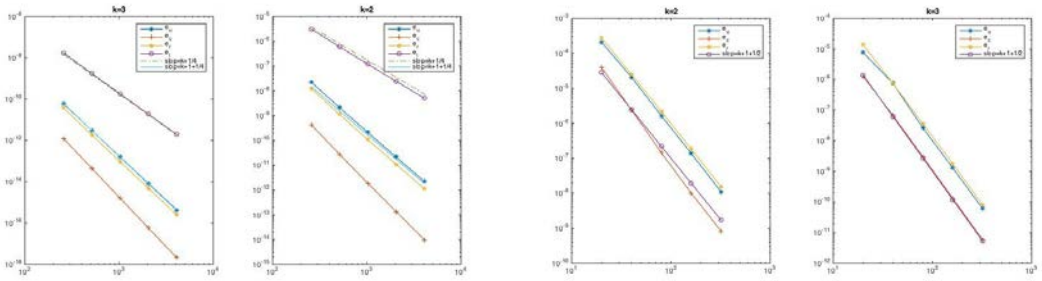
Alternating wind directions:
Both the DG solution itself and the DG flux function are superconvergent towards a particular projection of the exact solution,i.e.(4)

$$\| u_h - P_h u \|_0 = O(h^{k+1+1/2m'}), \quad \| f(u_h) - f(P_h u) \|_0 = O(h^{k+1+\nu}), \quad \| \alpha(u_h - P_h u) \|_0 = O(h^{k+1+\nu}). \quad (4)$$

Their function values are superconvergent at special point yj,i with an order of $k+1+1/2m'$ and $h^{k+1+\nu}$ and their derivative values are also superconvergent at special point $z_{j,i}$ with an order of $k+1+1/2m'$ and $h^{k+1+\nu}$ respectively. The cell average error is superconvergent for both the DG solution and DG flux function, with an order $k+1+1/2m'$ and $h^{k+1+\nu}$ respectively..

Fixed wind direction:
The DG solution is superconvergent towards a particular projection of the exact solution with a convergence rate k+2. Its function value is superconvergent at the right Radau point rj,i with a convergence rate k+2, and its derivative value is superconvergent at the left Radau points lj,i with an order of k+1. The cell average error is also superconvergent,with an order of 2k+1.

Comparison:
·The highest convergence rate k+3/2 v.s. 2k+1.
·The location of superconvergence points yj,i(zj,i) v.s. rj,i(lj,i).



*case*1 : *linear problem with* $\alpha = \sin(x), u_0 = e^{\sin(x)}, m' = 2.$ *case*2 : *nonlinear problem with* $f(u) = u^2/2, u_0 = \sin(x) + 1/2, m' = 1.$

$legend : e_c(cell\ average\ error), e_u(\| u_h - P_h u \|_0), e_r(function\ error\ at\ y_{j,i}), e_r(derivative\ error\ at\ z_{j,i})$

Convergence rate: for $k+1+1/2m'$ and e_c, e_r, e_u for e_l .

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LINEAR ENERGY AND ENTROPY-PRODUCTION-RATE PRESERVING SCHEMES FOR THERMODYNAMICALLY CONSISTENT CRYSTAL GROWTH MODELS

(By **Yucan Zhao**, **Jun Li**, **Jia Zhao** and **Qi Wang**)

The Penrose-Fife model is a thermodynamically consistent model describing crystal growth, in which the internal energy is conserved while the total entropy of the system increases in time. Energy quadratization paradigm can be used to develop high order numerical approximations of the partial differential equation model that preserves the energy conservation and entropy production in the discrete level. Linear, second order schemes based on the energy quadratization strategy have been recently proposed to solve the model numerically, which preserves the internal energy and the entropy-production-rate at the discrete level [1, 2]. Here, we summarize an unconditionally energy stable numerical schemes from [2] to solve the model equations. The scheme is linear and second order in time resulting from applying the energy quadratization (EQ) or the scalar auxiliary variable (SAV) method. The spatial discretization in this scheme is carried out using an adaptive finite element method [2].

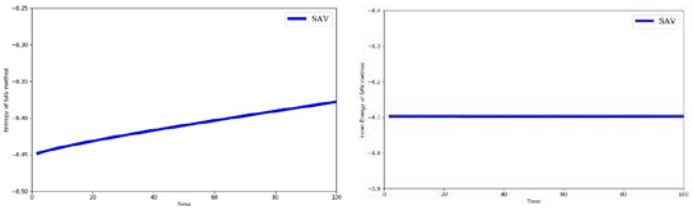

Fig. 1. Internal energy and total entropy as functions of time. The internal energy is conserved while the entropy grows in time.

We show that the linear system resulting from the energy stable numerical scheme is uniquely solvable. Some numerical experiments are given to show the accuracy of the scheme and its performance. Figure 1. depicts the internal energy conservation as well as the entropy production in a selected simulation. Figure 2. Portraits multiple simulations for crystal growth, in which various patterns are displayed. Temperature distribution in the crystal growth pattern is shown in the middle panel as well in Figure 2.

The proposed numerical method based on the energy quadratization paradigm can be extended to arbitrarily high order in time and space while retaining linearity. It can be applied to any gradient flows as well. It therefore constitutes a new family of numerical methods for thermodynamically consistent models.

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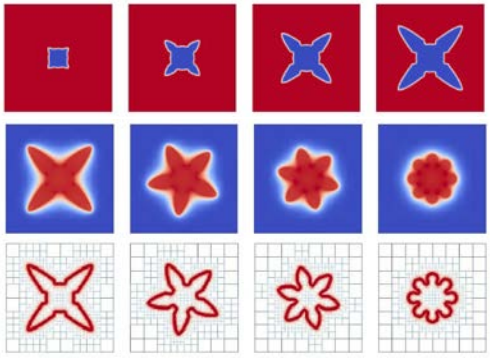
Fig. 2. Simulated patterns in crystal growth. The top panel displays the growth pattern of four folds; the middle panel displays patterns in crystal growth of 4,5,6,8 folds colored in temperature fields; the bottom panel displays the adaptive mesh used in the simulations.



DIRECT AND INVERSE SCATTERING PROBLEMS IN A HALF PLANE

(By **Guanghui Hu**, **Xiaoli Liu** and Wangtao Lu)

Wave scattering in a layered medium and in a half plane has numerous applications in scientific and engineering areas. For the purpose of proving well-posedness of the scattering model, understanding the physical radiation behavior of the wave field at infinity is critical. A rigorous description of the asymptotics not only helps to design a proper radiation condition for the wave field at infinity, but also helps to truncate the unbounded domain with an accurate boundary condition for numerically solving the problem. Consider a sound-soft trapezoidal surface in two dimensions, which is a non-local perturbation of the half plane (see Figure 1). In [2], a new radiation condition was established to prove uniqueness and existence of weak solutions of the scattering problem via a coupling scheme between FEM and the integral equation approach. This new radiation is proven sharper than the angular spectrum representation condition [3] and has generalized the radiation condition for locally perturbed flat surfaces.

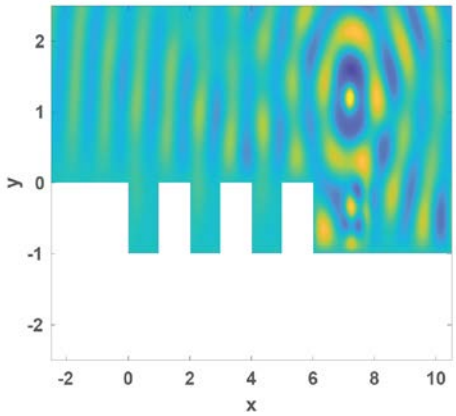


Fig. 1. Real part of the total field excited by an incident cylindrical wave. The white region indicates the PEC substrate. It is supposed that the total field satisfied the Sommefeld radiation condition. For incident plane waves, it is assumed that the scattered wave, post-subtracting reflected plane waves by the two half lines of the scattering surface in certain two regions respectively, satisfies an integral form of Sommerfeld radiation condition at infinity. A numerical mode matching method based on this new radiation condition is developed and a perfectly matched layer is setup to absorb outgoing waves at infinity.

The aim of half-space inverse scattering problems is to recover the unbounded interface from the scattered field measured at a finite distance above the scattering surface. It occurs in many applications such as geophysics, seismology and nondestructive testing. Recently, the authors of [1] propose a non-iterative imaging approach to reconstruct an unbounded rigid rough surface from the near-field data generated by elastic plane waves at one frequency with multiple directions. The proposed approach is of sampling type which does not require forward solvers in the inversion process. Compared to iterative schemes and other sampling type methods, the proposed imaging method is capable of depicting the profile of the surface only through the inner products of the measured data and a known function at each sampling point and has robustness to a fairly large amount of noise in the measured data. This new imaging scheme relies essentially on a relation between the Funk–Hecke formula and the free-space Green's tensor for the Navier equation.

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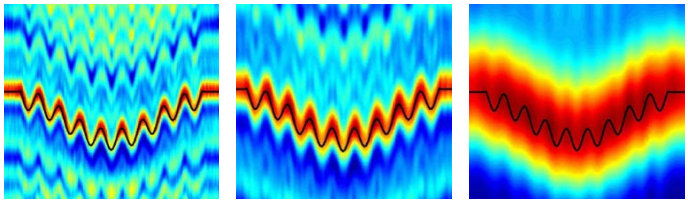
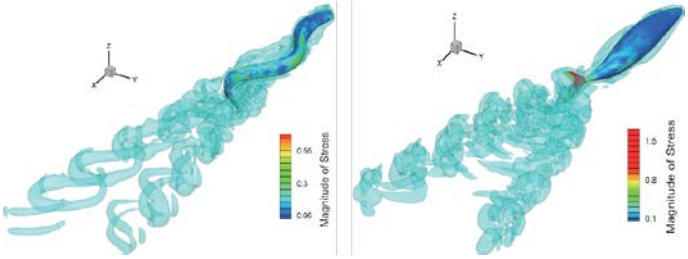


Fig. 2. Reconstructed results of the imaging function from the multi-frequency data at w=5 (left), 15 (middle) and 25 (right), respectively. It can be seen that the imaging result with lower frequency $w = 5$ can only capture the macro-scale features of the rough surface, while the use of the higher frequency data at $w = 25$ can capture not only the micro-scale but also the macro-scale features.

HOW FISH POWER SWIMMING?

(By **Tingyu Ming**, **Bowen Jin, Jialei Song**, **Yang Ding**, Haoxiang Luo, and Ruxu Du)

In the undulatory swimming of fish, a backward-traveling wave of body bending is formed to push against the water and generate propulsion. How the thrust is generated has attracted interdisciplinary research in the past few decades, and considerable progress has been made in understanding the propulsion hydrodynamics. Assuming that the force on the body of the swimmer is dominated by the drag and that forces are independently generated by the segments, Taylor developed the resistive force theory (RFT) [1]. In the classic elongated body theory (EBT) by Lighthill, the inertia of the surrounding fluid of the body is considered the key effect for propulsion, and the predominant forces on the body are reactive forces, which are required to accelerate/decelerate the water [2]. However, which theory can better describe fish swimming is still unclear.



Internally, the swimming of fish is powered by muscles; therefore, how muscles are used is a key question in understanding fish swimming. Electromyography (EMG) measurements on the muscle of fish during swimming provide spatiotemporal patterns of muscle activation in swimming fish of various species [3]. During steady swimming, a common pattern emerges: the muscle elements are activated in the manner of a wave traveling posteriorly, but this EMG wave travels faster than the curvature wave. Nonetheless, details of the muscle activation pattern vary among species. For carangiform swimmers such as carp, the propagation speed of EMG onset is much higher than that of the bending wave, whereas that of EMG termination is even higher, resulting in a posteriorly shortening period. Such shortening is still a mystery.

A recent study [4] by Tingyu Ming, Bowen Jin, Jialei Song and Yang Ding from CSRC, and Haoxiang Luo from Vanderbilt University, and Ruxu Du from Chinese University of Hong Kong, used 3D CFD simulations to investigate the force distribution for a typical anguilliform swimmer (eel) and a typical carangiform swimmer (mackerel) and to evaluate the theoretical models. They show forces on the bodies of both the anguilliform swimmer and the carangiform swimmer are dominated by reactive forces, which can be roughly estimated using the elongated body theory (EBT). However, the force on the caudal fin of the carangiform swimmer is dominated by drag-like forces that cannot be quantitatively predicted by EBT, RFT, or their combination. Furthermore, they showed that the torque exhibits wave patterns that match the overall EMG patterns of real eel and mackerel. The power output for the anguilliform swimmer is concentrated on the anterior half of the body and is significantly negative on the posterior side of the body. In contrast, for the carangiform swimmer, most of the power is generated by the posterior part of the body before the peduncle. The results explain the differences in the observed electromyography patterns in fish with different swimming modes and show that the tendon can save energy in carangiform swimmers by connecting muscles that do work with opposite sign in certain periods.

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三维流体力学模型
解释鱼类游动时内部是如何驱动的

在面上项目（批准号：No.11672029）和NSAF联合基金会（批准号：No.U1930402）的资助下，北京计算科学研究中心力学部的丁阳团队近日发表在PLOS Computational Biology上的“3D Computational Models Explain Muscle Activation Patterns and Energetic Functions of Internal Structures in Fish Swimming”一文揭示了鱼在游动时肌肉的活动模式以及能量的传递。明廷玉和靳博文为本文的共同第一作者，丁阳特聘研究员为通讯作者。

在鱼的波动游动中，会形成一个身体弯曲的反向行波来推动水，产生推进力。肌肉是鱼类游动时神经控制的执行器和机械动力的来源，理解肌肉在游动时如何被激活能够帮助我们更好的理解鱼类游动时的控制和力学行为。实验上曾观测到身体弯曲的曲率波和肌肉激活波传播时存在一定的相位差，即“神经机械相位滞后”。以往的数值模拟中，往往使用了简化的理论模型或者基于CFD的二维数值模拟。因此，这些模型能够对“神经机械相位滞后”的现象定性解释，但是却引入了难以估计的误差。另外一些肌电信号的特征，如肌电信号时长在身体后部变短，也无法解释。

为了更准确的阐明不同物种之间肌肉活动潜在的力学原理，丁阳团队首次使用了三维计算流体动力学模型研究了鳗鲡式波动（鳗鱼）和鲹科式波动（鲭鱼）的力矩模式和功率输出模式，并将模拟结果与实验观察结果相结合，解释不同游泳模式下鱼类肌电图的特征及其变化。计算发现水动力和身体惯性所需要的力矩呈现出波的形状（图1），这些波在鳗鲡式和鲹科式游动者中都比曲率波传播得快，与实验结果一致。另外，鳗鲡式游动者的能量输出集中在身体的前半部分，而在身体的后半部则明显为负。而鲹科式游动者后半部分的负功呈现出间歇性。这些结果解释了不同游泳方式下观察到的鱼类肌电图形态的差异，并提示肌腱可以通过连接在一定时期内以相反符号运动的肌肉来节省能量。

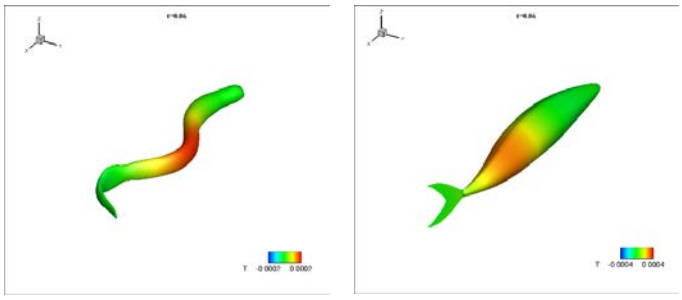

图1：鳗鱼和鲭鱼的力矩分布

通过分析力矩，功率的模式并进一步考虑肌腱和身体的粘弹性对能量的转移,储存,和释放作用,该模型不仅可以解释实验上观察到的肌肉活动模式的特性和变化，还可以阐明肌腱和身体的粘弹性具体如何节省能量。此研究提供了一个鱼如何协调身体形状、运动方式、流体力学、肌肉活动以及肌腱等来完成高效游动的力学蓝图，可以指导高效仿生机器人的设计，特别是具有分布式驱动系统和弹性体的机器人的设计。

A COMPARATIVE STUDY OF INTERFACE-CONFORMING ALE-FE SCHEME AND DIFFUSE INTERFACE AMR-LB SCHEME FOR INTERFACIAL DYNAMICS

(By **Changjuan Zhang**, Abbas Fakhari, Jie Li, **Li-Shi Luo**, Tiezheng Qian)

Fascinating phenomena in dynamics of interfaces have been exquisitely exhibited in the experimental observations captured in Van Dyke's "Album of Fluid Motion" and [1] its modern computational reproduction, "Gallery of Fluid Motion" [2]. To this date, modeling and simulation of multiphase or multicomponent flows involving fluid-fluid interfaces remain a great challenge and a subject of much interest in computational fluid dynamics. There have been distinctive, even opposing, methodologies of treating a fluid-fluid interface, i.e., interface tracking (sharp interface methods) vs. interface capturing (diffuse interface methods). The advocates of sharp interface methods insist that the sharp interface methodology is superior in terms of its numerical accuracy hence its fidelity to pertaining physics, while the proponents of the diffuse interface methodology promote the versatility and simplicity of the approach especially in situations involving topological changes.

A comparative study for two simulation methods is conducted for interfacial flows in two dimensions: an arbitrary Lagrangian Eulerian finite element method (ALE-FEM) on interface-conforming meshes and a phase field lattice Boltzmann method on Cartesian meshes with quadtree adaptive mesh refinement (AMR-LBM). Even though both schemes solve the incompressible Navier-Stokes equations with fluid-fluid interfaces, they are different in every aspect possible in terms of modeling philosophy and solution techniques.

The dynamics of a single bubble with and without buoyancy force in a rectangular container in two dimensions is chosen to conduct this comparison study. In spite of being simple in its flow configuration and setting, the fluid dynamics of a single bubble is indeed rich and fascinating. A single bubble in a quiescent ambient liquid satisfies the Laplace law. The dynamics of a bubble driven by buoyancy force exhibits a complicated process, including acceleration process to reach a terminal velocity, and when reaching the top wall of the container, the bubble can impinge to or bounce from the wall, depending on the physical conditions in the flow. In addition, the dynamics of a bubble has been extensively studied by means of experiment [3], analysis [4], and simulation [5,6].

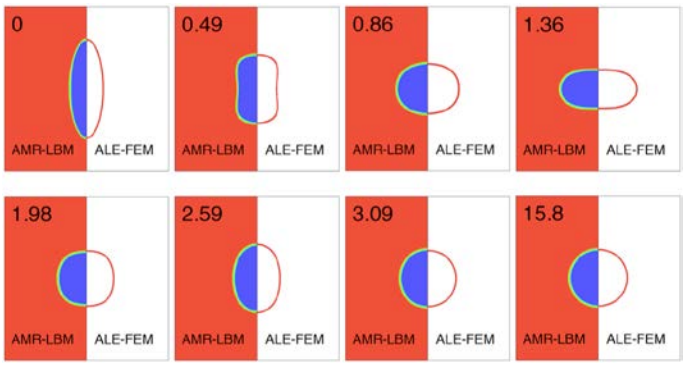

Fig. 1. Time evolution of the shape of an underdamped bubble, with comparison made at the same time, with μ= 0.001 Pa·s and σ =0.001 N/m. The number at the upper left corner indicates the corresponding dimensionless time T. Here the left half of each snapshot is the AMR-LBM result and the right half is the ALE-FEM result.

The researchers start from a validation study in which a static bubble is used to test the two methods. The spurious velocities are found to be negligibly small at numerical equilibrium. Then the oscillatory behaviors of suspended bubbles in the absence of gravity (Fig. 1) are investigated. The numerical results from the two methods are in quantitative agreement. The authors investigate the oscillatory behaviors of rising bubbles in the presence of gravity. The numerical results from the two methods are in semi-quantitative agreement for all the cases. Additional simulations of the breakup of a rising bubble and the bubble interaction with a horizontal wall are used to quantify the efficacy and efficiency of the two methods. It is observed that the AMR-BM is more dissipative due to the nature of the diff use interface method. Overall, the results obtained from both methods agree well with each other when the effects due to the numerical artifacts intrinsic to the diffuse interface method can be neglected. Also, the LBM is in general more efficient and easier to be parallelized.

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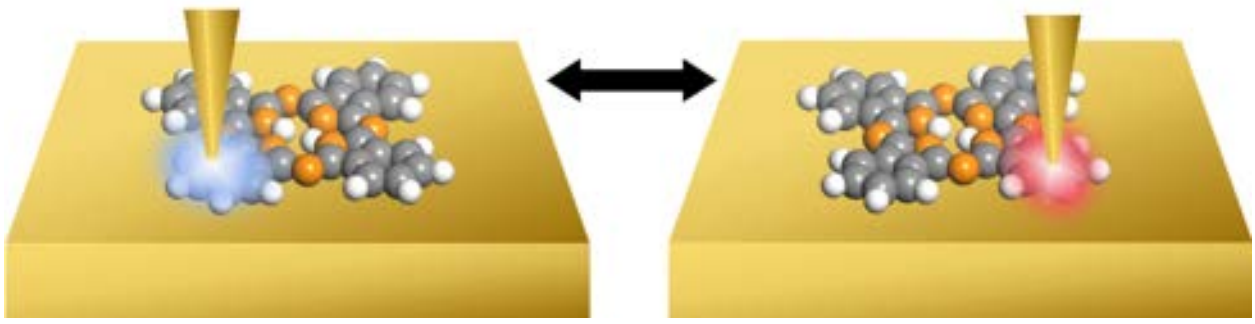
CONTROLLABLE SINGLE-MOLECULE LIGHT EMISSION BY SELECTIVE CHARGE INJECTION IN SCANNING TUNNELING MICROSCOPY

(By **Xiaoyan Wu**, Rulin Wang, Yu Zhang, **Bowen Song** and **ChiYung Yam**)

Advanced fabrication technologies for the semiconductor electronics industry enable control over the charge transport at the nanoscale. As the downsizing of the electronic devices continues, however, the operating frequency limited to the GHz range.1,2 To overcome this limit, hybrid electronic-photonic devices have been proposed as future ultrafast devices. While signals carried by photons offer the possibilities of extending the work frequencies by several orders of magnitude, because of the diffraction limit, optical components are too large in size to compete with modern nanoelectronics. Therefore, a key component of these hybrid devices is a nanoscale transducer that allows the conversion of electrical stimuli into optical signals.



Recently, tunneling electron-induced light emission in scanning tunneling microscopy (STM) has been explored as a novel light source with tunable properties. Here, using first-principles-based atomistic simulations, ChiYung Yam's research team at CSRC studied STM-induced luminescence of a single free-base phthalocyanine (H2Pc) molecule and proposed a way to control the emission frequency of the STM molecular junction by precisely controlling the charge injection at different molecular positions.3 They found the luminescence is directly related to the spatial distribution of the molecular states and thus depends sensitively on the tip position. Via careful refinement of the chemical structures, devices with desirable frequencies at different parts of the emitting unit can be designed. Their proposal has profound implications for applications in nanoscale optoelectronic and future hybrid electronic-photonic circuits.

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REVERSIBLE SWITCHING OF CATALYTIC ACTIVITY BY SHUTTLING AN ATOM INTO AND OUT OF AU NANOCLUSTERS

(By Xiao Cai, Govindarajan Saranya, Kangqi Shen, **Mingyang Chen**,* Rui Si,* Weiping Ding, and Yan Zhu*)

With the successful attainment of atomically precise metal nanoclusters capped by ligands,[1] where an atom of a nanocluster can be replaced by a foreign atom without altering the atomic structure of the nanocluster, an opportunity for unravelling catalysis of one doping atom has been provided. Recent success in shuttling single gold atom into $[Au_{24}(PPh_3)_{10}(SC_2H4Ph)_5Cl2]^+$ (abbreviated as Au_{24}) and out of $[Au_{25}(PPh_3)_{10}(SC_2H_4Ph)_5Cl2]^{2+}$ (abbreviated as Au_{25}) allows one to explore how the catalytic properties of a homometal catalyst are dominated by addition or removal of a single metal atom (Figure 1a). One-central-atom loss in the Au_{24} nanocluster induced a significant perturbation to the electronic structure, which may render different catalytic properties. Therefore, catalysis of the Au_{24} and Au_{25} nanoclusters was explored, in which catalytic conversion of methane was used as a model reaction. As shown in Figure 1b, the Au_{24} catalyst was more effective than the Au_{25} catalyst for catalytic oxidation of methane with H_2O_2. Notably, both Au_{24} and Au_{25} nanoclusters exclusively converted methane to methanol. The performances of recycled catalysts provided the new aspects about the reversible activity of the two nanoclusters in the reaction. Au_{24} was more active but less stable than Au_{25} and with cycles Au_{24} went through a continued slowdown in activity close to Au_{25} (Figure 1c).

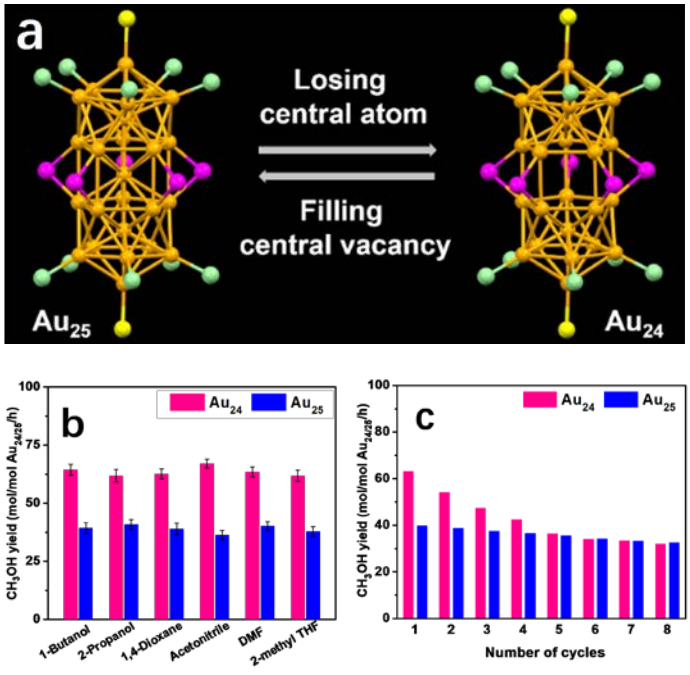

Fig. 1. (a) Atomic structures of Au_{24} with the central vacancy and Au25 with the central atom (b) Catalytic performance of methane oxidation over the Au_{24} and Au_{25} catalysts in the different solvents (c) Recyclability of Au24 and Au_{25}.

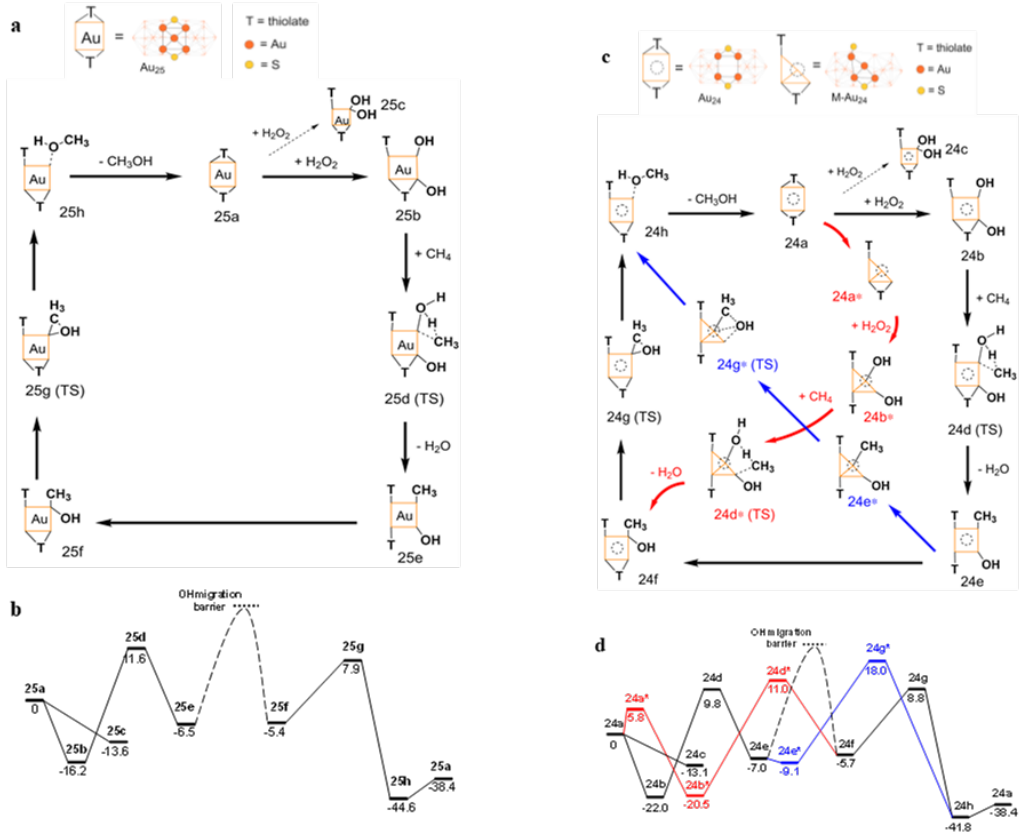

Fig. 2. Proposed catalytic mechanism and predicted reaction enthalpy profiles for the methane oxidation on (a, b) Au_{25} and (c, d) Au_{24} at the DFT level.

DFT calculations show that the methane to methanol conversion on the Au_{24} and Au_{25} catalysts are facilitated by the heterogenous active sites on the surface of the nanoclusters (Figure 2). The PPh_3 and SC_2H_4Ph protected Au sites can adsorb free •OH in the reaction. The partial cleaved bridge Au sites induced by OH insertion can promote CH_4 activation, and adsorb the resulting CH_3. The M-Au_{24} isomer of Au_{24}, resulting from the migration of the central vacancy in Au_{24}, enables the two-site reaction steps that enhance catalysis of Au_{24}, which can be insightful in designing catalytic reactions that involve two small fragments.

The highlighted work is published in *Angew Chem Int Edit*. [2]

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CRITICAL LEVEL CROSSINGS AND GAPLESS SPIN LIQUID IN THE SQUARE-LATTICE SPIN-1/2 J_1-J_2 HEISENBERG ANTIFERROMAGNET

(By **Ling Wang** and Anders Sandvik)

The spin-1/2 frustrated J_1-J_2 Heisenberg model on the two-dimensional (2D) square lattice (where J_1 and J_2 are the strengths of the first and second neighbor couplings S_i - S_j , respectively) has been studied and debated since the early days of the high-Tc cuprate superconductors. The initial interest in the system stemmed from the proposal that frustrated antiferromagnetic (AFM) couplings could lead to a spin liquid (SL) in which preformed pairs (resonating valence bonds) become superconducting upon doping. Later, with frustrated quantum magnets emerging in their own right as an active research field, the J_1-J_2 model became a prototypical 2D system for theoretical and computational studies of quantum phase transitions and nonmagnetic states. Of primary interest is the transition from the long-range Neel AFM ground state at small $g = J_2/J_1$ to a nonmagnetic state in a window around g=0.5 (before a stripe AFM phase at g>0.6). The nature of this quantum phase transition has remained enigmatic. The nonmagnetic state may be one with spontaneously broken lattice symmetries due to formation of a pattern of singlets (a valence-bond-solid, VBS) or a SL. The quantum phase transition out of the AFM state may possibly be an unconventional "deconfined" transition. However, because of the small system sizes accessible, previous calculations was not possible to rule out a direct AFM–VBS transitions.

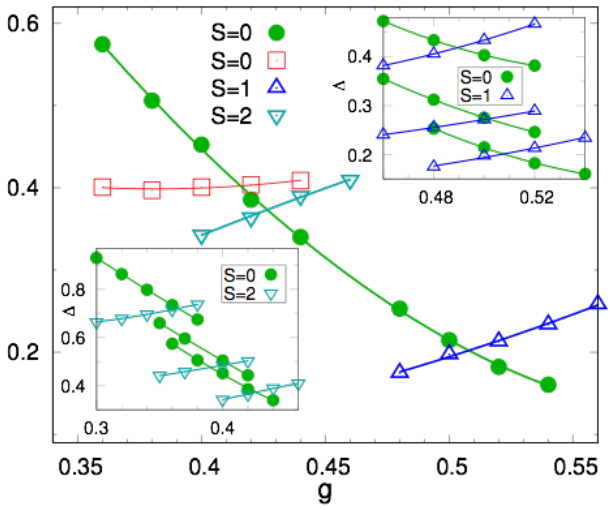

Fig. 1. Gaps to the relevant S = 0, 1, and 2 excitations vs g for L = 10. The insets show the regions of the level crossings of interest for L = 6,8,10 (gaps decreasing with increasing L). The curves show polynomial fits.

L. Wang from CSRC and her collaborator A. Sandvik from Boston University demonstrated an intervening gapless SL by locating the AFM–SL and SL-VBS transitions using a numerical level-spectroscopy approach, where finite-size transition points are defined using excited-level crossings. These crossing points exhibit smooth size dependence and can be more reliably extrapolated to infinite size than the order parameters and gaps used in past studies. They use a variant of the DMRG method to calculate the ground state energy as well as several of the lowest singlet, triplet and quintuplet excited energies. They demonstrated a singlet-triplet level crossing in the J_1-J_2 model which for 2L by L cylindrical lattices shifts as g_{c2} - g_{c2} (L) $\propto 1/(L*L)$ and converges to g_{c2}=0.52. In addition they observed a singlet-quintuplet level crossing, which converges to a different point, gc1=0.46. Given an analogy in a Heisenberg spin chain with long rang interactions, where singlet-quintuplet and singlet-triplet level crossings are associated with AFM-SL and SL-VBS transitions respectively, they interpret both gc1 and g_{c2} as quantum-critical points. For $g_{c1} < g < g_{c2}$ the system appears to be a gapless SL with algebraically decaying correlations.

Their work demonstrated a new powerful generic way to use the DMRG method, with the demonstration itself solving a long-standing important problem in quantum magnetism and presenting new spectral properties that should be useful for understanding SLs beyond the one studied there.

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GIANT MAGNETORESISTANCE IN HUBBARD CHAINS

(By **Jian Li**, **Chen Cheng**, Thereza Paiva, **Hai-Qing Lin**, **Rubem Mondaini**)

Giant magnetoresistance (GMR) is a good example of how an unexpected fundamental scientific research can quickly give rise to new technologies and commercial products. After its discovery in 1988 [1,2], less than 10 years later, in around 1997, GMR-type sensors were introduced as reading elements in hard disk drives. Since then, the applications of GMR effect not only have greatly increased storage capacities, but also paved the way for the new storage technologies.

The GMR effect is observed as a significant change in the electrical resistance of composed magnetic-nonmagnetic multilayers. Depending on the magnetization direction of adjacent ferromagnetic layers, the overall resistance is relatively low for parallel alignment and relatively high for antiparallel alignment. Here the magnetization direction can be controlled, for example, by applying an external magnetic field. The physical explanation of this purely quantum mechanical effect relies on the fact that electrons traveling through a ferromagnetic conductor scatter differently depending on the relative orientation of their spin to the magnetization direction of the conductor—with those oriented parallel scattering less often than those oriented antiparallel [3-5]. In a band picture, this is explained by the imbalance of charge populations with spin parallel and antiparallel to an external magnetic field, which translates into very different local density of states in the magnetic regions for both spin states at the Fermi energy [5]. For the antiparallel component, the reduced density of states results in a higher resistance for this channel, compared to a lower resistance for the parallel one.

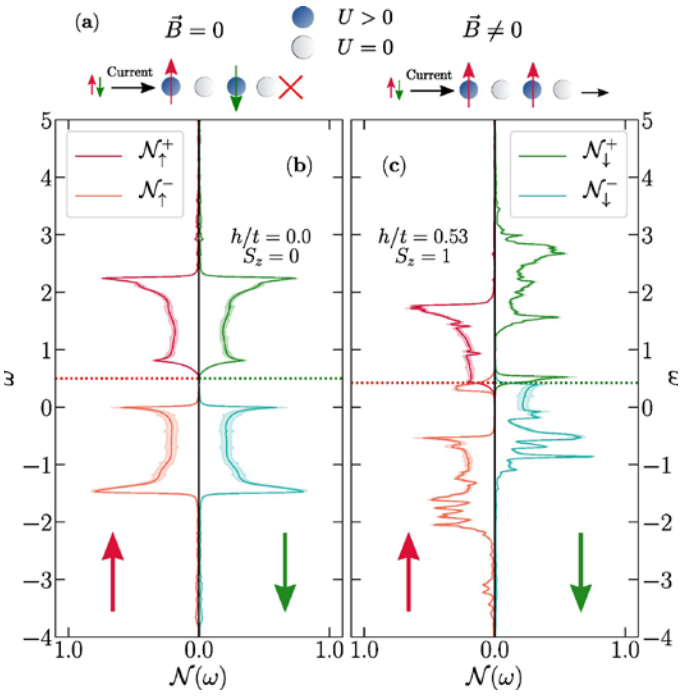

Fig. 1. (a) Schematic representation of the superlattice with the picture for transport and magnetism, in the absence or presence of an external magnetic field B. (b) [(c)] The spin-resolved density of states of the superlattice at zero temperature for h = 0 [h ≠ 0]. In the absence of the field, the Mott gap renders an insulating behavior, while the latter, a metal induced by the field.

A recent investigation [6] involving Jian Li, Cheng Chen, Hai-Qing Lin and Rubem Mondaini from CSRC, and Thereza Paiva from Federal University of Rio de Janeiro, investigates GMR effect in a pure quantum scenario, with full interacting setting. The researchers start from one of the simplest possible interacting quantum model describing the interacting electrons hopping on a lattice, namely the Hubbard model. By applying site-dependent interactions on a one-dimensional lattice, one can mimic the nonmagnetic-magnetic multilayer structure in GMR material with periodic distributed nonmagnetic (without Hubbard U) and magnetic (with finite Hubbard U) sites, as shown in Fig.1 (a).

By means of unbiasedly numerical methods, a combination of exact diagonalization and density matrix renormalization group techniques, the obtained transport properties as well as the spin correlations of this simplified quantum system show the essential features of the GMR effect. In the absence of external field, the adjacent magnetic sites show antiferromagnetic correlations and the system behaves as a perfect insulator [See Fig.1(b)]. In the contrary, in the presence of a sufficient magnetic field, the adjacent magnetic sites show ferromagnetic correlation, and the system has finite conductivity [See Fig.1(c)].

The authors have connected the GMR effect, which is usually explained in a single-particle picture, to the strongly-correlated lattice model in a purely interacting setting. Therefore, to artificially distinguish the identical electrons to two types, localized and delocalized ones, is no longer necessary in this work. Moreover, the implementation has the possibility of being emulated using cold atoms trapped in optical lattices experimentally and could inspire experimentalists in exploring GMR effects in highly tunable cold atom experiments.

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HE REACTIVITY UNDER HIGH PRESSURE: CHEMISTRY WITHOUT CHEMICAL BOND

(By **Liu Zhen**, **Botana Jorge**, Hermann Andreas, Valdez Steven, Zurek Eva, Yan Dadong, **Lin, Hai-Qing**, Miao Mao-Sheng)

In 1933, Pauling predicted that noble gas (NG) elements could become chemically reactive under certain circumstances. In 1962, Bartlett synthesized the first NG compound, Xe+[PtF6]-.1 Since then, numerous NG compounds have been found.2-8 Due to a high ionization energy of 24.59 eV, Helium (He) has been thought to be chemically inert for a long time. In 2017, Dong et al. reported He could form compounds with Sodium and Sodium oxide under high pressure, in a combined experimental and computational study.9 The new compounds, Na2He and Na2OHe, showed no charge transfer between the He atoms and the other elements. Na2He can be regarded as a high-pressure electride, in which localized electrons exist in the interstitial space. Na2He is stabilized so in the form of Na+2E-2He, where E represents the electrons localized in interstitial sites. Sun et al. study the He reactivity with alkali oxide and sulfide compounds under high pressure. 10 Finally, H2O was reported to be reactive with He above around 300 GPa by Liu et al. 11 In all the known He compounds, there is no electron transfer between He and other elements. The stability of these He compounds is still not well understood.

Zhen Liu, Jorge Botana, Haiqing Lin of CSRC, Dadong Yan of Beijing Normal University, Steven Valdez and Maosheng Miao of California State University Northridge, Andreas Hermann of The University of Edinburgh, Eva Zurek of State University of New York at Buffalo, compared density functional theory and Madelung energy calculations to find out the mechanism that drives the stability of He compounds under high pressure. In Fig. 1, we show the 1D model, where the blue circles stand for anions, and the red ones stand for cations; big and small circles indicate doubly and singly charged ions, respectively. The white circles stand for NG atoms (He in our case). The insertion of He within both AB and A2B chains will increase the distance between ions. For the AB chain, He inserts between A-B repetitive units, increasing the distance between cations and anions, and increasing the Madelung energy. This weakens the stability of the systems. For A2B chain, He is inserted between A-B-A unit. The distance between two cations increases, which reduces the Madelung energy. This strengthens the stability of the chain after the He insertion. In this manner, A2B or AB2 compounds tend to form stable systems with He under high pressure. To test this model, the authors chose MgF2, MgO, Li2O, LiF, CaF2 and Na as candidate compounds to react with He. In Fig. 2, all the AB2-type compounds form stable structures with He, while MgO and LiF would not be able to. The Madelung energy and the internal energy are compared in Fig. 3. They follow similar trends in the studied pressure interval, for both the AB2 type and AB type compounds. For AB2 type compounds

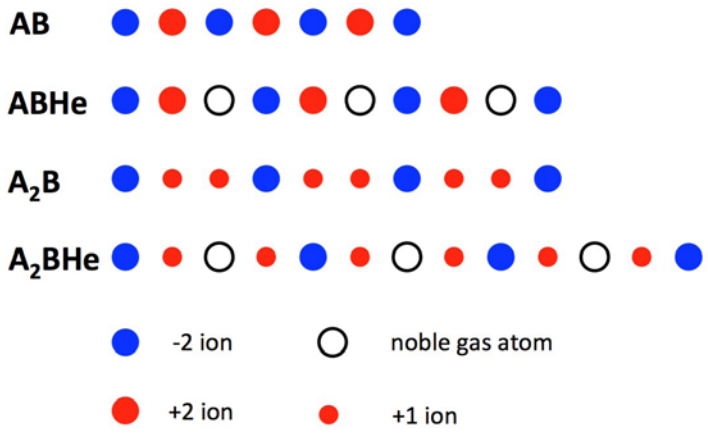

Fig. 1. 1D model of He insertion in chain-like AB- and A2B-type ionic compounds.

(MgF2, Li2O, CaF2, Na2+E2-), the Madelung energy change after the He insertion is greatly reduced at high pressure, stabilizing the insertion. For AB type compounds, the Madelung energy change stays positive for all pressures, as the internal energy does, inhibiting the He insertion in AB type compounds. This study unveiled the mechanism that drives the stability of He compounds with ionic crystals and predicts that there is a large family of He compounds that can be synthesized.

Their work has been published on Nature Communication. Also, their work has been reported by many professional websites such as X-mol, Scientific American, C&EN, and Chemistry World.

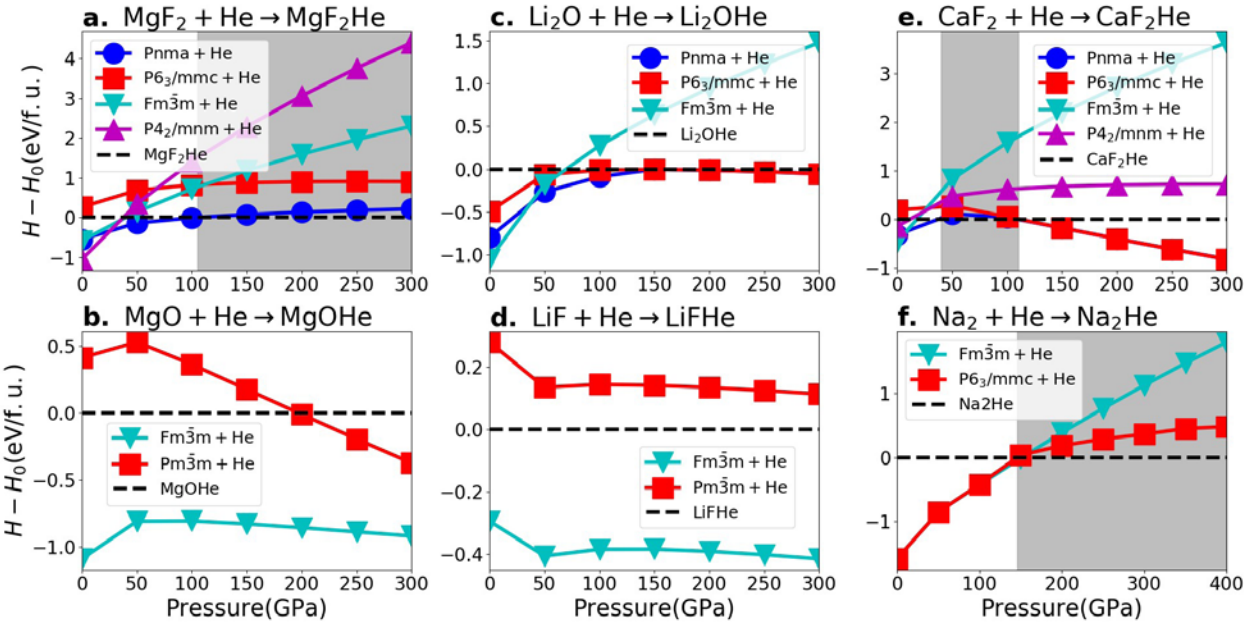

Fig. 2. Reaction enthalpies as defined by the above formula, between Helium and (a) MgF_2, (b) Li2O, (c) CaF_2, (d) MgO, (e) LiF, and (f) Na, plotted as a function of pressure. The pressure range in (a)-(e) is 0 to 300 GPa, and in (f) is 0 to 400 GPa. The reaction enthalpies are calculated respect to the He inserted compounds (dashed lines). Shaded areas indicate the intervals where He inserted compounds are stable.

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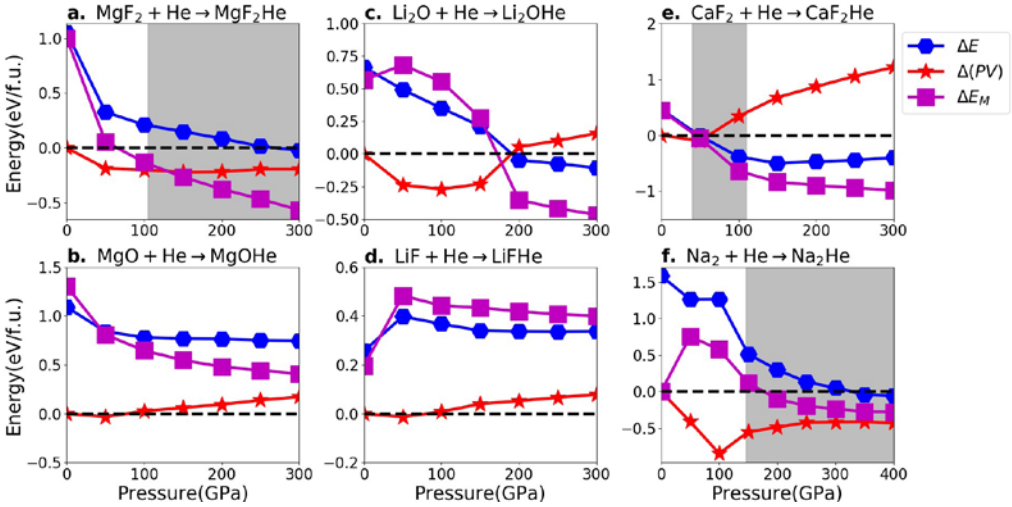

Fig. 3. Relative changes per formula unit of the mechanical work *PV*, the internal energy E for the He-inclusion reaction, and the numerically determined Madelung energies (E_M) of the He-included compounds, as a function of pressure. Shaded areas indicate the intervals where He inserted compounds are stable.

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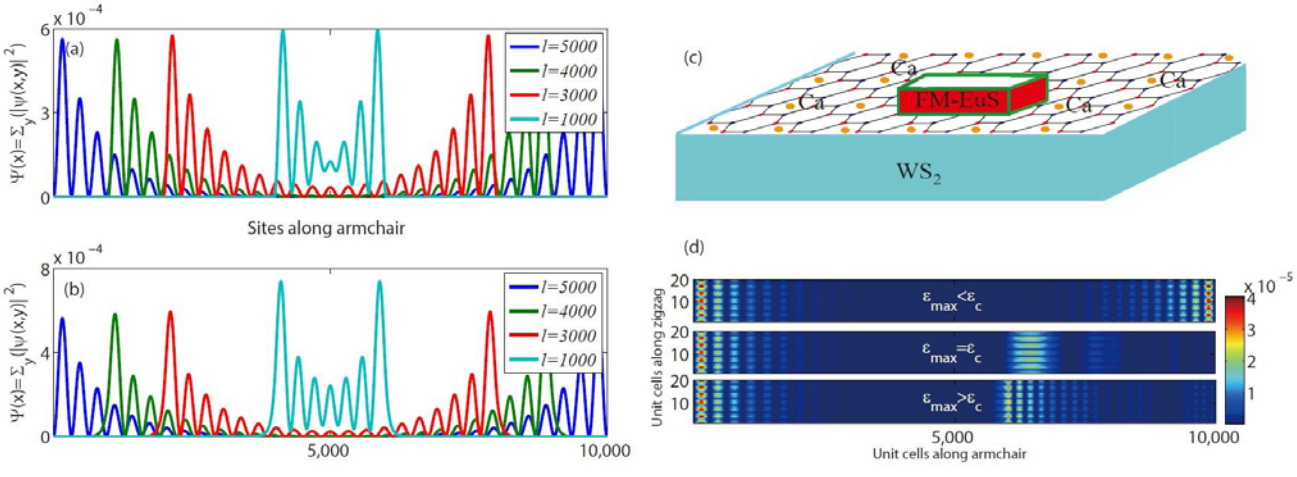
STRAIN MANIPULATION OF MAJORANA FERMIONS IN GRAPHENE ARMCHAIR NANORIBBONS

(By **Wang Zhen-Hua**, Castro Eduardo V., **Lin Hai-Qing**)

Majorana fermions—particles which are their own antiparticles [1]—have recently been the subject of intense research due to the real prospect of realizing such exotic particles in condensed-matter platforms [2,3]. Graphene with its highly tunable properties is a tempting platform when it has a vanishing spin-orbit coupling (SOC). Recently, Zhen-Hua Wang, Eduardo V. Castro, and Hai-Qing Lin have studied the Majorana zero mode in Graphene nanoribbons with armchair edges: enhanced Rashba spin-orbit coupling due to proximity to a transition-metal dichalcogenide, such as WS2, and enhanced Zeeman field due to exchange coupling with a magnetic insulator, such as EuS under an applied magnetic field. The presence of s-wave superconductivity induced either by proximity or by decoration with alkali-metal atoms, such as Ca or Li, leads to a topological superconducting phase with Majorana end modes (see Fig. 2(c)).

For an insulating armchair ribbon, Rashba SOC lifts spin degeneracy by displacing the parabolic bands horizontally in opposite directions. The spectrum can be seen in Fig. 1(a) for a conservative SOC value of $\lambda \approx 0.6$ meV. The Zeeman coupling lifts the remaining spin degeneracy at k = 0, opening up a gap of value 2Vz as shown in Fig. 1(b). Strain has a strong impact on the system and this is shown in Fig. 1(c) for strains ε = 0, 0.01%, 0.03%. In the presence of a finite s-wave superconducting pairing Δ the system becomes gapped as shown in Fig. 1(d) for Vz < Δ. The system goes through a gapless transition point at Vz

Fig. 2. Effect of (a) nonuniform μ and (b) V_z in the Majorana zero mode wave function. (c) The device proposed: graphene armchair nanoribbon sandwiched between high SOC transition-metal dichalcogenide WS_2 and a thin layer of ferromagnetic insulator EuS, decorated with alkalimetal atoms Ca or Li. (d) Effect of a strain profile in the Majorana zero mode wave function for three different profile heights parametrized by ε_{max}.



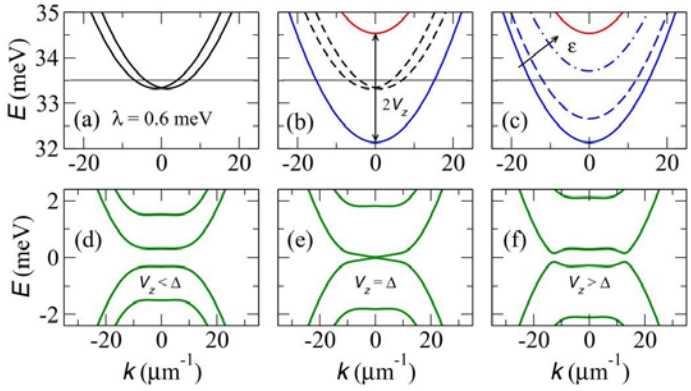


Fig. 1. Lowest conduction band for an armchair ribbon of width Ny = 81 unit cells. The effect of Rashba SOC is shown in (a), and the effect of Zeeman coupling is shown in (b), whereas in (c) we show the evolution of the lowest band with strain ε = 0, 0.01%, 0.03%. For Δ ≠ 0 the system develops a gap, which closes at Vz = Δ (d)–(f).

= Δ [Fig. 1(e)] and becomes gapped again for Vz > Δ [Fig. 1(f)]. The presence of a finite gap with a gap closing point separates the topological and trivial phases.

The advantage of graphene compared to other platforms is that not only strain, but also other parameters—such as the chemical potential μ and the Zeeman coupling Vz— can be used to manipulate Majorana zero modes. Fig. 2(d) shows the Majorana zero mode wave-function amplitude along the ribbon for different strain profile heights εmax. If εmax < εc, the two Majorana zero modes appear localized at the two opposite ends of the ribbon (top panel). At εmax = εc the right side of the ribbon (x>x0) goes through a topological phase transition, and the gap closes (middle panel). For εmax > εc the region x>x0 becomes trivial, and one of the Majorana zero modes localizes at x0 (bottom panel). The Majorana zero mode has thus been transferred to x0 through strain manipulation. Applying a nonuniform chemical potential and Zeeman field, the topological region can be confined to an acquired region (Fig. 2(a)-(b)). Graphene armchair nanoribbon appears to be good candidates to realize topological superconductivity and provides new platforms to design topological quantum computation [4].

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DARK INFORMATION OF BLACK HOLE RADIATION RAISED BY DARK ENERGY

(By **Yu-Han Ma**, **Jin-Fu Chen**, **Chang-Pu Sun**)

The thermal radiation discovered by Hawking [1] implies that the entropy will increase through the Hawking process, which leads to the black hole information paradox. The "lost" information of black hole through the Hawking radiation was recently shown being stored in the correlation among the non-thermally radiated particles [2,3]. This correlation information, which has not yet been proved locally observable in principle, is named by dark information, as shown in Fig. 1

Recently, Yu-Han Ma and Chang-Pu Sun of CSRC, Qing-Yu Cai from IPM, Hui Dong from GSCAEP resolved the paradox [4] with canonical typicality [5]: when the constraint of energy conservation is considered, the extremely small black hole radiation spectrum is obviously shown to be not perfectly thermal. This non-thermal radiation spectrum shows stronger correlations—a kind of "dark information", and thus satisfies the requirement of information conservation. Based on this observation, Yu-Han Ma, Jin-Fu Chen and Chang-Pu Sun of CSRC studied the influences of dark energy on black hole radiation [6]. It is found that the dark energy will effectively lower the Hawking temperature, and thus results in a longer life time for the black hole. It is also discovered that the non-thermal effect of the black hole radiation is enhanced by dark energy so that the dark information of the radiation is increased. The authors observation shows that, besides the mechanical effect (e.g., gravitational lensing effect [7]), the dark energy rises the stored dark information, which could be probed by a non-local coincidence measurement. The detailed influences of dark energy on black hole radiation are illustrated in Tab. 1.

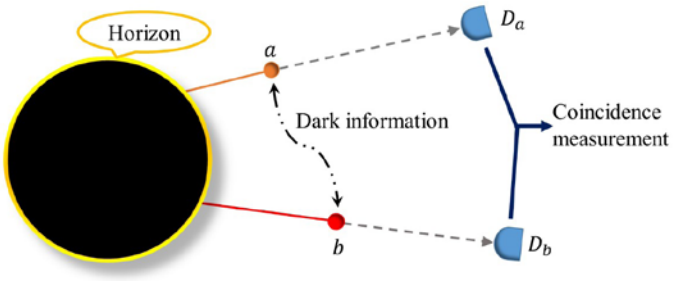

Fig. 1. Probing the dark information of the black hole radiation. Two radiated particles a and b escape from the black hole horizon. The energy distribution of these two particles are not independent of each other due to the non-thermal radiation spectrum, implying that there exist correlation between them. Because the particles may be radiated out from any position of the horizon, and the directions of their momentum are random, it is almost impossible to detect them at the same location. Suppose we have two detectors D_{a} and D_{b} to detect these two particles separately in the space. If one only focus on D_{a} (D_{b}), the result of its detection is an average over the distribution of b (a), thus the correlation between a and b is hidden and can not be observed. To show this correlation information, the coincidence measurement should be taken among a and b through the two detectors. Therefore, we can conclude that this correlation can not be probed through local measurement. Namely, the information is dark.

Table. 1 Characteristic variables of black hole influenced by dark energy

Characteristic variables	Without dark energy	With dark energy
Hawing temperature	$1/8\pi M$	$(1-16M^2\Lambda/3)/8\pi M$
Black hole life time	$5120\pi M^3\Lambda$	$5120\pi M^3\Lambda(1+56M^2\Lambda/5)$
Dark information	$8\pi E_a E_b$	$8\pi(1+16M^2\Lambda)E_a E_b$

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BISTABILITY OF CAVITY MAGNON POLARITONS

(By **Yi-Pu Wang**, **Guo-Qiang Zhang**, **Dengke Zhang**, Tie-Fu Li, C.-M. Hu, and **J. Q. You**)

Both quantum information processing [1] and future quantum internet [2] inevitably need efficient quantum information transfers among different physical systems. Hybrid quantum systems may provide hopeful solutions to these problems [3, 4]. Recently, cavity magnonics has attracted much interest (see, e.g., [5–12]), which involves cavity photons strongly or untrastrongly [13] interacting with collective spin excitations in a millimeter-scale yttrium iron garnet (YIG) crystal. This hybrid system gives rise to new quasiparticles called cavity magnon-polaritons [14, 15]. Benefiting from low damping rates of both magnons and cavity photons, this hybrid system is also expected to become a building block of the future quantum information network. Now, a versatile quantum information processing platform based on the coherent couplings among magnons, cavity microwave photons [5–7], optical photons [16–19], phonons [20] and superconducting qubits [21, 22] is being established, with the strong coupling between magnons and cavity photons being the core of the hybrid quantum system.

A recent investigation [23] involving Yi-Pu Wang, Guo-Qiang Zhang, Dengke Zhang, and J. Q. You from CSRC, Tie-Fu Li from Tsinghua University, and C.-M. Hu from University of Manitoba reports an experimental observation of the bistability of the cavity magnon-polaritons originating from both the Kerr effect of magnons and the hybridization between magnons and cavity photons. In a wide range of parameters, the frequency of the cavity magnon-polaritons is found to jump up or down sharply at the switching points where the cavity magnon-polaritons transition from one state to another. To clearly demonstrate the nonlinear effect, the researchers implement the experiment by aligning the [100] and [110] crystallographic axes of the YIG sphere parallel to the externally applied static magnetic field, respectively.

The relation between polariton frequency shift and drive power, drive field frequency detuning is

$$\left[(\Delta_{\mathrm{p}}+\delta_{\mathrm{p}})^2+\left(\frac{\gamma_{\mathrm{p}}}{2}\right)^2\right]\Delta_{\mathrm{p}}-cP_{\mathrm{d}}=0$$

For the [100] case, the results are shown in Fig.1. The polariton frequency shift is blue-shift.

For the [110] case, the results are shown in Fig.2. The polariton frequency shift is red-shift.

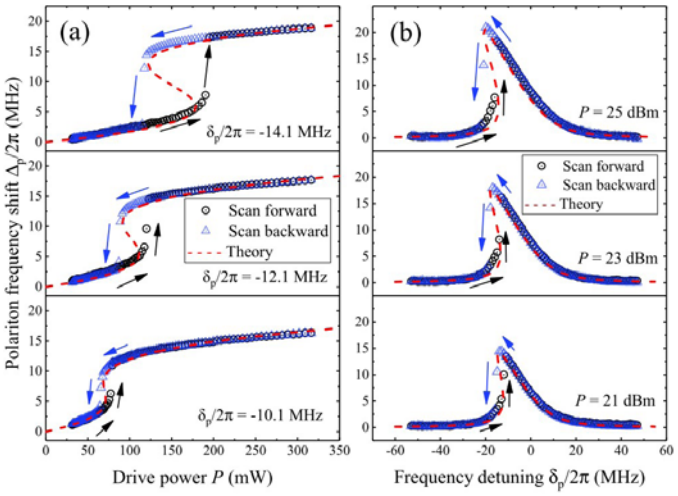

Fig. 1. (a) Frequency shift of the lowerbranch magnon-polaritons versus the drive power when the drive-field frequency detuning relative to the lower-branch magnon polaritons is fixed at −14.1, −12.1 and −10.1 MHz, respectively. (b) Frequency shift of the lower-branch magnon-polaritons versus the drive-field frequency detuning when the drive power is fixed at 25, 23 and 21 dBm, respectively. The black circle dots are the forward-scanning results and the blue triangle dots are the backward-scanning results. The red dashed curves are theoretical results obtained using Eq. (1).

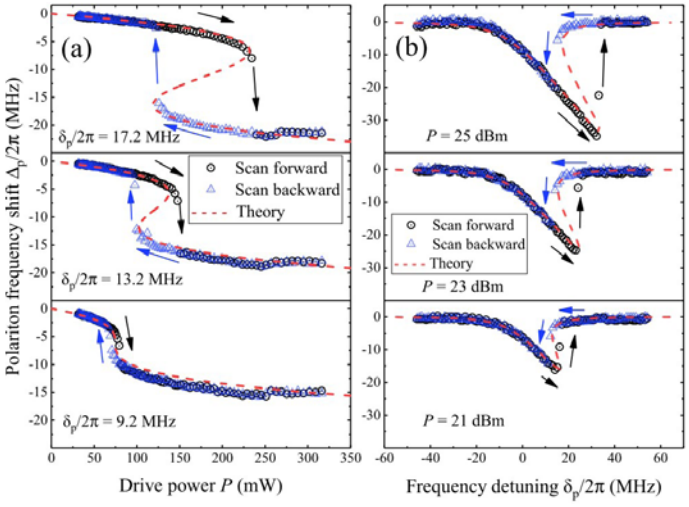

Fig. 2. (a) Frequency shift of the lower-branch magnon-polaritons versus the drive power when drive detunings equal to 17.2, 13.2, 9.2 MHz. (b) Frequency shift of the lower-branch magnon-polaritons versus the drive-field frequency detuning when P = 25, 23, 21 dBm. The black circle dots are the forward-scanning results and the blue triangle dots are the backward-scanning results. The red dashed curves are theoretical results obtained using Eq. (1)

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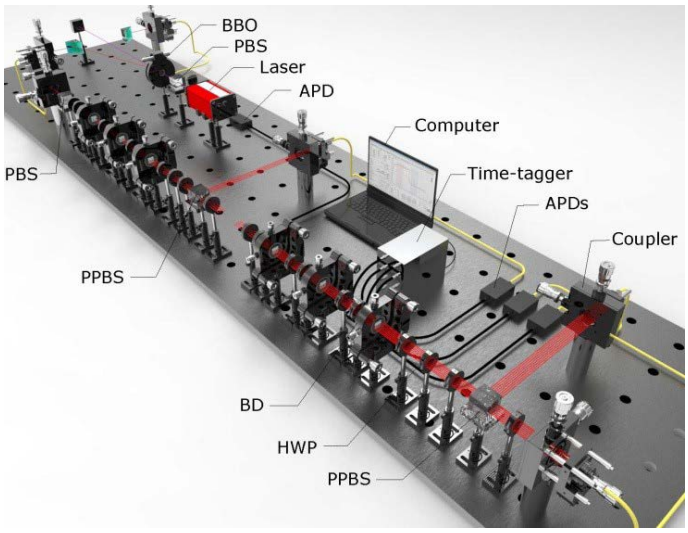
DETECTING TOPOLOGICAL INVARIANTS AND REVEALING TOPOLOGICAL PHASE TRANSITION

(By Lei Xiao, Xiaoping Wang, Kunkun Wang, Zhihao Bian, Xiang Zhan and **Peng Xue**)

Topological phases exhibit remarkable properties, and have stimulated extensive research interest in modern physics [1,2]. In contrast to conventional phases of matter which are characterized by symmetry properties and local order parameters, topological phases are typically parametrized by integer-valued topological invariants. While many experiments [3,4] are concerned with the detection and characterization of topological edge states, recent progress has led to the direct measurement of topological invariants in the bulk of synthetic topological systems. On the other hand, topological matter exhibits exotic properties yet phases characterized by large topological invariants are difficult to implement, despite rapid experimental progress. A promising route toward topological invariants (even large topological invariants) is via engineered Floquet systems, particularly in photonics, where flexible control holds the potential of extending the study of conventional topological matter to novel regimes.

A recent investigation [5] involving Xiaoping Wang, Lei Xiao, Kunkun Wang and Peng Xue



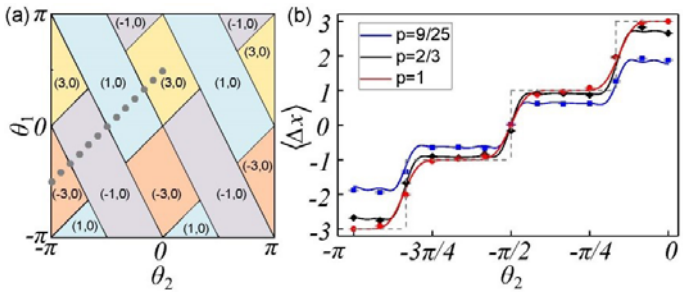


Fig. 1. Left: An experimental setup for three-step non-unitary quantum walk up to four time steps. Right: (a) Phase diagram for three-step non-unitary quantum walks characterized by the topological invariants as functions of the coin parameters. (b) Measured average displacements of three-step non-unitary quantum walk corresponding to U3 with different loss parameters.

from CSRC, Xingze Qiu and Wei Yi from University of Science and Technology of China, experimentally investigate topological phenomena in one-dimensional discrete-time photonic quantum walks using a combination of methods. They first detect winding numbers of the quantum walk by directly measuring the average chiral displacement, which oscillates around quantized winding numbers for finite-step quantum walks. Topological phase transitions can be identified as changes in the center of oscillation of the measured chiral displacement. The position of topological phase transition is then confirmed by measuring the moments of the walker probability distribution. Finally, they observe localized edge states at the boundary of regions with different winding numbers. They also confirm the robustness of edge states against chiral-symmetry-preserving disorder.

Topological matter exhibits exotic properties yet phases characterized by large topological invariants are difficult to implement, despite rapid experimental progress. A promising route toward higher topological invariants is via engineered Floquet systems, particularly in photonics, where flexible control holds the potential of extending the study of conventional topological matter to novel regimes. Here, Lei Xiao, Kunkun Wang, Zhihao Bian, Xiang Zhan and Peng Xue from CSRC, Xingze Qiu and Wei Yi from University of Science and Technology of China, Hideaki Obuse from Hokkaido University, and Barry C. Sanders from University of Calgary, implement a one-dimensional photonic quantum walk to explore large winding numbers [6]. By introducing partial measurements and hence loss into the system, they detect winding numbers of three and four in multistep non-unitary quantum walks, which agree well with theoretical predictions. Moreover, by probing statistical moments of the walker, they identify locations of topological phase transitions in the system and reveal the breaking of pseudo-unitary near topological phase boundaries. As the winding numbers are associated with non-unitary time evolution, their investigation enriches understanding of topological phenomena in non-unitary settings and create further opportunities in engineering unconventional topological phenomena using photonics.

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ORIGIN OF THE SELF-LIMITED ENERGY DENSITY OF OXIDE CATHODE MATERIALS FOR LI-ION BATTERIES

(By **Peng Zhang, Su-Huai Wei**)

The increasing demand of modern society for clean energy has made it critical to develop novel battery materials with high energy density and cycling stability. Cathode materials of Li-ion batteries have been extensively studied in the past, and recently it has been proposed that by utilizing the anionic redox reaction one may be able to increase the total capacity of cathode materials. But the mechanism behind this proposal is not well understood because the traditional point of view is that the redox reaction is mainly carried out by the transition metal (TM) ions and experimentally achieved energy capacity is much lower than what is predicted by theory assuming all the Li ions can be extracted from the cathodes. Thus, for future development of new Li-ion battery, it is crucial to understand the physical picture of the charge compensation redox process occurring in cathode materials during the delithiation-lithiation process and its relationship to the energy density and stability of the cathodes.

Recently, Su-Huai Wei's group in CSRC [1] has carefully studied the general charge-compensation redox process of cathode materials upon delithiation, based on the molecular-orbital analysis and first-principles calculations. They reveal that the charge compensation in a cathode during the delithiation-lithiation process is mainly achieved by the oxygen redox reaction, and only partially by the TM redox reaction, due to a negative-feedback effect and the associated charge transfer from the O 2p to TM 3d orbitals. This physical picture is quite different from the traditional point of view but is consistent with recent experimental observations. More importantly, their band structure and total energy calculations indicate that the energy density in a cathode is self-limited by the structural stability of its host upon delithiation, which depends on the energy level of the highest occupied states (HOS) of the host. As a critical amount of Li ion and electrons are removed from the host, the HOS become low enough to promote the formation of oxygen vacancy and thus destroy the host structure (Fig. 1). As a result, suitable TM elements should be used in the cathode materials to adjust the HOS level to keep a balance between energy density and stability, because the HOS is mainly determined by the TM for a given anionic framework. Their new physical understanding and insights on the redox process in the Li-ion batteries are important for the future development of new cathode materials.

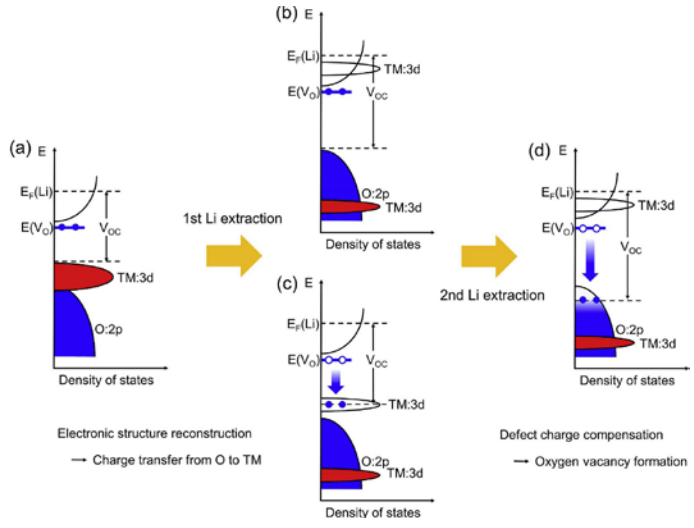

Fig. 1. Schematic illustration of the electronic structure reconstruction and defect charge compensation mechanism in a cathode.

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REVEALING THE LINK BETWEEN STRUCTURAL RELAXATION AND DYNAMIC HETEROGENEITY IN GLASS-FORMING LIQUIDS

(By **Lijin Wang**, Ning Xu, Wei-Hua Wang, **Pengfei Guan**)

When quenched quickly to bypass crystallization, liquids can become supercooled liquids. Glassy states formed by quenching supercooled liquids down to low enough temperatures, can exist in nearly all matters, which makes the glass transition a common phenomenon. However, the nature of the glass transition is still mysterious. One of the most significant findings in the study of glass transition in the past about one decade is dynamic heterogeneity which refers to slow dynamics in some regions but quick dynamics in other ones in supercooled liquids. Numerous studies from simulations and experiments find that dynamic heterogeneity grows with the increase of the structural relaxation time on approaching the glass transition, which makes people believe that the slowdown of dynamics can be understood from the viewpoint of dynamic heterogeneity. In addition, the concept "fragility" is proposed to quantify the extent of the temperature dependence of the structural relaxation times observed in different supercooled liquids along a "fragile" to "strong" scale.

Recently, Pengfei Guan's group at CSRC [1], in collaboration with Prof. Weihua Wang at Institute of Physics of Chinese Academy of Sciences, and Prof. Ning Xu at University of Science and Technology of China unravel for the first time the quantitative correlation between dynamic heterogeneity and fragility, and describe universally the temperature evolution of the structural relaxation time in different supercooled liquids, and hence reveal the link between dynamic heterogeneity and structural relaxation.This result indicates that dynamic heterogeneity plays a significant role in understanding dynamic properties of supercooled liquids and the nature of glass transition.

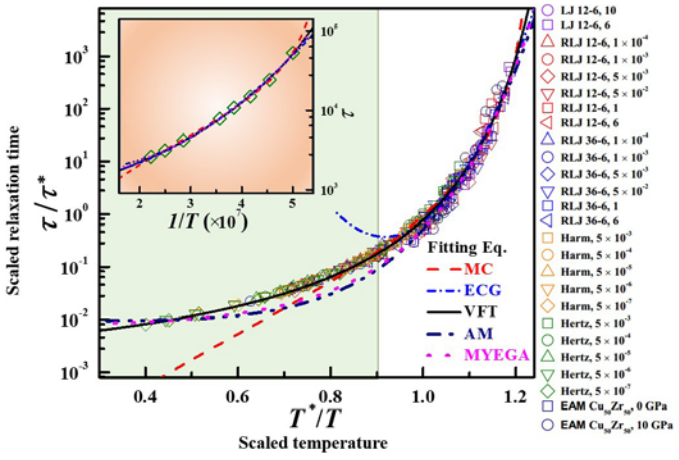

Fig. 1. Scaling collapse of structural relaxation time vs. temperature in different supercooled liquids.

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DISCOVERING NEW MECHANISM OF THE GLASS TRANSITION OF METALLIC GLASSES

(By YC Hu, YW Li, Y Yang, Pengfei Guan, HY Bai, WH Wang)

Amorphous alloys, also called metallic glasses (MGs), are typical atomic glass-formers dominated by metallic bonds. Due to the comparatively simple microstructure, they are good models for studying the fundamental physical problems of glasses. By virtue of the unique disordered structure, MGs have excellent mechanical, physical and chemical properties, which lay the foundation for their wide applications in different areas. Therefore, research of MGs is of great significant both on science and technology. Similar to other glass-formers, MGs are fabricated by hyper-quenching high temperature melts to avoid crystallization. At some temperature, glass transition happens and a glass form. Glass transition is closely related to the formation mechanism, microstructural characteristics and macroscopic properties of MGs. However, the underlying mechanism of glass transition cannot be understood from the theories of thermodynamic phase transition. It is actually one of the largest challenges in condensed matter physics and materials science. In phase transition theories, there is discontinuous change of the corresponding order parameter. But for the glass-forming liquids, the dynamics slows down dramatically, but the two-body structure measured by traditional diffraction techniques is almost invariant. How to understand the structural origin of the dynamical slowdown is the hottest topic in glass physics. In recent decades, it was frequently observed that the slowdown is accompanied by the change in some locally favorable clusters (short-range ordering). People are trying to establish the correlation between these local geometrical structures and slow dynamics, and try to treat these clusters as the desired structural origin.

Recently, Pengfei Guan's group at CSRC [1], in collaboration with Prof. Wei-Hua Wang's group at Institute of Physics, Chinese Academy of Sciences, and Prof. Yong Yang from City University of Hong Kong reveal the static correlation length from configuration correlation determines the slow dynamics of both confined and unconfined supercooled liquids, and unravel the critical role of this static length scale in the glass transition of metallic glass-forming liquids. The properties of the static length scale can be well understood from the random first-order transition theory, indicating that glass transition has some thermodynamic characteristics rather than is a purely dynamical process. The research outcomes are conducive to understanding the structure and glass transition of metallic glasses, and benefit to spur new experimental investigations. Meanwhile, whether there is a unique geometrical structure corresponding to this static correlation length is of paramount significance for future studies.

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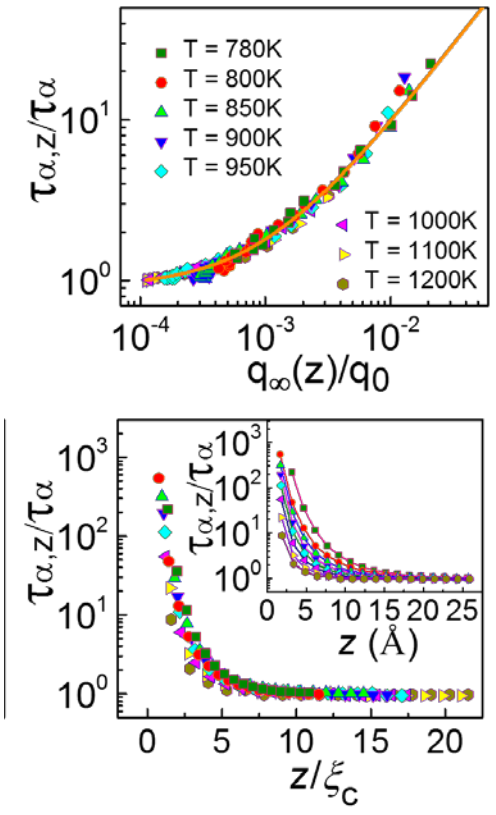

Fig. 1. Scaling collapes of structural relaxation time vs. staitc length scaled parameter in confined (left) and unconfined (right) systems.

UBIQUITOUS SPIN-ORBIT COUPLING IN A SCREW DISLOCATION WITH HIGH SPIN COHERENCY

(By **Lin Hu**, H. Huang, Z. Wang, W. Jiang, X. Ni, Y. Zhou, V. Zielasek, M. G. Lagally, **Bing Huang**, **Feng Liu**)

Spintronics offers a promising paradigm shift for future information and energy technologies by processing the electron spin instead of charge degree of freedom, thereby essentially avoiding heat dissipation. In a crystalline solid, the motion of an electron is inevitably coupled with its spin orientation through the spin-orbit coupling (SOC) effect. Therefore, discovering new forms of the SOC effect that provide more effective means to manipulate spin transport properties is not only of fundamental interest but also critical to the development of spintronics devices.

Recently, Bing Huang's group at CSRC [1], in collaboration with Prof. Feng Liu at University of Utah, and Prof. M G Lagally at University of Wisconsin, Madison unravel a surprising form of SOC that existsubiquitously in a screw dislocation (SD) in semiconductors. The 1D SOC in a SD is inherently induced by breaking of local inversion symmetry along the dislocations core, because the SD assumes always a rotational plus a fractional translational symmetry and generates a 1D spiraltype effective electrical field. Most importantly, the 1D SD-SOC resides deep in the band gap of semiconductors, completely isolated from the bulk bands. It has also an spin texture with a much higher degree of spin coherency than the 2D RD-SOC, which is tunable by the ionicity of a compound semiconductor, as demonstrated by firstprinciples calculations of several representative semiconductors (Si=Ge, GaAs, and SiC). Therefore, the 1D SD-SOC exhibits two ideal features that are not only fundamentally interesting but also highly desirable for spintronics device applications.

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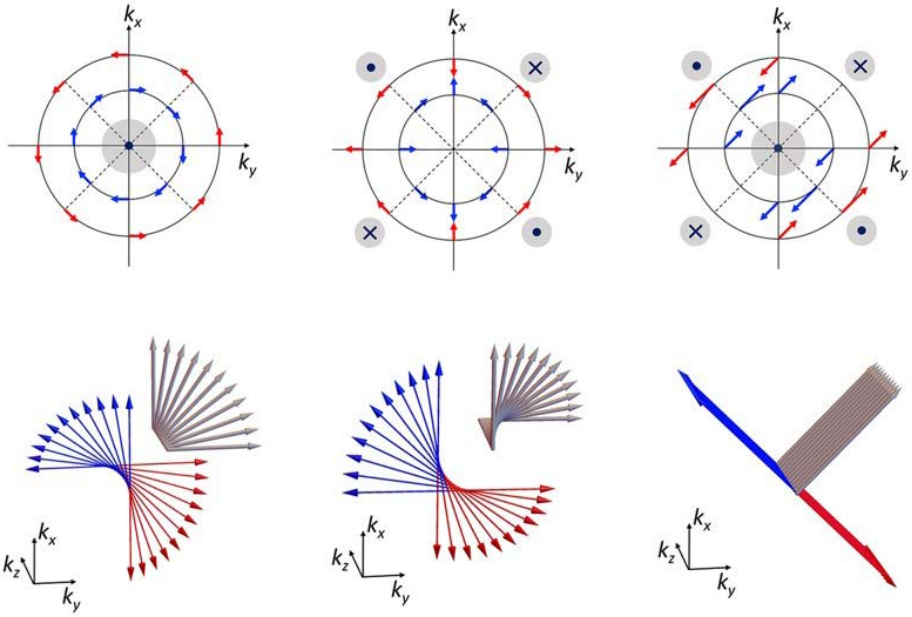

Fig. 1. (a) The comparison of the conventional Rashba SOC effect at surfaces or interfaces (upper panels) and our discovered 1D SD-SOC effect.

TOWARD INTRINSIC ROOM-TEMPERATURE FERROMAGNETISM IN TWO-DIMENSIONAL SEMICONDUCTORS

(By C. Huang, J. Feng, F. Wu, D. Ahmed, **Bing Huang**, H. Xiang, K. Deng, E. Kan)

The discovery of spintronic behaviors (e.g., giant magnetoresistance effect) gives new dimensions to manipulate the spin and charge of materials, leading to novel functional spintronic devices. One of the most promising candidates of spintronic materials is ferromagnetic (FM) semiconductor. Different from the usual antiferromagnetic (AFM) insulators, FM semiconductors simultaneously possess spontaneous net magnetization and the moderate electrical resistivity at finite temperature, leading to potential spintronic applications such as data storage, sensing, capacitor, and logical devices. For practical interests, a feasible FM semiconductor with strong ferromagnetism that can survive at room temperature (300 K) is highly desirable. However, FM semiconductors are rare in nature and their Curie temperatures (TC) are usually much lower than room temperature, such as the recent experimentally realized two-dimensional (2D) FM semiconductors whose TC are below 45 K. Actually, experimental observation of room-temperature intrinsic FM semiconductors has never been reported despite decades of tremendous efforts.

Recently, Bing Huang's group at CSRC [1], in collaboration with Prof. Hongjun Xiang at Fudan University, and Prof. Erjun Kan at Nanjing University of Science and Technology demonstrate that superexchange indeed can lead to carrier-free room-temperature semiconducting ferromagnetism. Using a double-orbital model, we reveal a general mechanism that FM coupling in a semiconductor can be significantly enhanced by reducing the virtual exchange gap between the occupied and empty spin-polarized orbitals of adjacent magnetic

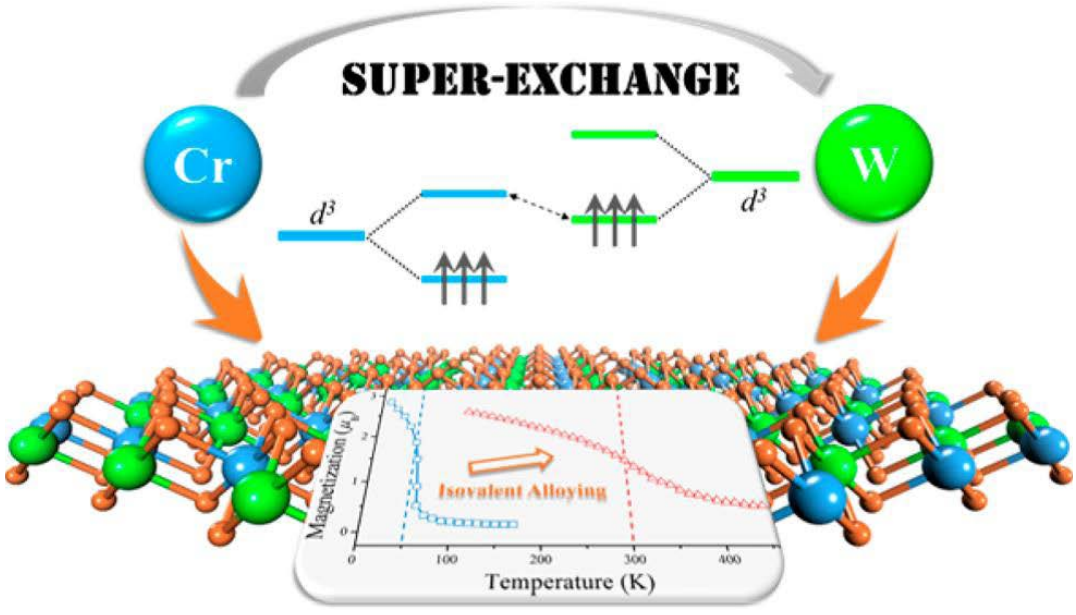

Fig. 1. Superexchange coupling enhanced ferromagnetism in 2D materials.

ions. The explored mechanism is then applied to two experimentally reported systems, namely, CrI_3 and $CrGeTe_3$ thin layers, which are intrinsic FM semiconductors with low TC. By isovalent alloying of Cr with W to construct alloy compounds $CrWI_6$ and $CrWGe_2Te_6$ monolayers, the excahnge gap between occupied W $t_{2g\uparrow}$ and empty Cr $eg_{\uparrow}$ orbitals is much reduced. First-principles calculations and classical Monte Carlo (MC) simulations demonstrated that both CrWI6 and CrWGe2Te6 monolayers are robust intrinsic FM semiconductors with TC of ~180 K, which is indeed much higher than that of the pristine CrI_3 (45 K) and $CrGeTe_3$ thin layers (30 K). And the TC of CrWGe2Te6 monolayer can be enhanced up to room temperature (300 K) under a small tensile strain (4%) without introducing any carriers. Besides, the applicability of the proposed mechanism is also confirmed in another typical magnetic system, that is, the $HgCr_2S_4$ spinel and MnS_2 monolayer.

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SYMMETRIC SHEAR BANDING AND SWARMING VORTICES IN BACTERIAL "SUPERFLUIDS"

Active swimmers exhibit rich collective behaviors such as the emergence of swarming, and the non-equilibrium phase transitions between disordered and ordered states. Arising from these striking collective behaviors, suspensions of active swimmers are able to show unusual macroscopic responses to external drives. Recently one experimental study discovered that, instead of increasing the apparent viscosity of the suspending fluid, dense swimming bacteria can turn a suspension into a "superfluid" with zero apparent viscosity [1]. However, due to the limit of the experimental setup used, the dynamics of such an exotic phase have not been observed and the microscopic mechanism underlying such surprising rheological behavior remains missing.

Recently, the research group led by Prof. X. L. Xu at Beijing Computational Science Research Center, together with Prof. X. Cheng's group at the University of Minnesota investigated the dynamics of concentrated bacterial suspensions under simple planar shear [2]. Their study found that bacterial "superfluids" under shear exhibit unusual symmetric shear bands, defying the conventional understanding of shear-banding of complex fluids, where the formation of steady shear bands necessarily breaks the symmetry of un-sheared samples. A simple hydrodynamic model based on the local stress balance and the ergodic sampling of non-equilibrium shear configurations is proposed. The model quantitatively described the observed symmetric shear-banding structure and successfully predicts various interesting features of swarming vortices observed for the bacterial suspensions used in the experiments. This work provides new insights into the physical properties of collective swarming in active fluids and illustrates their profound influences on transport processes.

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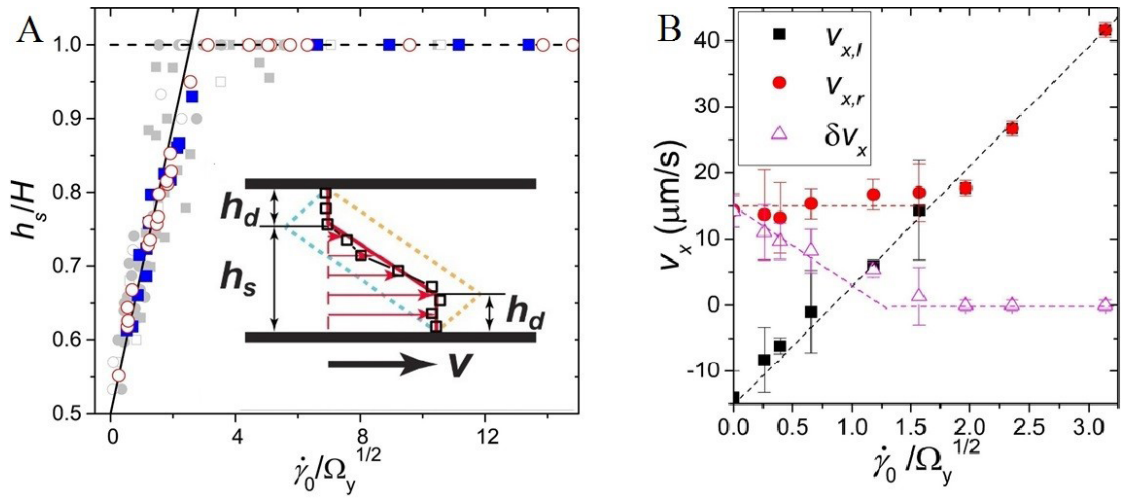

Fig. 1. Bacterial velocity profile. (A) The averaged velocity profile and the height where velocity becomes zero, as a function of dimensionless shear rate. (B) The velocity of each shear configuration.

ACTIVE MATTER CLASS WITH SECOND-ORDER TRANSITION TO QUASI-LONG-RANGE POLAR ORDER

(Benoît Mahault, Xin-chen Jiang, Eric Bertin, Yu-qiang Ma, Aurelio Patelli, Xia-qing Shi, and **Hugues Chaté**)

Whether active matter systems can exhibit new critical phenomena has been a pending question since the seminal work of Vicsek and collaborators in 1995 [1]. Indeed, Vicsek et al.'s original emphasis was that their model exhibit a new type of phase transition (their famous PRL is entitled Novel Type of Phase Transition in a System of Self-Driven Particles). It was later recognized that the critical scaling reported there is a finite-size effect [2] and that the transition to order/collective motion in fact follows a phase separation scenario in which the ordered liquid is separated from the disordered gas by a coexistence region [3].

This phase separation scenario is general for dry active matter systems where local alignment is the dominant interaction. Thus, there was no evidence for a bona fide phase transition with critical scaling in active matter systems with short-range interactions. It has been shown that introducing long-range interactions to suppress the mechanism at the origin of phase separation leads to continuous phase transitions [4,5], but otherwise, whether active matter systems with local interactions can give rise to new critical phenomena was an open outstanding problem.

But in a recent work [6], led by CSRC Chair Professor Hugues Chaté, a new class of dry active matter with alignment that displays a continuous transition to orientational order was introduced. It shows that self-propelled particles with velocity reversals and ferromagnetic alignment of polarities

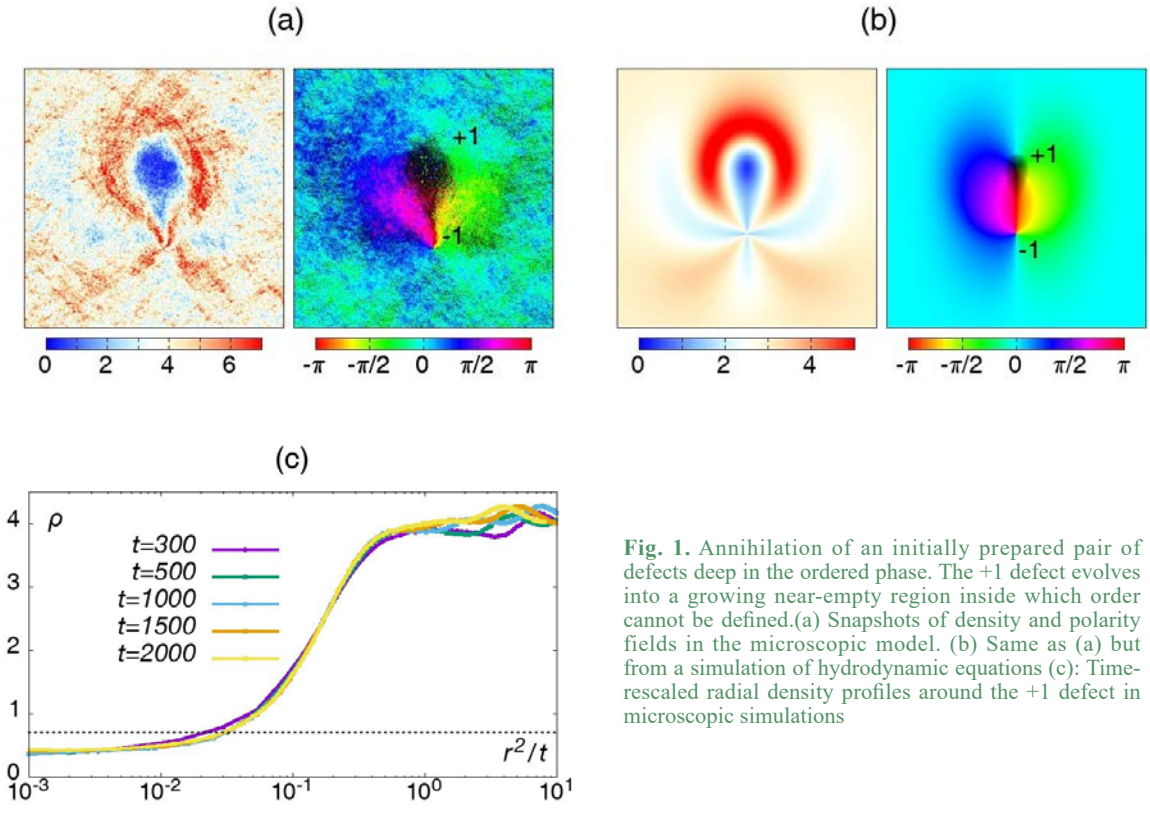

Fig. 1. Annihilation of an initially prepared pair of defects deep in the ordered phase. The +1 defect evolves into a growing near-empty region inside which order cannot be defined.(a) Snapshots of density and polarity fields in the microscopic model. (b) Same as (a) but from a simulation of hydrodynamic equations (c): Time-rescaled radial density profiles around the +1 defect in microscopic simulations

give rise to quasi-long-range polar order with continuously-varying scaling exponents. The continuous phase transition was found to not be in the Berezinskii-Kosterlitz-Thouless universality class, which is a surprise given that the system displays many of the features of the (equilibrium) XY model. Rather, a standard critical point with algebraic divergence of correlations is found, with scaling exponents not in any known class.

These findings can be rationalized by showing that the interplay between order and density in the problem changes the role of defects. in dry dilute active matter systems, they are not topologically-bound point objects, and the transition is not controlled by their interactions.

This is a result of importance not only to the fast-growing active matter community but also to statistical physics in general.

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VORTEX PATTERNS AND THE CRITICAL ROTATIONAL FREQUENCY IN ROTATING DIPOLAR BOSE-EINSTEIN CONDENSATES

One of the striking features of rotating atomic Bose-Einstein condensates (BECs) is the formation of vortices above a critical angular velocity. In a symmetric BEC, multiple vortices arrange in a characteristic triangular pattern. This triangular vortex lattice minimizes the free energy of the BEC. While the initial experiments considered atoms with local interactions, more recently, dipolar BECs with significant electric or magnetic dipole moment have received much attention from both theoretical and experimental studies. The dipole-dipole interaction (DDI) crucially affects the ground-state properties, stability, and dynamics of the gas. Furthermore, they offer a route for studying many-body quantum effects, such as a superfluid-to-crystal quantum phase transition, supersolids or even topological quantum phases.

In a quasi-2D rotating dipolar BEC, the emergence of vortex depends on the s-wave contact interaction strength, the polarization angle and the rotational frequency. When the rotational speed increases, many vortices will appear and arrange in patterns. In literature, several transitions of vortex lattice structure have been predicted, involving triangular lattice, rectangle lattice and square lattice.

Recently, CSRC researcher Yongyong Cai, together with Yongjun Yuan, Matthias Rosenkranz, Weizhu Bao and Han Pu, employed a quasi-2D dipolar Gross-Pitaevskii model for arbitrary DDI polarization, and studied how the s-wave contact interaction strength and the polarization angle affect the critical rotational frequency with both attractive and repulsive DDI strengths. Focusing on the regime with many vortices, they were able to discern characteristic vortex patterns that occur as the polarization changes from predominantly perpendicular to parallel. It was found that the critical rotational frequency for single vortex depends mainly on the effective 2D contact interaction strength. For fast rotation, when the polarization angle changes from perpendicular to parallel to the condensate plane, a structural phase transition in the vortex lattice geometry from triangle to square is observed for positive DDI, but not for negative DDI. However, there is no simplified theory to illustrate the lattice structure transition and the DDI in rotating BEC requires further studies. The highly accurate numerical simulations provided insights for next step research on rotating dipolar BECs.

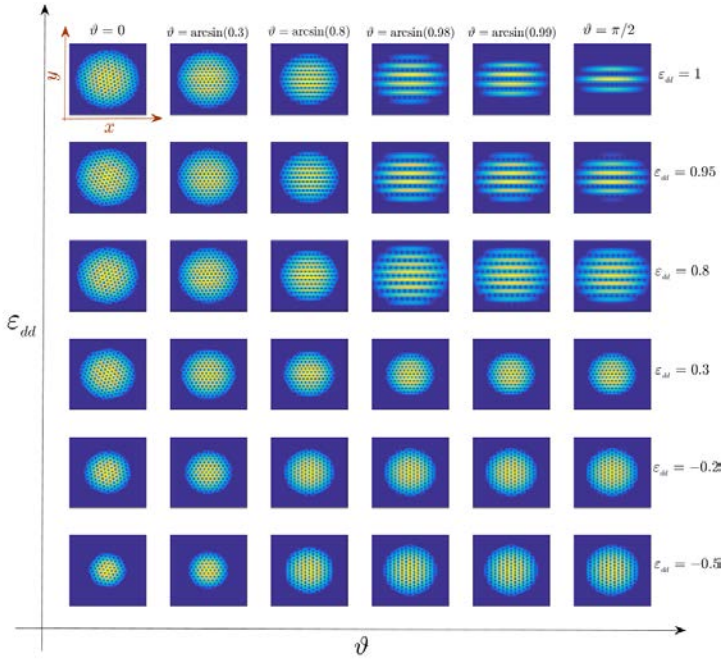

Fig. 1. Density of a 2D rotating dipolar BEC for different dipole polarization angles ϑ and for different DDI strengths with ε_{dd}.

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SHARP ERROR ESTIMATE OF THE NONUNIFORM L1 FORMULA FOR LINEAR

(Reaction-subdiffusion equations Hong-Lin Liao, Dongfang Li and Jiwei Zhang)

In any numerical methods for solving the reaction-subdiffusion problem, a key consideration is that the solution is typically less regular than would be the case for a classical parabolic PDE, and the solution may also grow fast when the time is far away from the initial time for nonlinear problems. This feature of the solution requires the time mesh to be more general nonuniform to obtain the optimal error estimate. But, it is a challenge to address the corresponding theoretical analysis when there has not enough grid information. This paper [1] will open new roads to guide the numerical analysis and simulations of the time-fractional PDEs. We now introduce the work in the following options.

1. What is the decisive advance in this paper in the design and/or analysis of a numerical method or class of methods?

We prove stability and convergence for the L1 scheme applied to a linear reaction-subdiffusion equation with employing nonuniform time steps to resolve the initial singularity in the solution. Our sharp error analysis has two notable features: we first prove a discrete fractional Gronwall inequality (see the relative work [2]), and propose the conception of the error convolution structure (ECS) to describe the local consistency error. To exploit these two features, a complementary discrete convolution kernel and a new property of the discrete L1 kernels are crucial in the nonuniform setting. In addition, this framework is available to extended to some high-order schemes such as the Alikhanov scheme, see our new work [3].

2. Why is the method or class of methods considered in the paper of significant and broad interest to the readers?

The paper opens a novel approach for proving stability and consistency for L1 scheme for reaction-subdiffusion problems with general nonuniform time grid. The ECS analysis of numerical approximations has two advantages:

(i) localize (and simplify) the analysis of approximation error of discrete convolution formula, and make it possible to analyze the numerical approximation on generally nonuniform time grids;

(ii) reveal the error distribution information in the long-time integration via global consistency error.

The core result is an ECS bound and a global consistency error in nonuniform temporal grids for both L1 approximation and Alikhanov approximation (a high-order scheme) and the corresponding fast-algorithm-based schemes. Based on our EBC, we can show that the local error in the current cell and the historic errors in the (long-time) interval make almost the same contribution, in the sense of convolutional summation, to the global consistency error of the discrete Caputo derivative. This observation seems not to be derived by other methods.

3. What are the new and original aspects of the paper that set it apart from the existing work in this field?

Our theory allows great flexibility in the choice of time steps, unlike, for instance, the Gronwall inequality used recently by Jin, Li and Zhou [5], which requires a constant time step. Our approach can easily be extended to handle the problem with nonlinear reactions [4].

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ENERGY QUADRATIZATION: A GENERAL STRATEGY FOR NUMERICAL APPROXIMATIONS OF THERMODYNAMICALLY CONSISTENT NONEQUILIBRIUM MODELS

(By Jia Zhao, Xiaofeng Yang, Yuezheng Gong, Xueping Zhao, Jun Li, Xiaogang Yang and Qi Wang)

We have developed a general approach to deriving energy stable numerical approximations for thermodynamically consistent models for nonequilibrium phenomena. Thermodynamically consistent models are the ones that satisfy the thermodynamical laws, especially, the second law. These models include many well-known ones in materials science, physics, fluid dynamics and rheology etc.

The central idea behind the systematic numerical approximation is the energy quadratization (EQ) strategy, where the system's free energy (or entropy) is transformed into a quadratic form by introducing new intermediate (or auxiliary) variables. This process is known as the EQ-reformulation. It in fact embeds the thermodynamical model into a higher dimensional variable space where the energy functional (or the entropy functional) is a quadratic functional, and in the meantime, the dissipative structure of the model system is fully retained.

For the equivalent thermodynamically consistent model with a quadratic energy, one can develop linear, high order semi-discrete schemes in time that preserve the energy dissipation property of the original thermodynamically consistent model equations in the semi-discrete sense. When coupled with an appropriate spatial discretization, for instance, finite element methods, spectral methods and finite difference methods that respect the discrete summation-by-parts rule, a fully discrete, high order, linear scheme can be developed to warrant the energy dissipation property of the fully discrete scheme. A host of energy stable numerical schemes for phase field models and other thermodynamically consistent models have been published in the literature which are merely examples of the general approach.

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UNIQUENESS TO INVERSE MEDIUM SCATTERING WITH ONE INCOMING WAVE

JOHANNES ELSCHNER AND GUANGHUI HU

A challenging open problem in inverse time-harmonic scattering is to determine if the far field pattern (also called scattering amplitude) for scattering of one incident plane wave at a fixed energy completely determines the scatterer. It is widely believed that it is true for a large class of scatterers, but little progress has been made so far. In 1967, Lax and Phillips firstly mentioned Schiffer's idea to show that the shape of a sound-soft obstacle can be uniquely determined by far-field patterns for an infinite number of incident plane waves with distinct directions. Colton and Slemman [1] proved that the data of a single incident wave are sufficient under an a priori smallness assumption on the size of the scatterer. Cheng and Yamamoto [2] verified a global uniqueness within the class of sound-soft polygonal scatterers. However, the proofs of these local and global uniqueness results do not apply to penetrable scatterers. Motivated by corner scattering problems [3], J. Elschner and G. Hu recently consider uniqueness in inverse medium scattering with a single plane wave. It was verified in [4, 5] that interfaces with corners or edges are capable of scattering every incident wave non-trivially (that is, the scattered field cannot vanish identically). Moreover, the shape of a convex penetrable obstacle of polygonal or polyhedral type can be uniquely determined by a single far-field pattern. A sharp local uniqueness result is also derived in [6] to show that interfaces even with a weakly singular point always scatter; see Fig. 1.

These uniqueness results provide insights into whether the measurement data are sufficient to determine the shape of an unknown object, playing important roles in inversion algorithms (e.g., optimization-based iterative schemes). Further, the arguments of Elschner and Hu [4-6] exclude non-scattering energies in a large class of singularly perturbed domains and attract particular interests in inverse scattering communities. Ref. [4] was selected as one of the highlight articles of the journal Inverse Problems and Ref. [5] was published on the prestigious journal ARMA on applied mathematics in 2018.

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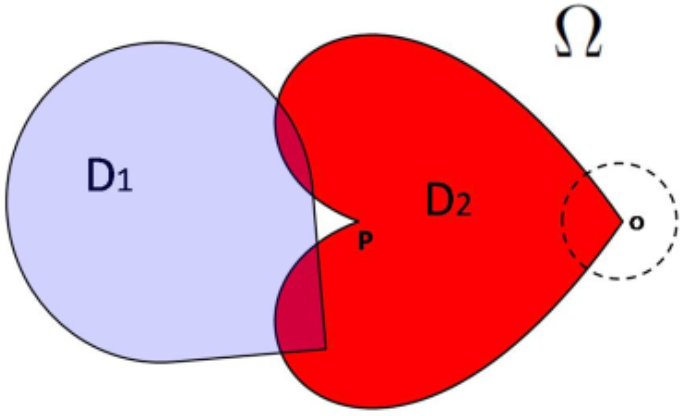


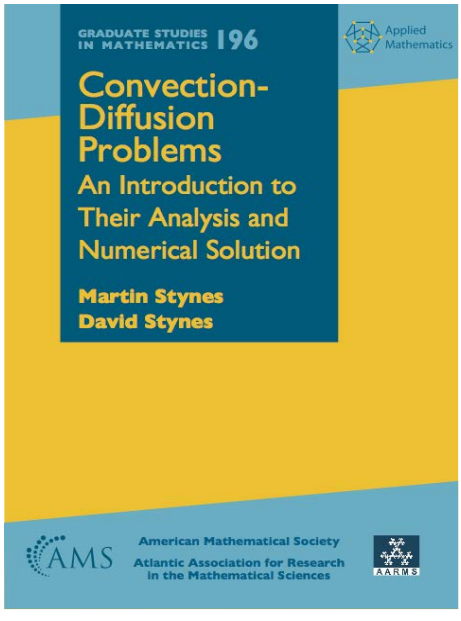
Fig. 1. The two penetrable scatterers D1 and D2 on the left hand side cannot generate the same far-field pattern (or scattered field) due to the presence of the singular point O lying on the boundary of D2. This phenomenon was rigorously explained in [4-6] by analytical approach and singularity analysis of the inhomogeneous Laplace equation in a cone.

CONVECTION-DIFFUSION PROBLEMS: AN INTRODUCTION TO THEIR ANALYSIS AND NUMERICAL SOLUTION

(By Martin Stynes and David Stynes)

Many physical problems involve diffusive and convective (transport) processes. When diffusion dominates convection, standard numerical methods work satisfactorily. But when convection dominates diffusion, the standard methods become unstable, and special techniques are needed to compute accurate numerical approximations of the unknown solution. This convection-dominated regime is the focus of the book [1]. After discussing at length the nature of solutions to convection-dominated convection-diffusion problems, the authors motivate and design numerical methods that are particularly suited to this class of problems.

At first they examine finite-difference methods for two-point boundary value problems, as their analysis requires little theoretical background. Upwinding, artificial diffusion, uniformly convergent methods, and Shishkin meshes are some of the topics presented. Throughout, the authors are concerned with the accuracy of solutions when the diffusion coefficient is close to zero. Later in the book they concentrate on finite element methods for problems posed in one and two dimensions.



For numerical analysts working in this area, the standard reference book is Roos, Stynes and Tobiska, which has already reached its 2nd edition [2,3]. This book contains a lot of useful information, but it is pitched at a fairly high level and so is daunting for those beginners who have some familiarity with numerical methods and their analysis but who have not previously worked with convection-diffusion and other singularly perturbed differential equations. An easier, more introductory book is needed to encourage new people to enter this fascinating research area. This gap in the published literature is demonstrated by the popularity of an introductory survey article written by M.Stynes for Acta Numerica in 2005 [4].

The new book [1] is an extended and updated version of [4], where exercises and other material are added to make the book more attractive and more useful for the novice reader. It is published by the American Mathematical Society in their "Graduate Studies in Mathematics" series, as the main target audience for the book is graduate students in numerical analysis. In addition, researchers from other areas who wish to learn quickly the basic techniques needed to deal with singularly perturbed differential equations and convection-dominated problems will find the book useful.

The book is based on a course of lectures presented by M.Stynes at the AARMS (Atlantic Association for Research in the Mathematical Sciences) Summer School at Dalhousie University in Halifax, Canada during July 2015.

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A WEIGHTED MULTIPLE-RELAXATION-TIME LATTICE BOLTZMANN METHOD FOR MULTIPHASE FLOWS AND ITS APPLICATIONS TO PARTIAL COALESCENCE CASCADE

(By A. Fakhari, D. Boster, and **L.-S. Luo**)

We present a lattice Boltzmann method (LBM) with a weighted multiple-relaxation-time (WMRT) collision model and an adaptive mesh refinement (AMR) algorithm for direct numerical simulation of two-phase flows in three dimensions. The proposed WMRT model enhances the numerical stability of the LBM for immiscible fluids at high density ratios, particularly on the D3Q27 lattice. The effectiveness and efficiency of the proposed WMRT–LBM–AMR is validated through simulations of (a) buoyancy-driven motion and deformation of a gas bubble rising in a viscous liquid (Cf. Fig. 1); (b) the bag-breakup mechanism of a falling drop; (c) crown splashing of a droplet on a wet surface; and (d) the partial coalescence mechanism of a liquid drop at a liquid–liquid interface. The numerical simulations agree well with available experimental data and theoretical approximations where applicable (Cf. Fig. 2).

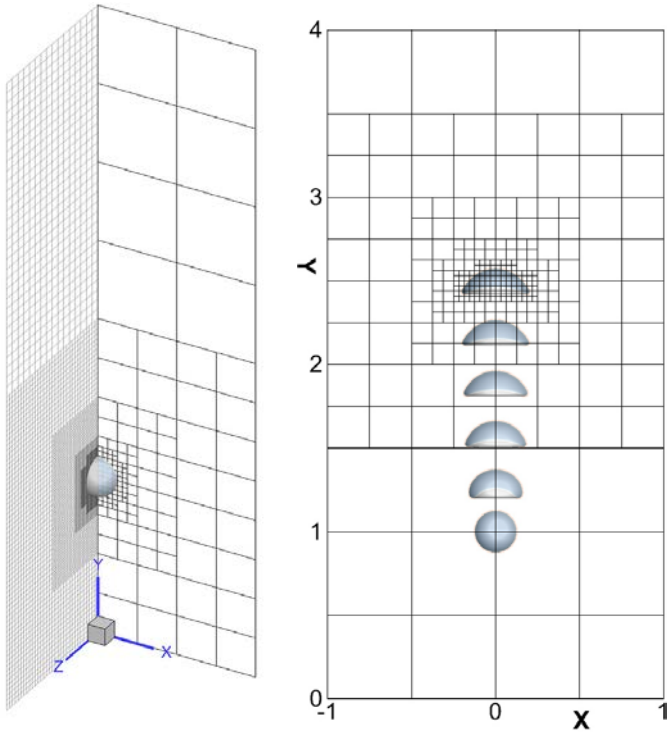

Fig. 1. Rising bubble setup. (a) Initial configuration showing the edge of AMR block (on the x–y plane) and the grid resolution (on the y–z plane); (b) plane view of the evolution of the bubble with ρ^*=1000, μ^*=100, Re_{Gr}=40, and Eo=40 (Mo=2.50×10^{-2}). The flood contours show the phase field at t_*= 0–10 with Δt_*=2.

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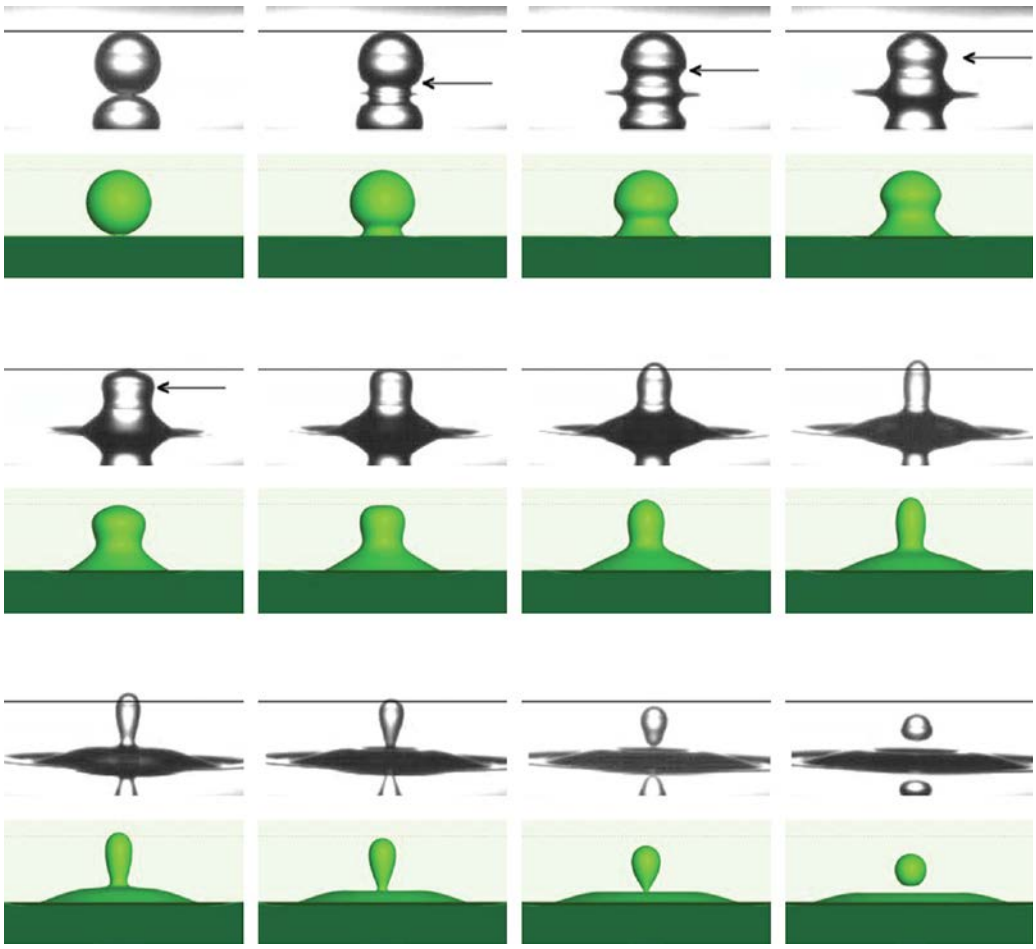

Fig. 2. Partial coalescence between a liquid drop and a liquid–liquid interface. Comparison between the current model and the experiments by Chen et al. [*Phys. Fluids* **18**:051705 (2006)]. $\rho^*=1.316$, $\mu^*=0.5$, Bo=9.59×10^{-2}, and Oh=5.53×10^{-3}. The green contour shows the isosurface of $\phi=0.5$. Solid black lines in experiments and dotted red lines in simulations are the guidelines for tracking the vertical position of the liquid drop. The initial and final times are $t^*=0$ and $t^*=0.890$ with $t^*=0.081$, which corresponds to 542microseconds in experiments. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of the article.)

FAST TIME INTEGRATION OF NAVIER-STOKES EQUATIONS WITH AN EXPONENTIAL-INTEGRATOR SCHEME

(By Shu-Jie Li, Zhi-Jian Wang, Li-Li Ju, Li-Shi Luo)

I. Introduction

The Navier-Stokes equations are often solved using various spatial-discretization methods which lead to ordinary differential equations (ODEs) with time derivatives. Considerable efforts are being directed towards developing high accuracy spatial schemes, such as the discontinuous Galerkin method (DG), multi-moment constrained finite-volume (MCV) method, flux reconstruction (FR) or correction procedure via reconstruction (CPR) method and many others. Although these high-order methods offer the potential of providing accurate solutions, the semi-discrete ODEs are most often solved with a classical time marching method. The computational cost of a time marching method thus affects the overall computational performance. For solving the three-dimensional compressible Navier-Stokes equations, the multi-dimensional, space-time scales effects usually impose a severe Courant-Friedrichs-Lewy (CFL) restriction for the explicit methods. This is especially true for the Direct Numerical Simulations (DNS) and Large Eddy Simulations (LES), in which spatial discretizations of the computational domains are often associated with stretched or refined grids. The computational cost is thus amplified in the time stepping stage compared to the cost of a spatial discretization.

In this work, the second-order exponential time-integrator scheme, named the Predictor- Corrector EXPonential scheme (PCEXP) [1-5], originally developed by S.-J. Li, etc, in AIAA- 2017-0753 is successfully extended to solve the compressible Navier-Stokes equations over three-dimensional geometries with hybrid curved elements. The stiffness of viscous flows that leads to a severe time-step size restriction in the explicit methods is addressed in the PCEXP context using a nearly exact evaluation of the residual Jacobians. The second method of Bassi-Rebay (BR2) is employed to discretize the viscous terms with a discontinuous Galerkin method. A hybrid approach for accurately computing the analytical high-order viscous Jacobian matrices is presented and an efficient way to simplify the computation is discussed, resulting in a robust while fast exponential time-integration method. We evaluate the PCEXP scheme using several benchmark test cases to demonstrate its substantial speedup compared to the classical third-order TVD Runge-Kutta approach and comparable performance to the implicit backward Euler (BE) method with large time steps.

II. Sample Results

C. Ma = 0.2535 flow past a sphere at Re = 118 In this case, computational efficiency of the PCEXP scheme is investigated for a typical 3D external flow problem of practical applications: a subsonic flow past a sphere at Re = 118, Ma = 0.2535. The solution is a laminar flow governed by the 3D compressible NS equations which has a typical boundary layer and a large wake flow zone. We generate a curved mesh that consists of 4248 prisms in the boundary layer and 9778 tetrahedrons in the rest, as shown in Figure 3. The normal height of the first-layer boundary cells is about 0.02. The radius

Table 2. The computational efficiency table for the steady solution of Ma = 0.2535 flow past a sphere at Re = 118. The #Step refer to the number of step of density residual at 10^{-12}. The t_P, t_B, and t_T denotes the CPU times of the PCEXP, BE, and TVDRK3 schemes normalized by the CPU time of PCEXP, respectively.

	PCEXP			BE (ILU-GMRES)			TVDRK3		
p order	#Step	CFL_{max}	t_P	#Step	CFL_{max}	t_B/t_P	#Step	CFL	t_T/t_P
$p=0$	25	500.0	1.0	45	500.0	1.11	15544	0.7	32
$p=1$	127	500.0	1.0	211	500.0	0.68	119171	0.5	19
$p=2$	226	500.0	1.0	373	500.0	0.97	339363	0.3	12
$p=3$	302	500.0	1.0	505	500.0	0.47	1623343	0.1	17

of the sphere is set to be 1 and its surface is set as the no-slip boundary condition. The entire computational domain is a sphere of radius 10 and its outer boundary is set as the far-field characteristic boundary condition using the Riemann's invariables. For this case, the computation domain only uses a quarter sphere while respects the flow symmetry. Therefore, the resulting horizontal and vertical surfaces of the quarter sphere are set as the symmetric boundary condition. The steady solution using the PCEXP scheme and DG p = 3 accuracy are compared with the experiments32 in Figure 4. It is observed that the computed wake pattern matches well with the experiment32 in spite of using rather near far-field boundaries. Furthermore, the convergence rates with different spatial orders of accuracy are compared with the explicit third-order TVD Runge-Kutta method and the implicit backward Euler (BE) method solved with the ILU preconditioned GMRES method. The CPU time and the iteration count of the full convergence solution are given in Table 2. From which one can see that the PCEXP scheme can use CFL number up to 500 and is much more efficient than that of the TVDRK3 scheme, while can converge to the steady state in remarkable fewer time steps. Comparing to the implicit BE method, the PCEXP scheme achieves even higher convergence rate with almost a half iteration count of the implicit BE method. The CPU time of the first-order BE scheme outperforms the second-order PCEXP scheme for some cases, as shown in Figure 5, which is also observed in inviscid flow computations.28 We have to remark that the BE scheme used in this paper are solved with the ILU preconditioned GMRES that is among the fastest implicit methods, implying that the PCEXP scheme might outperform a slower implicit method. In general, the CPU times of both the exponential scheme and the implicit scheme are comparable and far more efficient than an explicit scheme such as the TVDRK3.

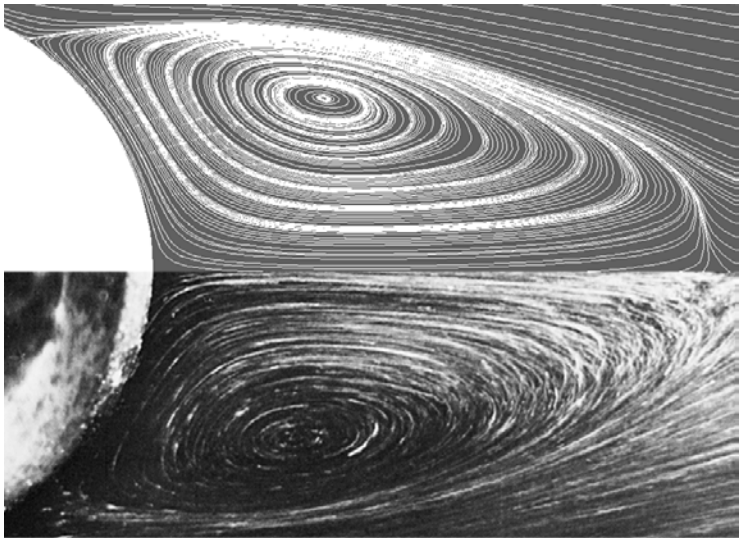

Fig. 4. Comparison the computed streamline patterns on the symmetric plane (upper) with the experimental result (lower) for the flow past a sphere at Ma = 0.2535, Re = 118 case; p = 3 DG accuracy.

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DNS STUDY OF INITIAL-STAGE SHOCK-PARTICLE CURTAIN INTERACTION

(By **Ling-Jie Jiang**, **Xiao-Long Deng**, **Liang Tao**)

High speed particulate flow appears in many scientific and engineering problems. Our work focuses on the situation with volume fraction of particles between 0.001 and 0.5, in which both particle-fluid and particle-particle interactions are important. Based on the stratified multi-phase flow model[1] with Euler equations, by regarding one phase as solid, we developed a numerical method to conduct direct numerical simulations (DNS) to high speed particulate flows. It is then applied to simulate the problem with a planar shock wave impacting on a particle curtain[2,3], but focusing on the initial stage, in which the particles can be regarded as static. 2-D simulations are conducted by keeping the total volume fraction of particles and changing the number of particles (Figure 1).

The convergence of shock wave locations and turbulent energy are observed. A 1-D volume-averaged model[4] is also studied and compared with the DNS (Figure 2), which gives effective drag coefficients.

A 3-D DNS is conducted to compare with the 2-D DNS and 1-Dmodel, showing that the physics is more complex and more detailed 3-D DNS studies are needed.

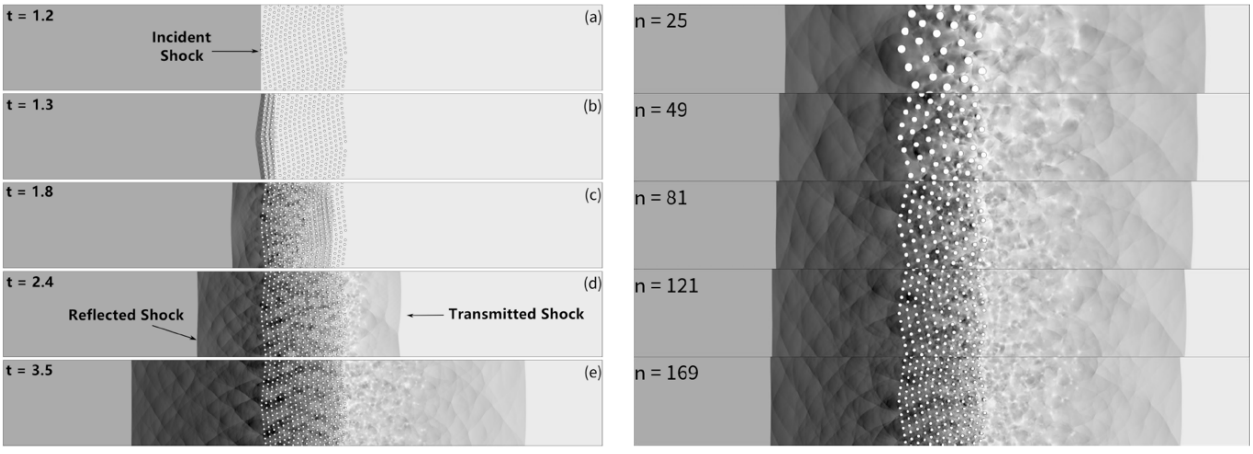

Fig. 1. (a) Pressure contours at five different non-dimensional times 1.2, 1.3, 1.8, 2.4 and 3.5, respectively, with total particle number 441. (b) Pressure contours at non-dimensional time t=3.5, with different total number of particles. Here we show the cases with 25, 49, 81, 121, 169 particles, from up to bottom, respectively.

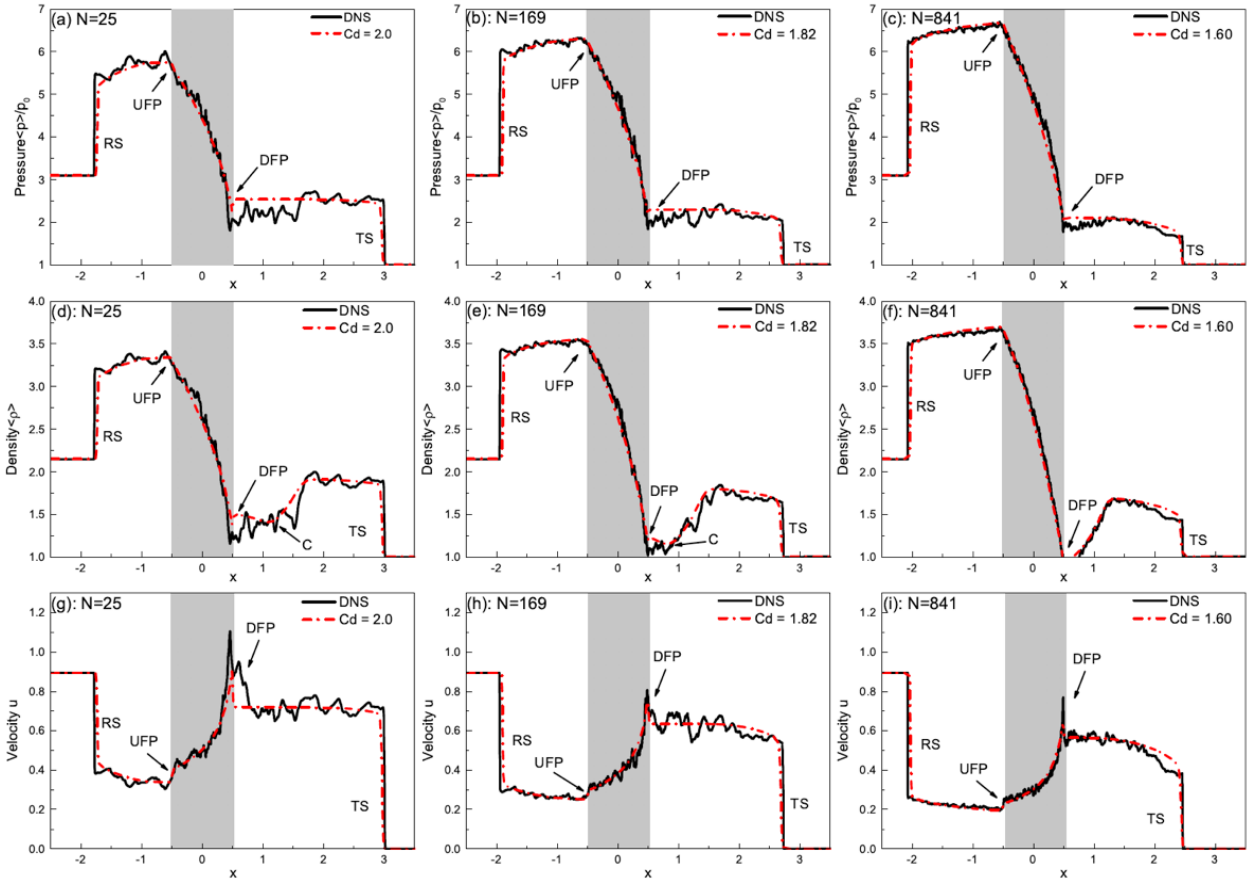

Fig. 2. The profiles of pressure <p> (upper row), density <ρ> (center row), and velocity <v> (lower row). The light gray regions stand for the particle curtain areas. The cases with 25, 169, 841 particles are shown here, respectively. In the plots, RS means reflected shock, UFP means upstream front of particles, DFP means downstream front of particles, C means contact discontinuity, and TS means transmitted shock.

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ANALYSIS OF MICRO-FLUIDIC TWEEZERS IN THE STOKES REGIME

(By Longhua Zhao, Li Zhang and **Yang Ding**)

Nanowire fluidic tweezers have been developed to capture, manipulate, and deliver micro objects [1]. Due to the non-contact and gentle features, the fluidic tweezers are particularly promising for biomedical applications. However, the mechanism behind the capture and release process has not yet been well.

Recently, a research team from CSRC, CWRU, and CUHK shed some light on the mechanisms of the tweezers. Utilizing the method of regularized Stokeslet, they studied a cylindrical nanowire tumbling and interacting with spherical particles in the Stokes regime. The capture phenomenon observed in experiments was reproduced and illustrated with the trajectories of micro-spheres and fluid tracers. The flow structure and the region of capture are quantitatively examined and compared for different sizes of particles, various tumbling rates, and dimensions of the tweezers. They found that pure kinematic effects can explain the mechanism of capture and transport of particles. They further revealed the relation between the capture region and stagnation points in the displacement field, i.e., the displacement for tracer particles in the moving frame within one rotation of the wire.

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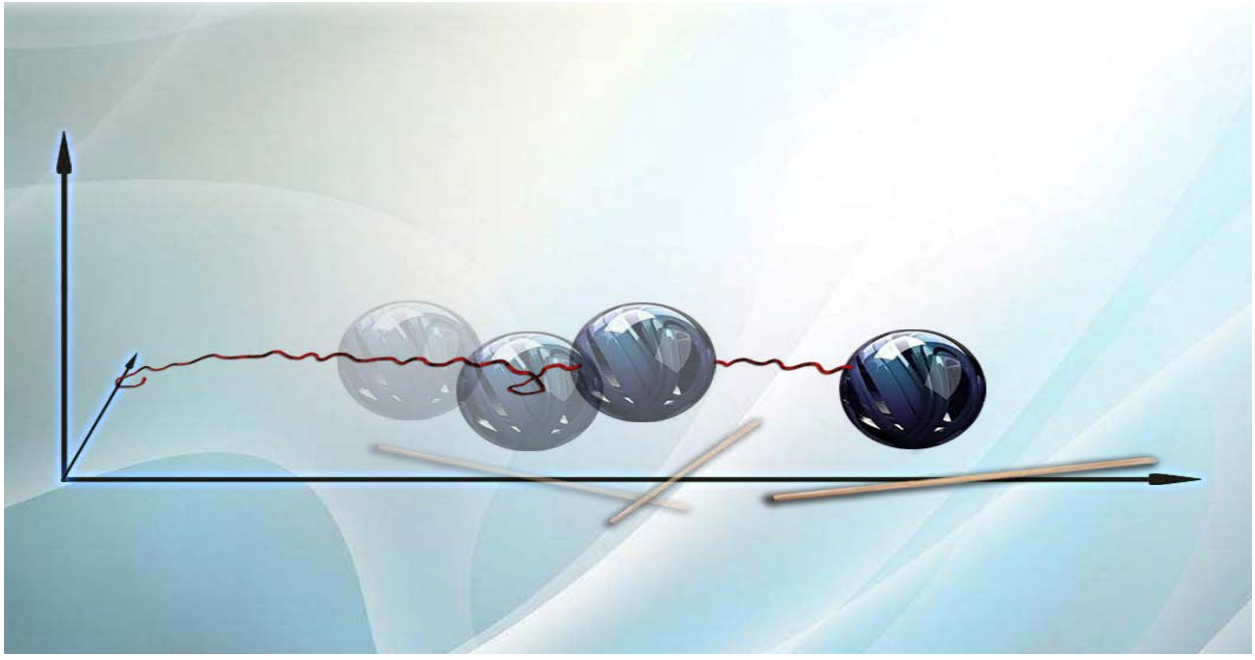

Fig. 1. Superimposed snapshots of the particle-tweezer system. The brown line represents the trajectory of the particle.

APPROXIMATE DFT-BASED METHODS FOR GENERATING DIABATIC STATES AND CALCULATING ELECTRONIC COUPLINGS

(By Chou-Hsun Yang, **Chi-Yung Yam** and Haobin Wang)

Electron transfer (ET) reactions are of fundamental importance as elementary steps in many chemical and biological processes. While phenomenological modeling was often used in the early days to extract experimental information, there is an increasing trend to apply first-principles electronic structure theory calculations to build microscopic models directly. The appropriate construction of the charge-localized diabatic states is crucial for defining the donor (the reactant) and the acceptor (the product) states for this particular type of chemical reaction, and has attracted significant attention.

In this work, Dr. ChiYung Yam and Prof. Haobin Wang at CSRC and University of Colorado Denver developed a constrained noninteracting electron (CNE) method to post-process Kohn-Sham states for construction of diabatic states and evaluation of their electronic couplings. This is compared to existing approaches, including the constrained DFT (CDFT) method, the approximate block-diagonalization (BD) of the Kohn-Sham operators, and the generalized Mulliken-Hush (GMH) method. Besides the GMH method, only the ground-state DFT calculations are required for the other three approaches. For large molecular systems, these approaches are the only feasible ways of obtaining electronic couplings with reasonable accuracy.

However, the CDFT, CNE, and BD approaches are problematic for describing intramolecular, bridge-mediated ET reactions when only two diabatic states are considered in the model. Analysis show that more consistent results are obtained when a multi-state model is adopted, which is similar for the GMH approach. The four diabatization schemes considered in this work aim at constructing approximate, microscopic multi-state models. For the simple intermolecular electron transfer in organic dimers (donor-acceptor), all approaches appear successful. On the other hand, if one modifies the system, e.g., studying intramolecular electron transfer in organic trimer (donor–bridge–acceptor) system, appropriate remodeling is in order. One would naturally expect that an effective two-state model is less accurate than a two-step ET model (donor to bridge, bridge to acceptor).

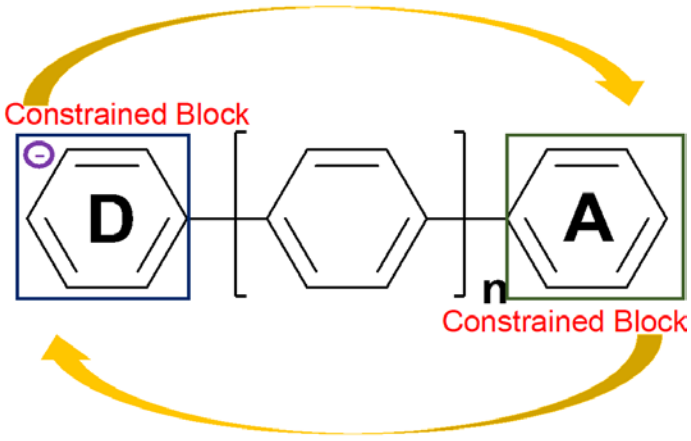

Fig. 1. Schematic diagram of constrained noninteracting electron method for constructing charge-localized diabatic states.

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REGULARIZED LINEAR SCHEMES FOR THE MOLECULAR BEAM EPITAXY MODEL WITH SLOPE SELECTION

(By **Lizhen Chen**, Jia Zhao, Xiaofeng Yang)

Abstract: We propose two full discrete linear schemes for the molecular beam epitaxy (MBE) model with slope selection, which are shown to be unconditionally energy stable and unique solvable. The second-order in time semi-discrete schemes are shown to be energy stable, and unique solvable. Then we further use Fourier-spectral methods to discretize the space, ending with full discrete schemes that are energy-stable and unique solvable. Through numerical tests, we have shown a proper choice of the regularization parameter would provide better stability and accuracy, such that larger time step is feasible. Afterward, we present several numerical simulations to demonstrate the accuracy and efficiency of our newly proposed schemes.

Model: MBE model with slope selection reads

$$\phi_t = -M\Big(\varepsilon^2\Delta^2\phi - \nabla\cdot((|\nabla\phi|^2-1)\nabla\phi)\Big)$$

Scheme: Give the initial condition

$$\begin{cases} \phi_N^0 = \phi_0, \\ q_N^0 = |\nabla\phi_0|^2 - (1+\gamma). \end{cases}$$

After calculated (ϕ_N^n, q_N^n) *and* $(\phi_N^{n-1}, q_N^{n-1})$, *find* $\phi_N^{n+1} \in \mathbb{P}_M$ *such that*

$$\Big(\frac{\phi_N^{n+1}-\phi_N^n}{\delta t}, \varphi_N\Big) = -M\Big(\varepsilon^2\Delta^2\phi_N^{n+\frac{1}{2}} - \gamma\Delta\phi_N^{n+\frac{1}{2}} - \nabla\cdot(q_N^{n+\frac{1}{2}}\nabla\overline{\phi}_N^{n+\frac{1}{2}}), \varphi_N\Big), \quad \forall\varphi_N \in \mathbb{P}_M,$$

$$\Big(\frac{q_N^{n+1}-q_N^n}{\delta t}, \psi_N\Big) = \Big(2\nabla\overline{\phi}_N^{n+\frac{1}{2}}\cdot\nabla\frac{\phi_N^{n+1}-\phi_N^n}{\delta t}, \psi_N\Big), \forall\psi_N \in \mathbb{P}_M.$$

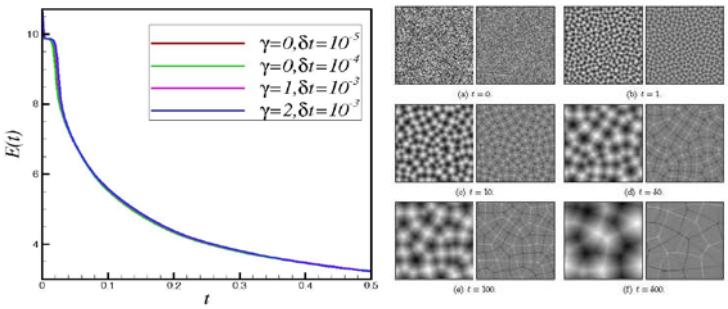


Fig. 1. Left: Time evolution of the energy for the MBE growth model using Crank-Nicolson scheme with random number condition when t ∈ [0,0.5].
Right: The isolines of numerical solutions of the height function φ and its Laplacian Δφ for the MBE growth model with random initial condition. The time step is δt = 0.0001. Snapshots are taken at t = 0,1,10,50,100,500, respectively.

CENTRAL DOPING OF A FOREIGN ATOM INTO THE SILVER CLUSTER FOR CATALYTIC CONVERSION OF CO_2 TOWARD C-C BOND FORMATION

(By Yuanyuan Liu, Xiaoqi Chai, Xiao Cai, **Mingyang Chen**, Rongchao Jin, Weiping Ding, and Yan Zhu)

Clusters with an exact number of atoms are of particular research interest in catalysis [1][2]. Their catalytic behaviors can be potentially altered with the addition or removal of a single atom [3]. However, it has not been unveiled to date how a core atom of a cluster replaced with a foreign atom can affect the inherent catalytic properties of the original cluster.

A recent investigation [4] as a joint effert by the Yan Zhu and coworkers at Nanjing University (experimental) and Mingyang Chen at CSRC (theoretical) reveals that the catalytic properties of the cluster catalysts can be dramatically changed with the subtle alteration by a single atom away from the active sites. The effects of doping with a single foreign atom (Au, Pd and Pt) into the core of an Ag cluster with 25 atoms on the catalytic properties are explored, where the foreign atom is protected by 24 Ag atoms ($M@Ag_{24}$ = $Au@Ag_{24}$, $Pd@Ag_{24}$, and $Pt@Ag_{24}$). The central doping of a single atom into the Ag_{25} cluster has a substantial influence on the catalytic performance in the carboxylation reaction of CO_2 with terminal alkyne through C≡C bond formation to produce propiolic acid (Fig. 1). The catalytic performance and stability of the $M@Ag_{24}$ catalysts during the carboxylation reactions of CO_2 with terminal alkynes are in the following order: Au > Pd = Pt > Ag. Density functional theory (DFT) shows that the $M@Ag_{24}$ catalysts have similar moleculars structures and electronic structures near the HOMO-LUMO gaps, and therefore the mechanism for the different catalytic behaviors of the doped catalysts could be uniqure in comparison to those for the solid and single-atom catalysis. A novel anion-anion adsorption related mechanism was propsed for the studied reactions based on the computational results (Fig. 2). The proposed mechanism explains the different reactivities and stabilities of the central-atom doped Ag_{25} catalysts, and reveals than the one-central-atom anionic doping can drastically change the proceses of catalytic reactions without significantly change the molecular and electronic structures of the cluster catalysts. This study may open a new avenue for realizing the catalytic reactions that involves anionic intermediates in the basic solution.

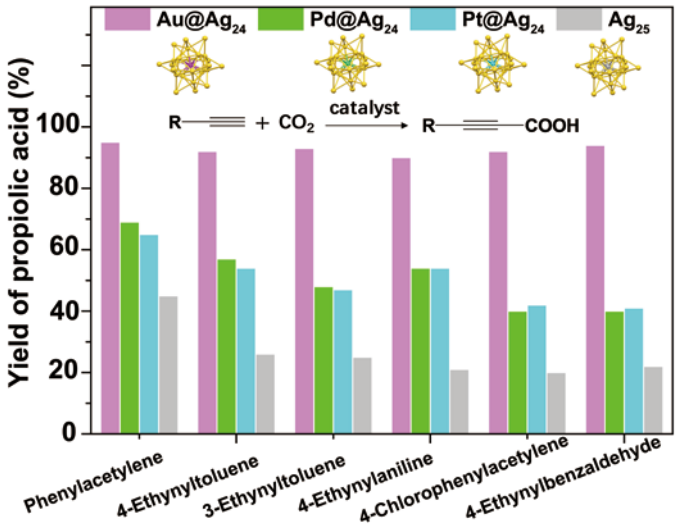
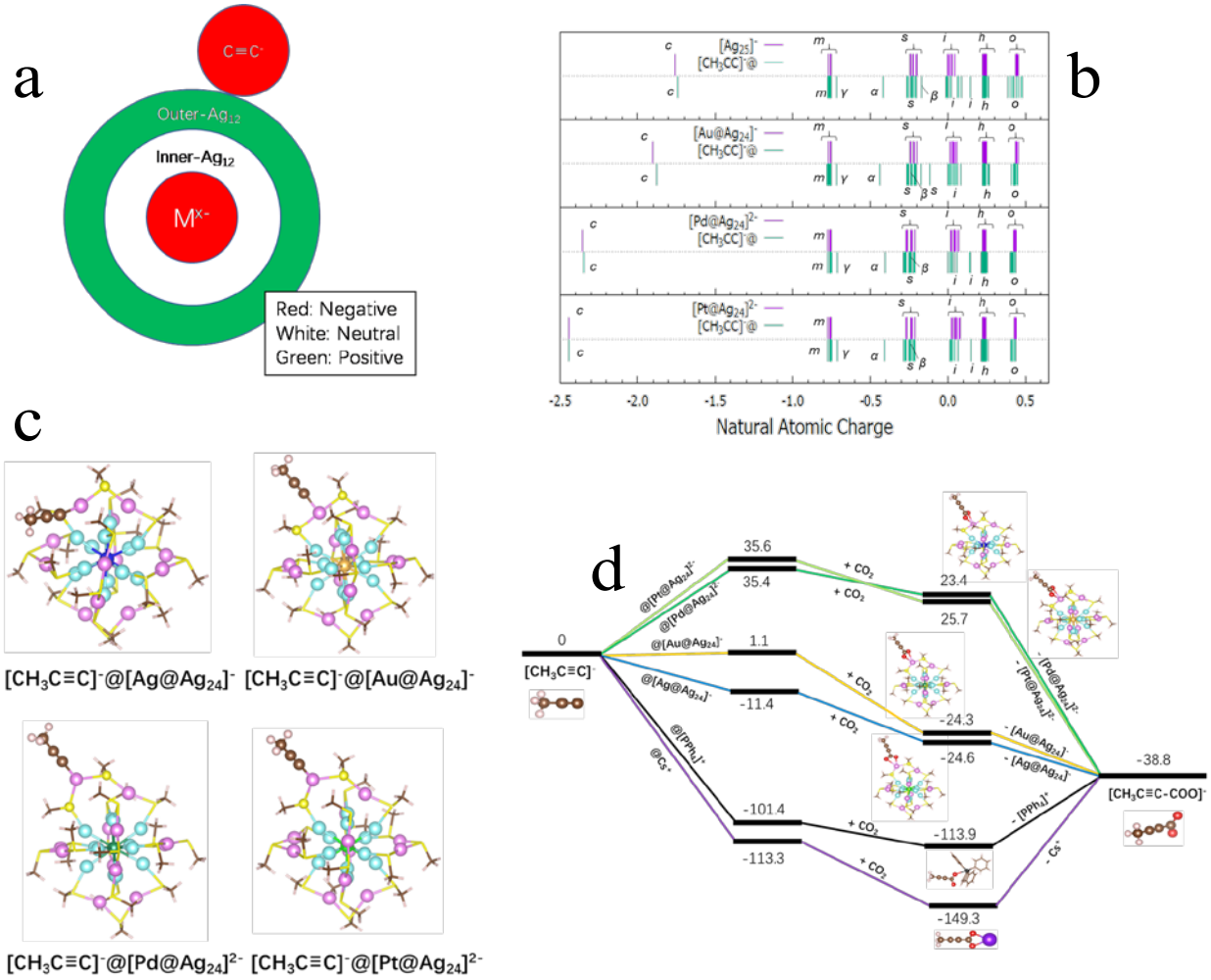


Fig. 1. Performances of $M@Ag_{24}$ catalysts in promting the carboxylation reactions of CO_2 with terminal alkynes.

Fig. 2. Anion-Anion adsorption based reaction mechanism. (a) schematic diagram for the anion-anion adsorption in M@Ag24 (b) natural atomic charge analysis (c) distortion of local geoetries due to the anion-anion adsorption (d) the reaction energy profile at DFT level.



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UNIVERSAL SCALING AND CRITICAL EXPONENTS OF THE ANISOTROPIC QUANTUM RABI MODEL

The quantum Rabi model (QRM), which describes a two-level system coupled to a single electromagnetic mode, provides a basic paradigm of light-matter interactions. Due to recent theoretical and experimental progress, the QRM attracted interest from researchers working on quantum optics, solid state physics, fundamental properties of quantum physics, and mathematical physics. The first analytical solution of the QRM, which is an important breakthrough on the mathematical and physical aspects of this model, was obtained by Braak only in 2011 [1]. While it is well known that at weak coupling the QRM can be approximated by the Jaynes-Cummings (JC) Hamiltonian, recent experimental progress in circuit QED has allowed to reach the ultra-strong and even deep-strong coupling regimes [2,3,4]. Very recently [5,6], it was proved that both the QRM and JC model can realize a new type of quantum phase transition (QPT) which, surprisingly, does not require the thermodynamic limit.

The QPT considered by Refs. [5,6] occurs as a function of coupling strength when the ratio η between the atomic and cavity frequency tends to infinity, and its properties are in fact very similar to the superradiant QPT of the Dicke model. In the latter case, a single cavity mode interacts with many two-level systems (large N), while the QRM corresponds to the N=1 case. The similarity to thermodynamic QPTs motivates investigating whether familiar concepts like universality classes are still generally applicable at N=1. More generally, the relationship of this new type of few-body QPTs and their thermodynamic counterparts has not been clearly understood.

To elucidate these issues, a recent investigation [7] involving Maoxin Liu, Stefano Chesi, Zu-Jian Ying and Hai-Qing Lin from CSRC, Hong-Gang Luo from Lanzhou University, and Xiaosong Chen from CAS-ITP & UCAS, has developed a general analytical approach valid in the limit of large η. The treatment not only derives a perturbative effective Hamiltonian applicable to the critical region (from a fourth-order Schrieffer-Wolff transformation), but extends the perturbative results obtaining a non-perturbative effective mass and mean-field potential. These quantities provide a full description of the low-energy properties at arbitrary coupling strengths (i.e., also away from the critical point).

The treatment of Ref. [7] is not only applicable to the original QRM and JC model at N=1, but also allows to include a finite anisotropy and an arbitrary (but finite) value of N. As expected, a well-defined universality class is established at arbitrary values of the anisotropy parameter (except the JC model). It was also found that the low-energy description at given anisotropy is independent of N, after appropriately rescaling η. Therefore, the few-body QPTs at arbitrary N display identical non-universal features, like the critical coupling or the value of the order parameter away from the QPT.

The effective low-energy theory described in this work is in excellent agreement with numerical calculations of the phase diagram, critical exponents, and scaling functions, also presented in Ref. [7]. Other interesting features revealed by this work are a superradiance-induced freezing of the effective mass and discontinuous scaling functions in the Jaynes-Cummings limit. Besides these theoretical achievements, this work could be relevant for experimental platforms like circuit QED and trapped ion systems, where the appropriate regime might be realized soon [3,4,8,9]. Because of its great potential interest, the article was selected by Physical Review Letters as an "Editors' Suggestion".

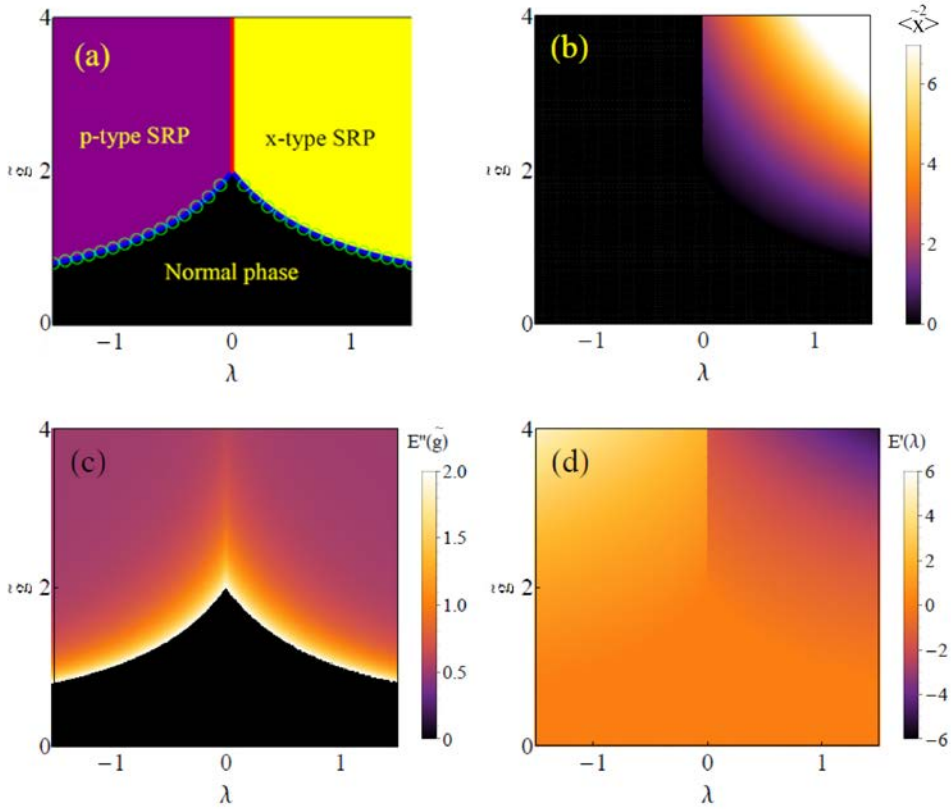

Fig. 1. Phase diagram (a) and order parameter (b) of the QRM with anisotropy. The red (blue) line in panel (a) indicates a first (second) order phase transition. The order of the transition is revealed by the first and second derivative of the ground state energy, respectively shown in panels (d) and (c).

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LOCALIZATION IN OUT-OF-EQUILIBRIUM DISORDERLESS SYSTEMS

When isolated quantum systems are taken out of equilibrium, its dynamics can be described by a time evolution which is unitary, unlike classically chaotic systems. The conditions that lead these systems to thermalize and the information regarding its initial preparations to be lost over the course of its evolution can be seen as result of the dephasing in the dynamics of the coherence between the eigenstates. Its mathematical basic grounds were based in what we call nowadays as the Eigenstate Thermalization Hypothesis (ETH) [1,2] and it became clear that interactions between the constituents of the system are essential in the thermalization mechanism. On the other hand, much attention has been also given to another aspect that may, in fact, prevent thermalization. When disorder comes into play an isolated quantum system can experience a halting of thermalization and, ultimately, localization takes place. This localization is manifest in the absence of mass transport and it can be seen as a generalization of the famous Anderson localization phenomenon when interactions are included.

Several numerical studies have shown this phenomenon in the presence of interactions [3], which we dub as many-body localization (MBL), and also a handful number of experiments [4] have also tackled it. In the latter, the analyzed quantum system is consisted of atoms trapped in a potential generated by laser beams in an optical lattice. By introducing disorder on the onsite energy levels, one can emulate the physics of the Anderson model with interactions which can be tuned in a controllable fashion. The most common way to identify this localization (and the associated lack of thermalization) is to follow the dynamical properties of a carefully prepared quantum system. Specifically, experiments in optical lattices employ high-fidelity preparation of initial states whose properties are well known, as for example, by confining the atoms in certain regions of the trapping environment. By measuring how the information of the initial prepared state is preserved for long-times after the release of this constraint one is able to identify the regimes where disorder is sufficient to lead to the MBL phenomenon.

On the other hand, much recent theoretical work has been devoted to understanding whether disorder is a necessary ingredient to generate localization in interacting systems. Pioneering works by Kagan and Maksimov on Helium mixtures have laid the foundation of localization when there are two constituents in the system, a light and a heavy one. In these cases, the heavy particles generate an effective random quasistatic potential which blocks the diffusion of the light ones, thus localizing them. More recently, some proposals tried to tackle this problem and much to the surprise found that an initial transient localization ultimately leads to diffusion. In a recent publication [5], Rubem Mondaini from CSRC and Zi Cai (Shanghai Jiaotong University) have investigated one of the first evidences of many-body localization in a translation invariant Hamiltonian with a single species of particles. Specifically, they tackled the problem of (hardcore) bosons in a lattice which interact via a quasi-periodic infinite range interaction. Despite the model may sound rather artificial, it has been shown to be emulated experimentally for trapped atoms in a optical lattice embedded in a cavity [6]. The long (infinite)-range interaction is mediated by vacuum modes of the cavity and are independently controlled by tuning the cavity resonance. The Hamiltonian reads,

$$\hat{H} = -J\sum_i (\hat{a}_i^\dagger a_{i+1} + \text{h.c.}) - \sum_{i<j} V_{ij}\left(\hat{n}_i - \frac{1}{2}\right)\left(\hat{n}_i - \frac{1}{2}\right) \quad (1)$$

where J is the nearest-neighbor tunneling amplitude, and the interactions V_{ij} have the functional form $V_{ij} = (V/L)\cos[2\pi p i - j]$. By taking p as an irrational number, the long-range interactions are no longer commensurate with the lattice and glassy behavior emerges

when the interactions are sufficiently large. We investigate this glass-like regime at zero temperature and show it can also be obtained in an isolated quantum system at *infinite temperatures*. To make a closer connection with the experiments, they investigate the persistence of the information of initial preparations under a quench. In particular, they quantify the degree of inhomogeneity of an initial pure state, via $(\Delta\hat{n})^2 \equiv (1/L)\sum_i (\hat{n}_{i+1} - \hat{n}_i)^2$.

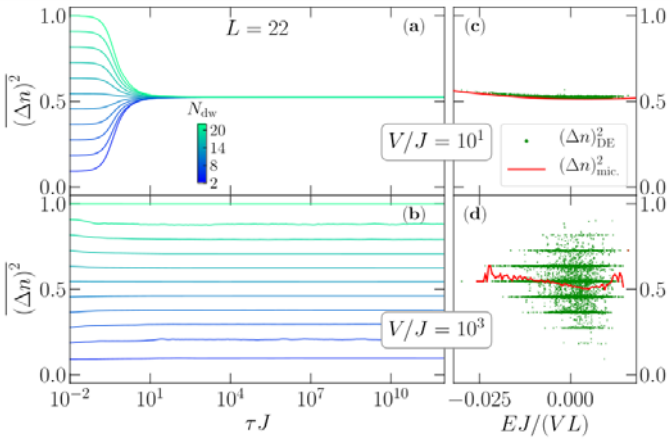

Fig. 1. Time evolution of the integrated charge inhomogeneity averaged over states with similar number of domain walls in ergodic [nonergodic] regimes in panel (a) [panel (b)] with V/J = 10^1 [V/J = 10]. Panels (c) and (d) are comparisons of the diagonal ensemble prediction (infinite-time limit) and the microcanonical (thermodynamic) result for the corresponding values of interactions

Before the quench, this observable represents the number of domain walls are present in the initial state. Its time evolution is depicted in Fig. (1) for two values of interactions. If a system thermalizes, a time-evolved state can be thought as a featureless state that no longer preserves local information of the initial state. That is the case in Fig. 1(a) for small values of interactions. Surprisingly, if one increases its magnitude, the tine-evolved state no longer loses information and memory of the initial preparations can be retrieved for arbitrarily long times, as shown in Fig. 1(b). with this clear indication of many-body localization in a translation-invariant (disorderless) system, we expect that this work may sparkle interest in the experimental investigation of the ideas we present, ultimately settling the issue of whether disorder is a necessary mechanism to its observation. Further aspects of these problem, as the study of commensurate long-range interactions, are an ongoing research being currently investigated at CSRC.

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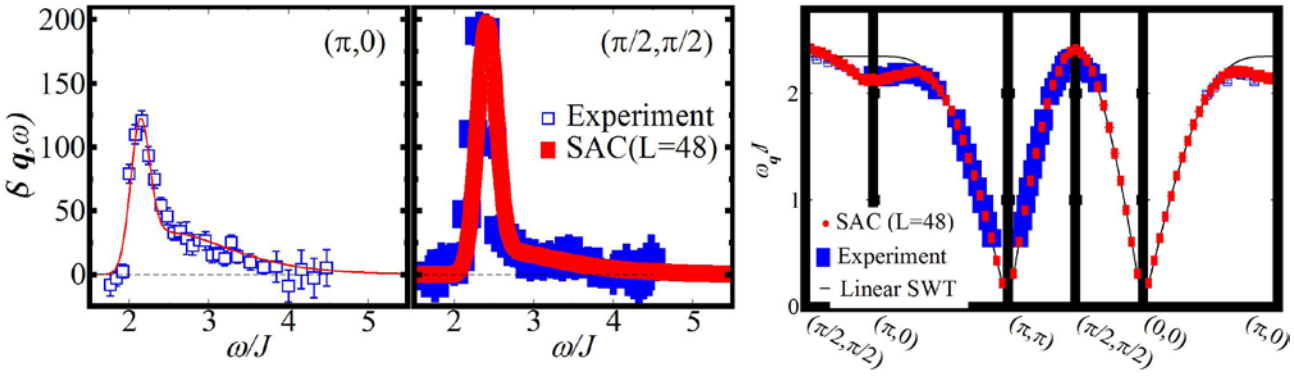
NEARLY DECONFINED SPINON EXCITATIONS IN THE SQUARE-LATTICE SPIN-1/2 HEISENBERG ANTIFERROMAGNET

The anomaly in the excitation spectrum around the wave-vector (π,0) in experimental realizations of the 2D spin-1/2 Heisenberg spin model, such as CFTD, is a long-standing issue, which is also reproduced in calculations with the Heisenberg model. It is manifested as a suppression of the excitation energy and an associated enhancement of spectral weight in the continuum above the spin-wave (magnon) peak. The physical reasons behind the anomaly have been debated over the past 20 years or so, and in the last few years the interest in the issue has heated up further as new high-resolution neutron scattering experiments have been carried out [1]. The main question is whether the anomaly is caused simply by more or less standard multi-magnon excitation processes [2], or whether there are more exotic reasons such as deconfinement of spinons [1]. On the other hand, the recently improved analytic continuation (SAC) method [3] enables people to study the spectral anomaly in greater details than previously. Most importantly, it provides an unbiased way to extract the energy and amplitude of the leading δ-function (magnon pole) contribution to the dynamic spin structure factor.

Recently, Hui Shao and Stefano Chesi of CSRC, Yan Qi Qin and Zi Yang Meng from IOP, Sylvain Capponi from University of Toulouse, and Anders Sandvik from Boston University, have used the improved SAC method to investigate the spin excitation spectral functions of the spin-1/2 square-lattice Heisenberg antiferromagnet [4], and, as shown in Fig. 1, the results are in excellent agreement with recent neutron scattering experiment on CFTD. Moreover, the abnormal reduction of the excitation energy at (π,0) is found together with a reduction of the magnon weight. Upon turning on a competing four-spin interaction which brings the system to a critical point with deconfined spinon excitations, they observe a rapid reduction of the magnon weight to zero (see Fig. 2 left). This, along with an effective model of the excitations - one magnon or two spinons (see Fig.2 right), brings to the picture of nearly deconfined spinons at (π,0) - a precursor to deconfined quantum criticality. This work bridges the two interpretations

Fig. 1. Comparison of the SAC results on the spin-1/2 square-lattice Heisenberg antiferromagnet and the new neutron scattering experiments carried out on CFTD. Left panel: spectral functions at two wave vectors; Right panel: single-magnon dispersion along a representative path of the BZ.



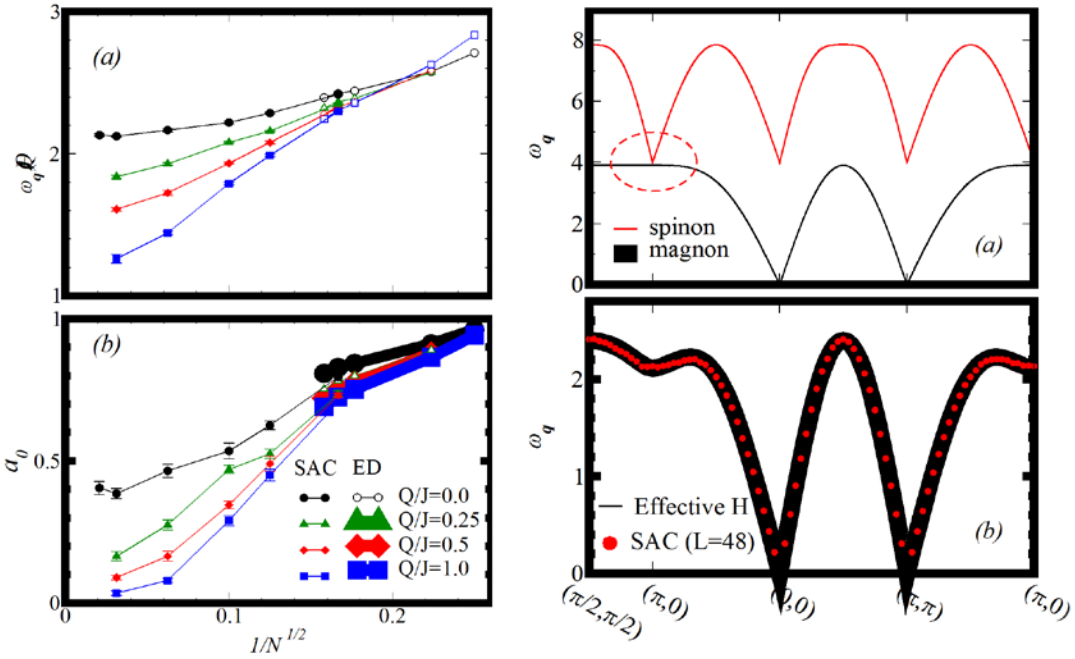


Fig. 2. Left panel: size dependence of the excitation energy (a) and the relative weight of the magnon pole (b) at q=(π,0) close to the Heisenberg limit of the J-Q model; Right panel: (a) dispersions of the bare excitations and (b) the lowest energy of the mixed spinon-magnon system obtained with the dispersions in (a).

(magnons versus spinons), by elucidating the so far neglected role of the interplay between the magnon pole and the continuum above it. Furthermore, it is the first study of the dynamics of the J-Q model and the evolution of its excitation spectrum upon approaching the deconfined quantum-critical point, where hitherto unknown aspects of the spinon deconfinement mechanism remains uncovered.

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GENERAL GREEN'S FUNCTION FORMALISM FOR LAYERED SYSTEMS: WAVE FUNCTION APPROACH

The single-particle Green's function (GF) of mesoscopic structures plays a central role in mesoscopic quantum transport. The recursive GF technique based on the Dyson equation is a standard tool to compute this quantity numerically, but it still suffers from two limitations. First, it is limited to relatively small systems. Second, its connection to another widely used approaches – the wave function mode matching approach -- remains incomplete (see Fig. 1).

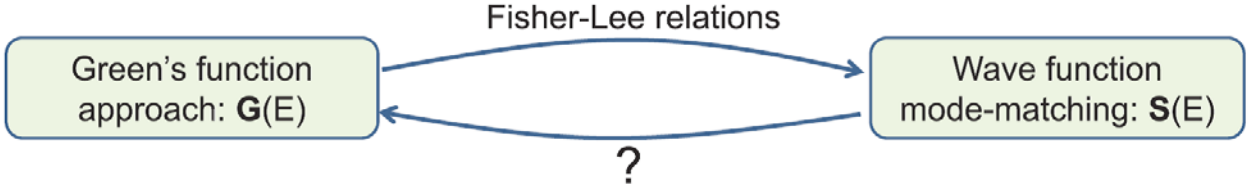

Fig. 1. Two widely-used approaches in mesoscopic quantum transport and their connection.

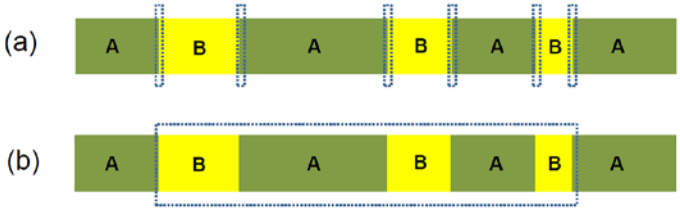

Fig. 2. Two GF methods: (a) our wave-function approach; and (b) conventional recursive GF approach.

Recently, the research group of Prof. Wen Yang at CSRC together with Prof. Kai Chang at Institute of Semiconductors, CAS addressed both issues by developing a wave function approach to calculate the Green's function of a general layered system. This new method enjoys two distinguishing features. First, only the interfaces between uniform regions need numerical treatment, so the time cost scales are determined by the number of interfaces [dashed boxes in Fig. 2(a)]. By contrast, the time cost of the recursive GF technique is determined by the length of the central region [dashed box in Fig. 2(b)]. Thus, it can speed up the calculation by 1-2 orders of magnitudes. Second, it establishes the reverse of the well-known Fisher-Lee relation (see Fig. 1) and hence connects the wave function mode-matching approach back to the GF approach, thus paving the way for extracting the scattering information of novel quasi-particles in the solid state by local transport measurements.

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THERMODYNAMIC PHASE DIAGRAM OF BERYLLIUM USING OUR PHONON QUASIPARTICLE APPROACH

Beryllium (Be) has been applied widely in various industry areas, especially for nuclear weapon design. It is also an important material for fundamental research such as plasmonics under high pressure. Therefore, it is important to understand the phase stability of Be under extreme conditions. However, there are controversy and debating about the existence of its bcc phase and the associated hcp → bcc transition both experimentally and theoretically. The phase stability of Be has been extensively studied experimentally. However, in most of experiments, no sign of bcc symmetry was ever captured [PRB 86, 174118 (2012); PRB 72, 094113 (2005); J. Phys. F 14, L1 (1984); J. Phys. F 14, L65 (1984); JPCM 14, 10569 (2002); PRB 65, 172107 (2002); PRB 79, 064106 (2009).]. So far, only three experimental reports declared the observation of bcc phase. Martin and Moore captured bcc Be at 1500 K near the melting temperature (~ 1550 K) at ambient pressure [J. Less-Common Met. 1, 85 (1959)], Abey provided a positive hcp/bcc phase boundary, [NTRL NTIS 198506, 1984]. However, Francois and Contre reported a negative hcp/bcc phase boundary [Proceedings of the Conference Internationale sur la Metallurgie du Beryllium, Grenoble (Presses Universitaires de France, Paris, 1965)]. On the theoretical side, the investigation of bcc Be with traditional methods encounters difficulty. This is because that the stabilization of bcc Be is primarily driven by lattice anharmonicity. Unfortunately, widely used quasi-harmonic approximation (QHA) and Debye model are not able to capture such effect. For this reason, theoretical transition is still missing for P < 11 GPa. When P > 11 GPa, bcc Be is stabilized by pressure and QHA has been extensively employed. Nonetheless, the QHA predicted hcp/bcc boundary shows significantly discrepancy from the experimental revelation. This presumably hints that the anharmonic effect is also pronounced at high pressure [J. Phys. IV France 134, 257 (2006); PRB 82, 104118 (2010); JAP 111, 053503 (2012); PRB 79, 064106 (2009); PRB 71, 214108 (2005); PRB 76, 235109 (2007); RB 75, 035132 (2007)].

Using a novel approach which characterizes phonon quasiparticles from first-principles calculations, the research group led by Dong-Bo Zhang at Beijing Computational Science Research Center carried out a systematic study of phase stability of Be under high pressure and high temperature. The outcomes show that Be exhibits pronounced anharmonic effects in both the bcc and hcp phases. The bcc phase, however, is favorable only in a very narrow temperature range near the melting temperature with a positive Clapeyron slope of ~ 41K/GPa. The temperature range where the bcc phase exists shrinks with increasing pressure and eventually disappears at around 11 GPa. This result agrees well with experiments.

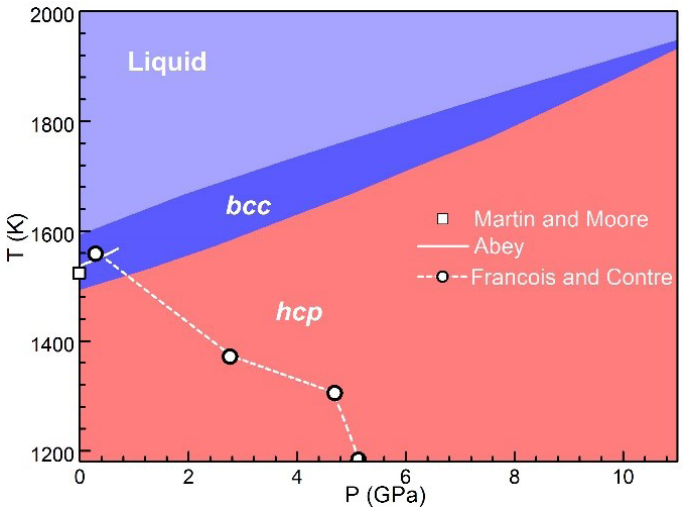

Fig. 1. Phase diagram of Be. The melting line is dopted from *PRB* **82**, 104118 (2010). The experimental results for the *hcp/bcc* phase

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MEASURING OUT-OF-TIME-ORDER CORRELATORS ON A NUCLEAR MAGNETIC RESONANCE QUANTUM SIMULATOR

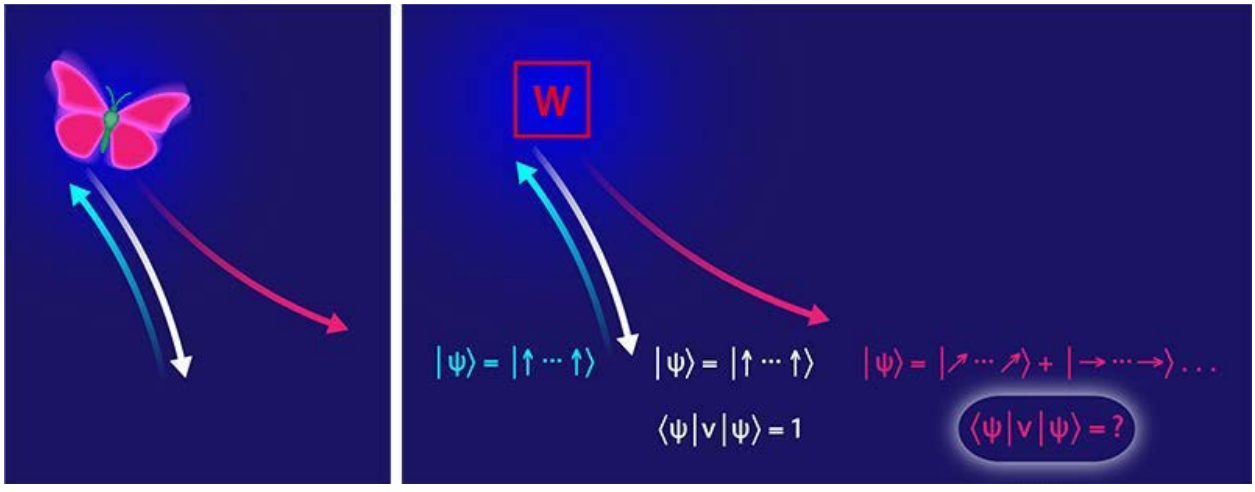
The idea of the out-of-time-order correlator (OTOC) has recently emerged in the study of a variety of research fields, e.g., condensed matter systems, quantum chaos and gravitational systems [1][2][3]. This quantity was suggested by Alexei Kitaev as a quantum generalization of a classical measure of chaotic behaviors [4], see Fig. 1. Despite of the significance of the OTOC revealed by recent theories, experimental measurement of the OTOC remains challenging. First of all, unlike the normal time-ordered correlators, the OTOC cannot be related to conventional spectroscopy measurements, such as ARPES, neutron scattering, through the linear response theory. Secondly, direct simulation of this correlator requires the backward evolution in time, that is, the ability of completely reverse the Hamiltonian, which is extremely challenging.

Recently, Jun Li, a postdoctoral fellow in Chang-pu Sun's group in CSRC and his collaborators Hui Zhai from Institute for advanced study, Tsinghua University, and Bei Zeng from Institute for quantum computing, University of Waterloo, and Xinhua Peng from University of Science and Technology of China, performed for the first time the measurements of OTOCs on a NMR quantum simulator. The system be simulated is an Ising spin chain model, whose Hamiltonian is written as

$$\hat{H} = \sum_{\cdot} \left(-\hat{\sigma}_i^z \hat{\sigma}_{i+1}^z + g\hat{\sigma}_i^x + h\hat{\sigma}_i^z\right)$$

The parameter values g = 1, h = 0 correspond to the traverse field Ising model, where the system is integrable. The system is non-integrable whenever both g and h are non-zero. Experiment was done on a four nuclear spins in the iodotrifluroethylene molecule, see Fig. 2. The experiment simu-lates the dynamics governed by the system Hamiltonian H, and measures the OTOCs of operators that

Fig. 1. A classical chaotic system can be diagnosed by the pres-ence of the butterfly effect, in which a small perturbation like the tiny flap of a butterfly's wing has a huge effect on the system at some later point in time. Analogously, in ex-periment with a quantum spin system, here described by a wave function. Quantum-control techniques are used to evolve the system forward in time (blue line), to apply a perturbation W, and to evolve the systems backward in time (red line). Then a measurement is performed to diag-nose the effect of the perturbation.



are initially acting on different local sites. The time dynamics of the OTOCs are observed, from which entanglement entropy of the system and butterfly velocities of the chaotic systems are ex-tracted. The results indicate that OTOC provides a faithful reflection of the information scrambling and chaotic behavior of quantum many-body systems.

Measuring the OTOC functions can reveal how quantum entanglement and information scrambles across all of the degrees of freedom in a system. This work here represents a first and encouraging step towards further experimentally observing OTOCs on large-sized quantum systems. The pre-sent method can be readily translated to other controllable systems.

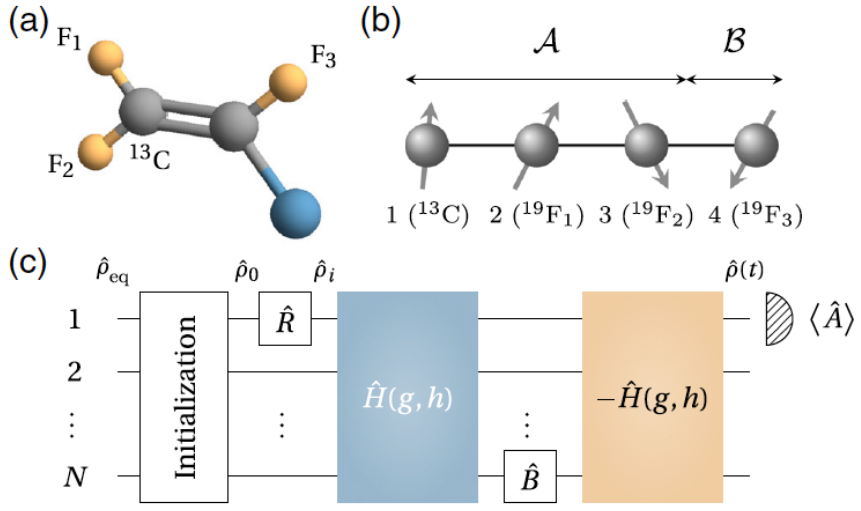


Fig. 2. Illustration of the physical system, the Ising model and the experimental scheme. (a) The structure of the C2F3I molecule used for the NMR simulation. (b) The four sites Ising spin chain, A and B label dividing the entire system into two subsystems in the later discussion of entanglement entropy. (c) Quantum circuit for measur-ing the OTOC for general N-site Ising.

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OBSERVATION OF THE EXCEPTIONAL POINT IN CAVITY MAGNON-POLARITONS

Controlling light-matter interactions has persistently been pursued and is now actively explored. Understanding these interactions is not only of fundamental importance but also of interest for various applications. Recently, there has been an increasing number of studies on collective excitations of ferromagnetic spin system (i.e., magnons) coupled to microwave photons in a cavity (see, e.g., [1]–[5]). Owing to the strong coupling between magnons and cavity photons, a new type of bosonic quasiparticles called cavity magnon-polaritons can be created. While the damping rate of magnons is fixed, by engineering the ports of cavity for inputting microwave photons and the related decay rates, the system of cavity photons coupled to magnons can be described by a non-Hermitian Hamiltonian. The hallmark of a non-Hermitian system is the existence of a singularity in its eigenvalues and eigenfunctions at some particular points in the parameter space of the system. This singularity is called the exceptional point.

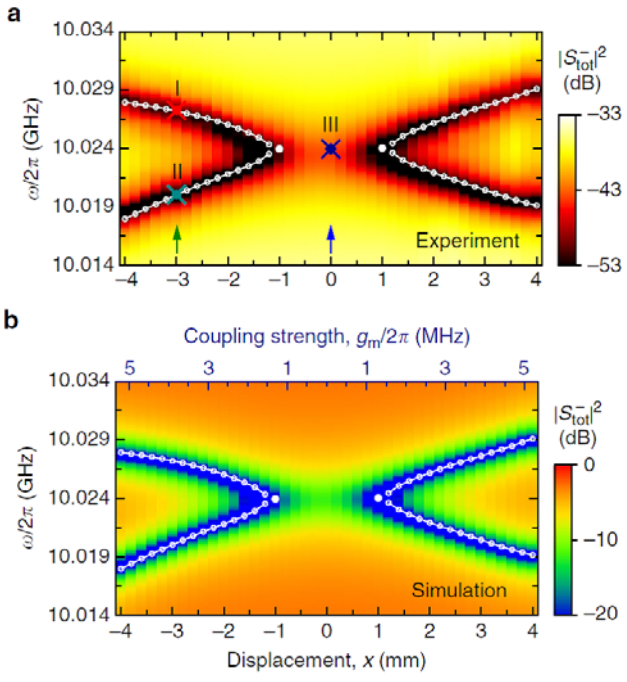

Fig. 1. Observation of the exceptional point in cavity magnon–polaritons. (a) Measured total output spectrum vs. the displacement x of the YIG sphere in the cavity. (b) Calculated total output spectrum corresponding to the measured results in (a). Corresponding coupling strength is indicated according to the relation $g_m/2\pi=1.3|x|$.

Very recently, Zhang *et al*. at the CSRC [6] have experimentally demonstrated that the non-Hermiticity dramatically modifies the mode hybridization and spectral degeneracies in cavity magnon-polaritons. In their experiment, they engineered the dissipations of magnons and photons to produce an effective non-Hermitian PT-symmetric Hamiltonian. By tuning the magnon-photon coupling, they observed the polaritonic coherent perfect absorption and demonstrated the phase transition at the exceptional point. Thus, cavity magnon-polaritons with non-Hermitian nature are explored and achieved in this experiment. It paves the way to explore the non-Hermitian physics of the cavity magnon-polaritons.

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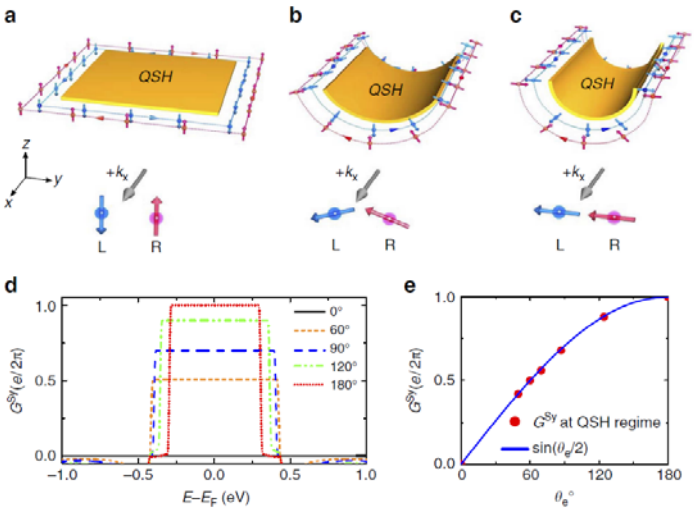
A UNIVERSAL RULE FOR CONTROLLING SPIN CURRENTS IN QUANTUM SPIN HALL SYSTEMS

A long-standing interest in spintronics is generating and transporting spin current (SC) in condensed matter systems. The discovery of pure spin current (PSC), for example, spin Hall current, that is decoupled from charge current (CC) has opened up exciting opportunities for spin transport, because it is expected that the transport of PSC has much smaller energy dissipation compared with that of conventional SC generated by ferromagnetic materials. Quantum spin Hall (QSH) system can exhibit exotic spin transport properties, especially, a transverse edge PSC of QSH effect can be generated under a four-terminal device setting. However, spin conservation mandates that there is no net SC under a two-terminal device setting in a QSH system. Although discovering new mechanism to control the SC and/or transverse PSC in a QSH system is of great importance for spintronics, its development is still at its infancy.



Recently, Prof. Bing Huang's group in CSRC in collaboration with Feng Liu's group in the University of Utah proposed a new concept of bending strain engineering to tune the spin transport properties of a quantum spin Hall system, as shown in Figure 1. They show that bending strain can be used to control the spin orientation of counter-propagating edge states of a quantum spin system to generate a non-zero spin current. This physics mechanism can be applied to effectively tune the spin current and pure spin current decoupled from charge current in a quantum spin Hall system by control of its bending curvature. This concept of bending strain engineering of spins via topological nanomechanical architecture affords a promising route towards the realization of topological nano-mechanospintronics.

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Fig. 1. (a)–(c) Schematic diagrams of spin current and charge current flowing along the edges as the bending angle increases from 0 (a) to 180 (c). A pair of edge states counter propagate along all four edges subject to TRS. The spins rotate adiabatically along the curved edges. The highlight of spin directions at the two opposite edges under the same charge current flow direction is shown in the bottom of (a)–(c). (d) Calculated spin conductance for the QSH ribbons with different bending angle in a two-terminal device setting. (e) The values of spin conductance in the QSH regime (plateau region) in (d) as a function of bending angle.

OPTICAL LEVITATION OF NANODIAMONDS BY DOUGHNUT BEAMS IN VACUUM

By trapping, detecting and manipulating nano- and micro-particles[1], optical tweezers are widely used in biophysics, colloidal sciences, chemistry, microfluidic dynamics, and fundamental physics2. Because of the wide applicability and high tunablity of the optically levitated systems, several schemes were proposed to realize the ground-state cooling of the mechanical motion, to search for non-Newtonian gravity and to detect gravitational wave. Particularly, it brings about more interesting phenomena and novel applications when the trapped particles have internal degrees of freedom (such as spins or electric dipoles) and enter the quantum regime.

Optically levitated nanodiamonds with nitrogen-vacancy (NV) centers are one of the most promising candidates for implementing a spin-optomechanical hybrid system[3,4]. In principle, this system can have both long spin coherence time and high quality factor of mechanical oscillation in vacuum. The electron spins of NV centers were shown to have long spin coherence time (in the order of 10^2 μs) even in nanodiamonds of diameter about 20 nm. When trapped in high-vacuum, the dielectric particles are predicted to have ultra-high quality factor Q larger than 10^{10}. Researchers have trapped diamond particles and observed the signal from NV centers in liquid, in air and very recently in vacuum with pressure down to 100 Pa. Realizing high quality mechanical oscillation requires trapping the particles in high vacuum (e.g, 10^{-6} Pa) to get Q~ 10^{10}. However, the high-vacuum condition usually causes the thermal damage problem, and experimentally trapping a nanodiamond in high vacuum is still very challenging. Nanodiamonds will absorb energy from the trapping laser beams due to the intrinsic defects and the inevitable imperfections or graphitization on diamond surface. The absorbed energy can hardly be dissipated in a high-vacuum environment, and the nanodiamonds will be quickly heated up significantly, which is unfavorable to the defect centers, or even burns out the diamond particles.

It is proposed here to solve the thermal damage problem by trapping a composite particle (a nanodiamond core coated with a less absorptive silica shell) at the center of strongly focused doughnut-shaped laser beams, as shown in Fig. 1. Systematical study on the trapping stability, heat absorption, and oscillation frequency concludes that the azimuthally polarized Gaussian beam and the linearly polarized Laguerre-Gaussian beam LG_{03} are the optimal choices. The respective oscillation frequency and quality factor got are shown in Fig. 2. With our proposal, particles with strong absorption

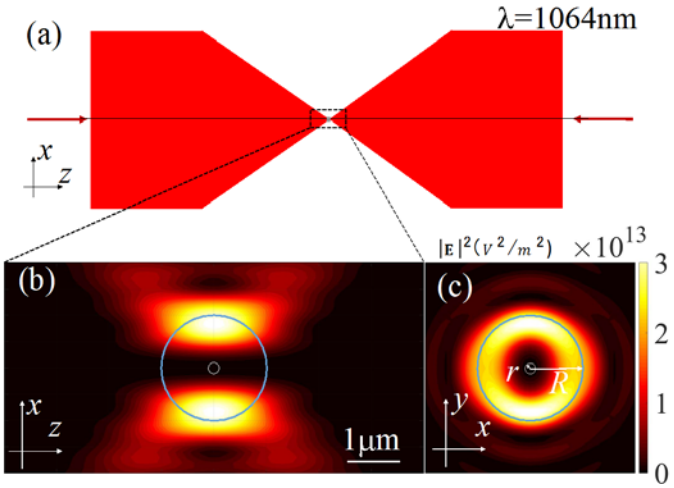

Fig. 1. (a) The schematic illustration of the system. A nanodiamond coated with a silica shell is levitated in an optical trap formed by two incoherent strongly-focused counter-propagating beams. (b) (c) Front view and side view of the intensity distribution of the two focused linearly polarized LG_{03} incident beams in the focal region. The circles indicate the composite particle with the core radius r = 100nm and the shell radius R = 1μm.

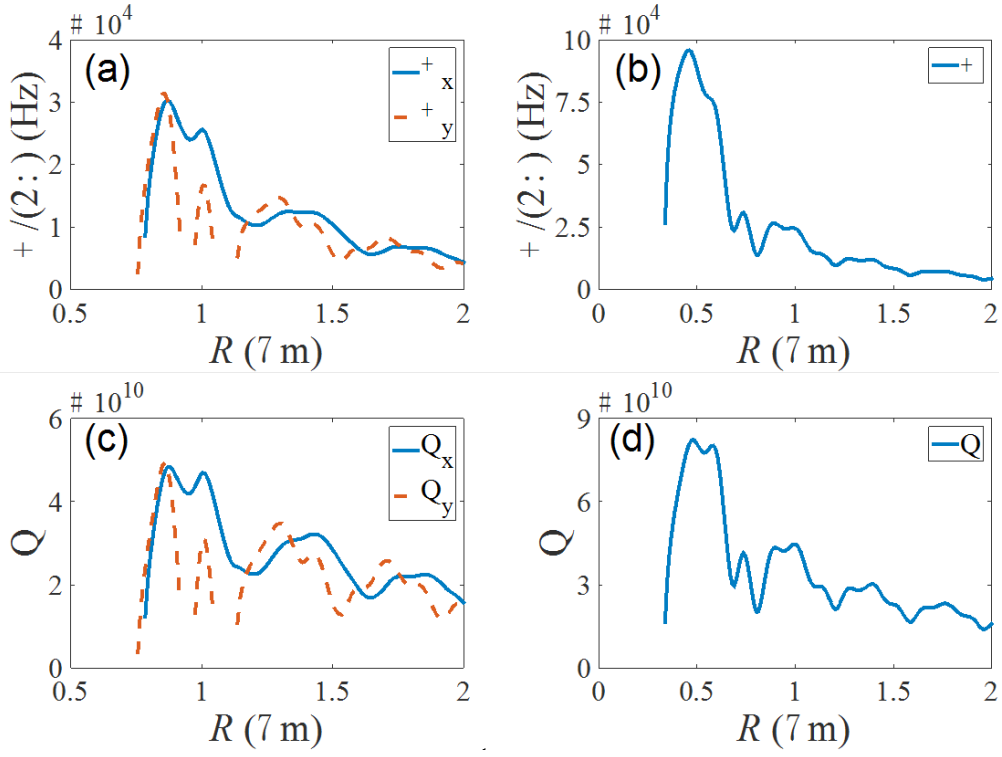

Fig. 2. The oscillation frequency $\Omega/(2\pi)$ of the core-shell particle in dual-beam optical tweezers with (a) linearly polarized LG03 beams and (b) azimuthally polarized beams. (c) and (d) The mechanical quality factor Q under pressure 10^{-6} Pa corresponding to cases (a) and (b), respectively. In all cases, the incident beams with power $P1 = P2 = 50$ mW are focused by lens with NA = 0.95.

coefficients can be trapped without obvious heating and, thus, the spin-optomechanical system based on levitated nanodiamonds are made possible in high vacuum with the present experimental techniques.

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For more information, please see the paper: "Optical levitation of nanodiamonds by doughnut beams in vacuum", *Laser Photonics Rev., 1600284 (2017). DOI: 10.1002/lpor.201600284.*

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PREDICTION OF IDEAL TOPOLOGICAL SEMIMETALS WITH TRIPLY DEGENERATE POINTS IN NACU3TE2 FAMILY

As topological phase extends from insulators to semimetals, new quasiparticles analogous to elementary particles in high-energy physics emerge in these topological materials. Interestingly, the band theory has shown that the crystal symmetries in solids allow for the existence of other types of topological quasiparticle excitations even without high-energy counterparts. Especially, the triply degenerate points (TDPs), formed by the crossing of a double-degenerate band and a nondegenerate band, can be recognized as an intermediate phase between Weyl (double-degenerate) and Dirac (fourfold-degenerate) fermions. The TDP semimetals have been predicted to have some unique properties, e.g., Lifshitz transitions of Fermi surface, helical anomaly, large nonsaturating or negative magnetoresistance, and unconventional quantum Hall effects. One of the key problems for exploring the intrinsic properties of TDP fermions is the lack of ideal TDP semimetals, in which the TDPs around the Fermi level do not coexist with other quasiparticle bands. Therefore, it is of great importance to search for ideal host materials having only TDP fermions around Fermi level.

Recently, Bing Huang's group in CSRC disclose an effective approach to search for ideal TDP semimetals via selective band crossing between antibonding s and bonding p orbitals along a line in the momentum space with C3v symmetry. Applying this approach, they have successfully identified the NaCu3Te2 family of compounds to be ideal TDP semimetals, where two and only two pairs of TDPs are located around the Fermi level. Moreover, they demonstrate a fundamental mechanism to modulate energy splitting between a pair of TDPs, and illustrate the intrinsic features of TDP Fermi arcs in these ideal TDP semimetals, as shown in Figure 1.

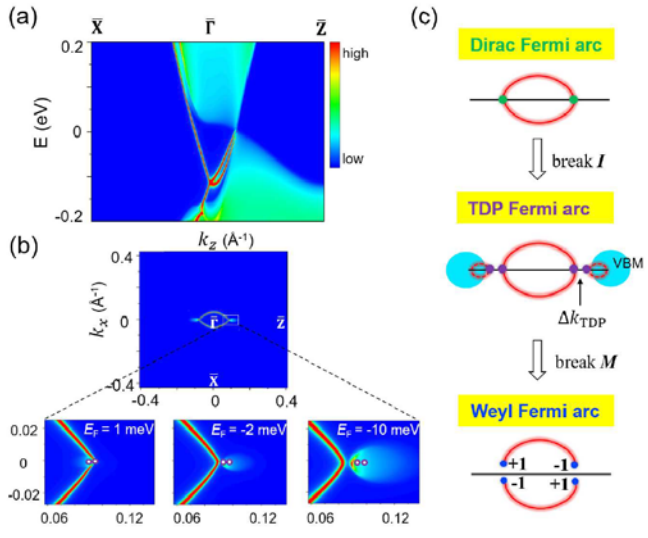

Fig. 1. (a) Surface projected band and (b) Fermi surfaces with different EF for the (010) surface of a semi-infinite NaCu3Te2 system. Two circles in magnified Fermi surfaces denote the surface projections of two adjacent TDPs. (c) Evolution of Fermi arcs from Dirac to TDP to Weyl fermions.

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SURFACE EVOLUTION OF A PT-PD-AU ELECTROCATALYST FOR STABLE OXYGEN REDUCTION

The exploration of new technologies for efficient energy management is attractive in order to reduce our dependence on environmentally unfriendly fossil fuels. Proton-exchange membrane fuel cells (PEMFCs) are thought to be an ideal solution for energy conversion because of their high efficiency, high reliability and low or zero carbon emissions1. Unfortunately, the sluggish reaction kinetics of the oxygen reduction reaction (ORR) at PEMFC cathodes and the poor durability of conventional ORR electrocatalysts have seriously hindered the development and commercial application of PEMFCs on a large scale1. As the most active metal electrocatalyst for ORR, Pt and Pt-based nanocatalysts have attracted substantial research interests over the past decade. The demonstrated approaches for achieving higher catalytic activities include exposing highly active lattice planes on their surfaces, alloying with other suitable metals to increase their intrinsic activity, and constructing hollow or core-shell1 structures to improve Pt utilization. Regarding improving catalyst durability, the addition of stabilizing elements and the optimization of crystallinity have been shown to be feasible.

Recently, Dr. Li-Min Liu in CSRC worked with Dr. Yi Ding and Jun Luo's group at Tianjin University of Technology, designed an unsupported nanoporous catalyst with a sub-nanometer-thick PtPd shell on Au by theory and experiment, which demonstrates a high ORR activity (1.140 A mg_{Pt}^{-1} at 0.9 V) and stability (1.471 A mg_{Pt}^{-1} until 100,000 cycles). The DFT and experiment unveil the origin of the activity change: the atomic-scale evolution of the shell from an initial PtPd alloy into a bilayer structure with a Pt-rich trimetallic surface and finally into a uniform and stable PtPdAu alloy. First-principles calculations further revealed that the surface atomic composition of the finally obtained PtPdAu decreases the free energy change of the final water formation from the *OH on the catalyst surface and thereby enhances the ORR catalytic activity.

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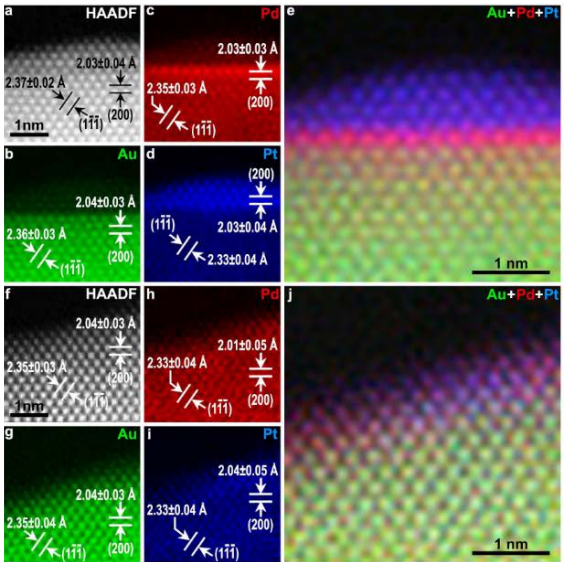
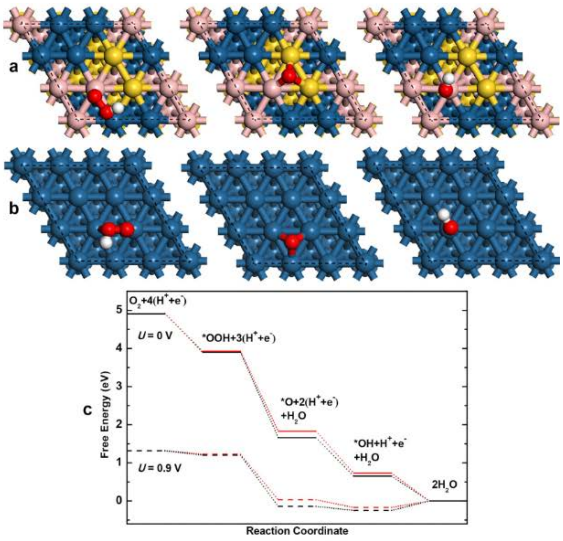
Fig. 1. Left: Atomically-resolved elemental mapping of the surfaces of NPG-Pd-$Pt_{10,000}$ and NPG-Pd-$Pt_{30,000}$ electrocatalysts. **Right:** Calculated adsorption configurations of the intermediate species of ORR on the surfaces of the PtPdAu(111) and the pure Pt(111) models and the calculated free energy profiles of the ORR steps.





BAND STRUCTURE ENGINEERING OF $CS_2AGBIBR_6$ PEROVSKITE THROUGH ORDER–DISORDERED TRANSITION

Given the low cost, suitable bandgap, high optical absorption and long carrier lifetime, the family of organic-inorganic perovskite halide $A^{I}B^{II}X_3$, especially $CH_3NH_3PbI_3$, has become the most investigated light-harvest material for solar cells in the last few years. Although solar cells based on $CH_3NH_3PbI_3$ thin films have approached a high power conversion efficiency of more than 22%, two serious problems including toxicity of the water soluble Pb^{2+} ions and thermodynamic instability of CH3NH3PbI3 in air against decomposition have presented major barriers to its commercial application. $Cs_2AgBiBr_6$ was proposed as one of the inorganic, stable, and non-toxic replacement of $CH_3NH_3PbI_3$. However, the wide indirect band gap of $Cs_2AgBiBr_6$ suggests that its application in photovoltaics is limited.

Recently, Su-Huai Wei's group in CSRC [1-2] show that by introducing disorder to the cation occupancy of Ag and Bi in $Cs_2AgBiBr_6$ they could engineering the band structure of $Cs_2AgBiBr_6$. Using the Monte Carlo and the first principle calculation, they predicted that disordered $Cs_2AgBiBr_6$ with the band structures changing from indirect band gap of 1.46 eV to pseudo-direct band gap of 0.44 eV could be synthesized by quenching from temperature beyond the phase transition temperature. Introducing n-type dopants such as Ba2+ and La3+ into the alloy can significantly reduce the energy difference and thus the transition temperature. Depending on the extent of disorder, the light absorption in the visible and the near infrared region for the disordered $Cs_2AgBiBr_6$ alloys could be considerably enhanced, which has broaden the application of the compound. This work shows that introducing cation disorder is a useful way for band structure engineering of the perovskite materials for various applications.

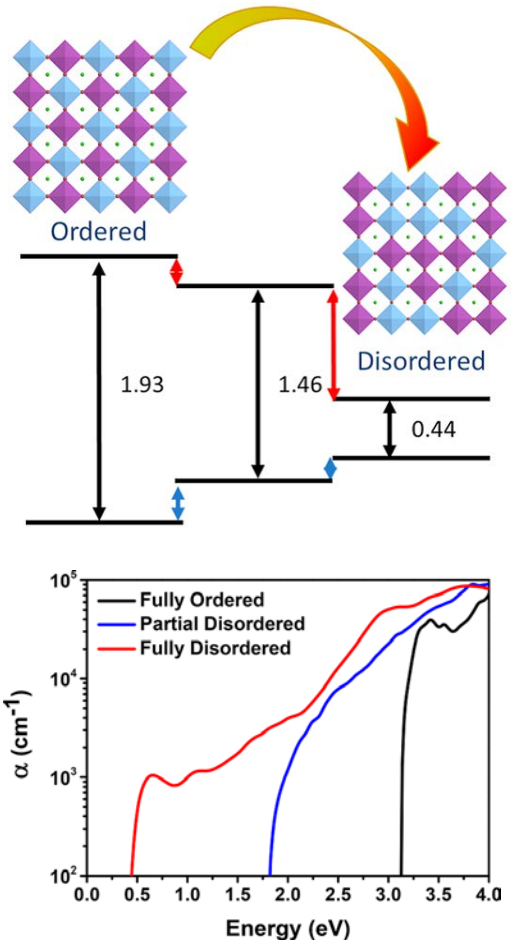


Fig. 1. The upper figure shows schematically the changes from the ordered double perovskite cell to the disordered perovskite cell and the corresponding changes of the band gap from ordered, partially disordered (at phase transition) to random atomic configurations. The lower figure shows the calculated optical absorption coefficients (α) of the fully ordered (black line), partial disordered (blue line), and fully disordered (red line) $Cs_2AgBiBr_6$.

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RATCHETING OF A VIRAL TRANSCRIPTION PROTEIN MACHINE ALONG DNA WITHOUT BACKTRACKING

he RNA polymerases (RNAPs) play an essential role in gene expression as they transcribe information from DNA to RNA while synthesizing the RNA based on DNA. The viral RNAP from bacteriophage T7 is a prototypical single-subunit polymerase that is widely used in lab gene expression system as an efficient tool, yet rarely people understood underlying mechanisms well. T7 RNAP is indeed a smallest transcription machine, yet it is capable of working for all stages of transcription from initiation to elongation and to termination, without supports from any protein factor. It is in contrast with RNAPs from higher organisms, which constantly need assistances or regulations from a variety of protein factors. That being said, T7 RNAP sets a nice model system for physical investigations on transcription in a nutshell. In particular, the translocation mechanism of T7 RNAP on the transcribing DNA was controversial, and two basic working scenarios had been proposed, either as the thermally activated Brownian ratchet [1] or as the tightly coupled power-stroke engine [2].

To clarify the translocation mechanisms of T7 RNAP, Jin Yu's group in CSRC recently performed extensive all-atom molecular dynamics simulations accumulated to ten microseconds and constructed the Markov state model (MSM) to reveal substantial structural dynamics of the transcription machine on DNA [3] (see Fig 1). Notably, they demonstrated that T7 RNAP moves along DNA via Brownian alike paths, facilitated by essential structural elements such as O-helix and Y-helix from the fingers subdomain. Interestingly, they found that the synthesizing RNA strand and its pairing template DNA move in non-synchronized manner. They further discovered that the O-helix could rotate to open even prior to translocation, not only to facilitate the translocation, but also to resist backtracking. The finding thus explains a long-standing puzzle on T7 RNAP not being detected with backtracking. Remarkably, they designed mutant T7 RNAPs via the O-helix to mimic structurally similar mitochondrial RNAPs for potential backtracking. Preliminary experimental tests from their experimental collaborator lab in PKU show survival of those mutants with more or less inhibited transcription activities, indicating the potential for backtracking. In summary, their work provides unprecedented detail and mechanistic insight into the translocation of a prototypical viral RNAP on DNA. The mechanism can be general for transcription machines with compact core structures. The rational re-design of the viral RNAP to acquire backtracking function preserved in other RNAP species also turns out to be highly promising.

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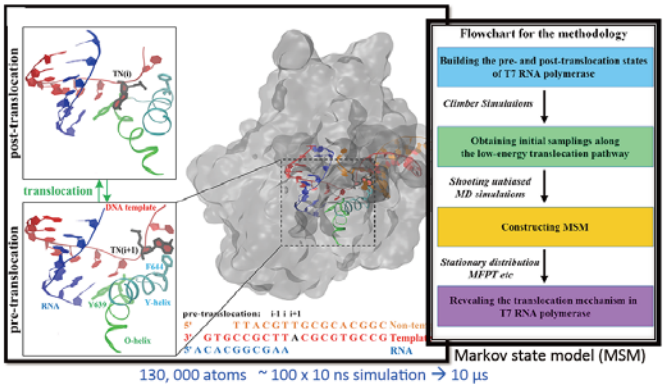


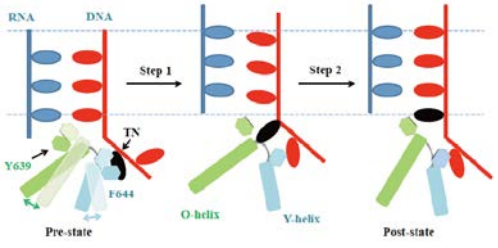


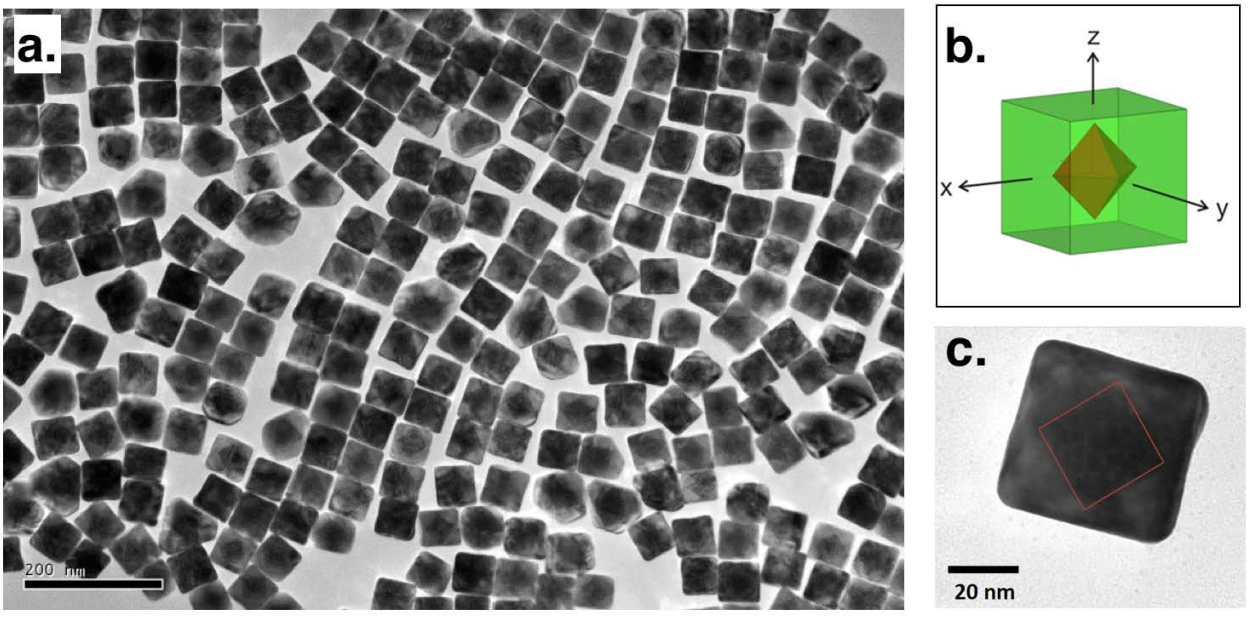
Fig. 1. The structural views of the active site of T7 RNAP elongation complexes before (pre) and after (post) the translocation (*left*), the methodological chart (*middle*), and the translocation schematics obtained (*right*).

A NEW ALGORITHM FOR XFEL SINGLE PARTICLE SCATTERING DATA ANALYSIS

X-ray Free Electron Lasers (XFELs) generate ultrabright X-ray pulses with duration of 4-100 femtoseconds, possible to outrun X-ray radiation damage using the 'diffract-before-destroy' experimental approach. Using core-shell nanoparticles as model systems, we carried out a proof-of-principle experiment at LCLS, the first XFEL user facility (Figure 1 & 2). Over a million diffraction patterns were collected, and Haiguang Liu and coworkers analyzed about 54k patterns after initial screening. Because the synthetic nanoparticles have size variations, the pre-sorting based on particle sizes is necessary before merging the data to 3D fourier space. On the other hand, the size analysis from scattering patterns relies on correct orientation information. Using a reduced representation of the raw data, Haiguang Liu's group successfully recovered particle orientation and sorted out the particle sizes. The idea is to integrate the intensity information along the radial axis, the resulting 1D intensity profile at azimuth angles is less sensitive to the variations of particle sizes (Figure 3). The 1D profiles are then compared to the standard reference models to recover the particle orientation. The q-spacing (distance between speckles along scattering streaks) is then converted to particle size information. The recovered size distribution from XFEL data is very consistent with the data obtained using STEM experimental approach (Figure 4). This is the first time that the analysis of XFEL scattering data resulted from heterogeneous particles. The data description is summarized in the Scientific Data, and the new algorithm is published in the IUCrJ.

The experiment was carried out at LCLS in Stanford Linear Accelerator Center National Laboratories, by an international collaboration team under the leadership of Haiguang Liu, Brenda Hogue, Ilme Schlichting, and John Spence. The analysis work is mainly carried out by Ph.D student, Xuanxuan Li.

Fig. 1. The core-shell nanoparticles. (a) view under STEM; (b) schematic drawing of the particle, with gold core and palladium shell; (c) a closer view of a single particle.



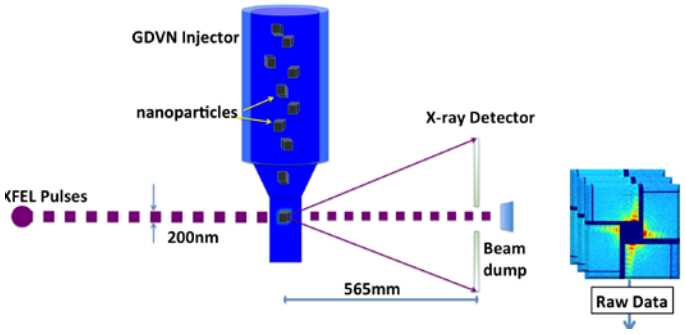


Fig. 2. Experimental setup at XFEL using diffract-before-destroy approach. Over 1 million raw images were collected at LCLS in SLAC national lab.

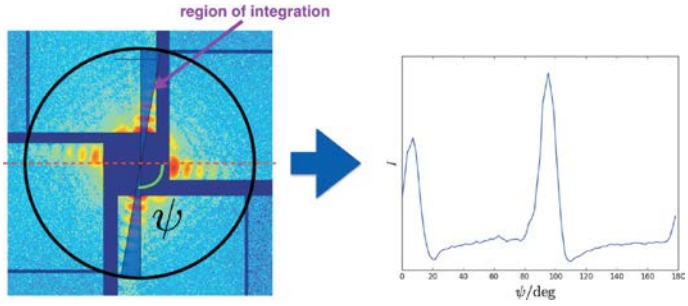


Fig. 3. Data reduction from 2D raw image to 1D intensity profile.

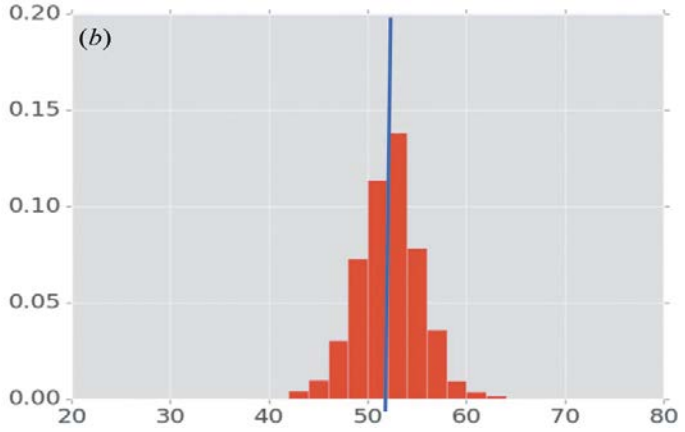


Fig. 4. The recovered particle size distribution and the average particle size (52nm) obtained from STEM.

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A STABLE SCHEME FOR A 2D DYNAMICAL Q-TENSOR MODEL OF NEMATIC LIQUID CRYSTAL

Liquid crystals are intermediate states of matter between the commonly observed solid and liquid that have no or partial positional order but do exhibit an orientational order. The nematic phase is the simplest among all liquid crystal phases whose rod-like molecules have no translational order but possess a certain degree of long-range orientational order. The Landau-de Gennes theory[1] is a continuum theory to describe the nematic liquid crystals. In this framework, it is widely accepted that the local orientation and the degree of order for the liquid crystal molecules are characterized by a symmetric, traceless d × d tensor called the Q-tensor in R^d (d = 2,3). The dynamic Q-tensor model is a L^2 gradient flow generated by the liquid crystal free energy that contains a cubic term, which is physically relevant but makes the free energy unbounded from below, and for this reason, has been avoided in other numerical studies. The unboundedness of the energy brings significant difficulty in analyzing the model and designing numerical schemes [1]:

$$\partial_t Q^{ij} = \xi \Delta Q^{ij} + L_4(2\partial_k(Q^{lk}\partial_l Q^{ij}) - \partial_i Q^{lk}\partial_j Q^{lk} + |\nabla Q|^2\ \delta^{ij}/2) - (a + \mathrm{tr}(Q^2))Q^{ij}$$

Recently, Yongyong Cai in CSRC in collaboration with Jie Shen in Purdue University and Xiang Xu in Old Dominion University, proposed an unconditionally stable numerical scheme to solve the 2D Q-tensor model for liquid crystal, and established its unique solvability and convergence[2]. The main difficulty in the analysis came from an unusual cubic term in the elastic energy, which made the free energy unbounded from below. By adding a stabilized term in the scheme, they were able to show that the norm of the numerical solution can be kept small which guaranteed the stability and the well-posedness. Numerical tests showed that the scheme is indeed first order accurate for a wide range of stabilizing constants, and produces physically consistent numerical simulations. The work provided essential ingredients for extensions to the 3D case, as well as the full dynamical model coupled with Navier-Stokes equations, which would lead to the better understanding of nematic liquid crystals.

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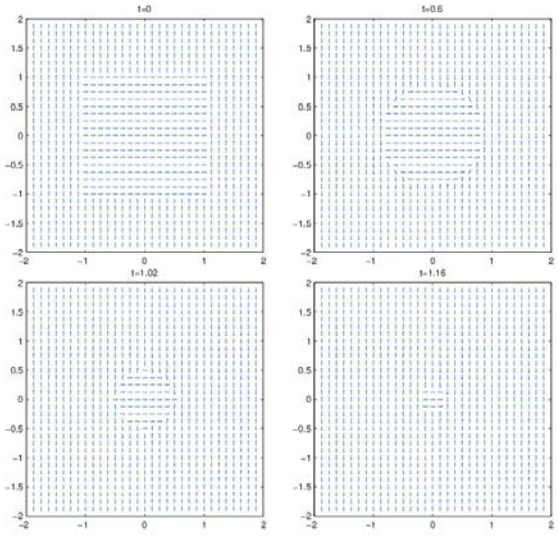


Fig. 1. Orientation of 2D liquid crystal at different time with periodic boundary condition.

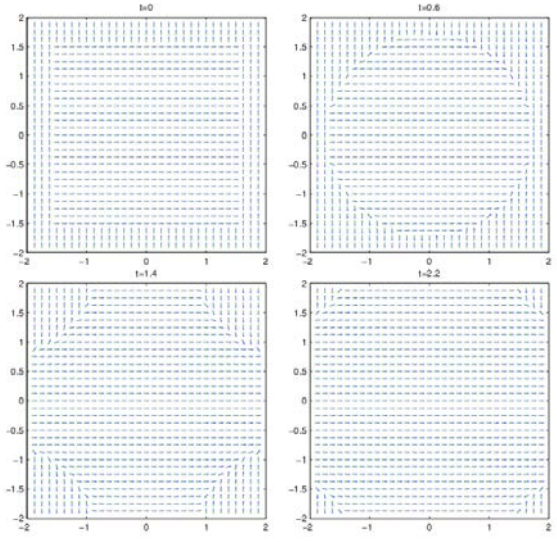


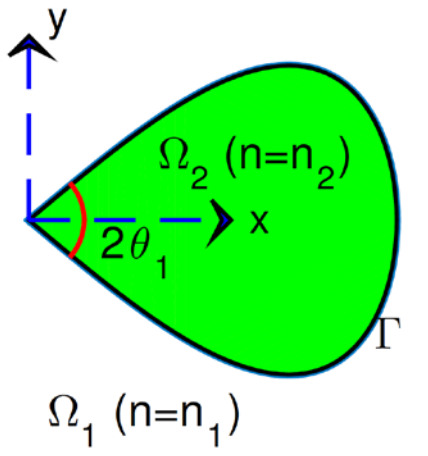
Fig. 2. Orientation of 2D liquid crystal at different time with different initial condition.

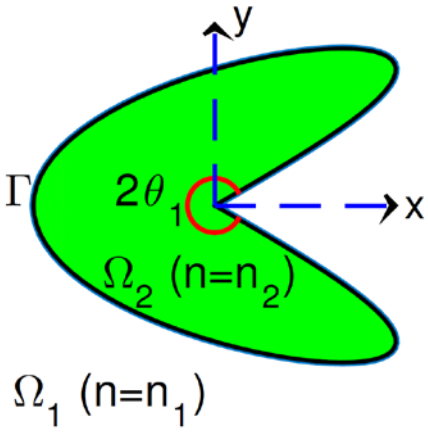
CALCULATING CORNER SINGULARITIES BY BOUNDARY INTEGRAL EQUATIONS

Electromagnetic fields around metallic nanoparticles and in subwavelength apertures or slits of metallic films are often many orders of magnitude more intense than the incident wave. Strong near-fields of well-designed plasmonic structures have important applications in biological and chemical sensing, and can be used to enhance nonlinear optical effects, quantum optical effects, Raman scattering and other emission processes. The local field enhancement in plasmonic structures is the result of localized surface plasmon resonances, but geometric features such as corners and edges (see the geometric illustrations in Figures) also strongly influence the near-fields.

To analyze the local field enhancement phenomenon and to study the numerous applications, it is clearly important to calculate the near-fields accurately near sharp corners and edges where electromagnetic fields exhibit singularities and tend to infinity. For cylindrical structures, the singularity exponents of electromagnetic fields near sharp edges can be solved analytically, but in general the actual fields can only be calculated numerically.

Recently, CSRC postdoc Hualiang Shi, under the joint supervision of Professors Yayan Lu and Qiang Du used a boundary integral equation method to compute electromagnetic fields near sharp edges. They constructed the leading terms in asymptotic expansions based on numerical solutions. The numerically found singularity exponents agree well with the exact values in all the test cases presented in their work, indicating that the numerical solutions are accurate. Our integral equations are formulated for rescaled unknown functions to avoid unbounded field components, and are discretized with a graded mesh and properly chosen quadrature schemes.





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ERROR ANALYSIS OF A FINITE DIFFERENCE METHOD ON GRADED MESHES FOR A TIME-FRACTIONAL DIFFUSION EQUATION

The numerical solution of initial-boundary value problems with a fractional time derivative of order α, where $0 < \alpha < 1$, has received much attention in the last few years. If $\alpha = 1$, then one has a standard parabolic partial differential equation, while $0 < \alpha < 1$ means that the equation models an anomalous diffusion process (subdiffusion). Given smooth data, typical solutions of this problem are smooth in the spatial variable, and in the time variable for $t > 0$, but at the initial time $t = 0$ the solution has a weak singularity: it is continuous but its integer-order time derivatives blow up at t approaches zero.

The figure shows a typical solution, and a cross-section of this solution along a line x=constant; clearly there is a singularity at $t = 0$. But the vast majority of published analyses of numerical methods for this class of problem assume that the solution is a smooth function of both variables on all of the domain, i.e., they ignore the effect of the initial singularity. This global smoothness assumption limits severely the class of problems to which their theory can be applied; see [1].

The paper [2] is the first to give a finite difference analysis of a numerical method for these problems that is valid for problems that have a weak singularity at $t = 0$. In [2] one uses a uniform mesh in space and a special graded mesh in time (this mesh grading is often used in the solution of Volterra weakly integral equations, which are closely related to the fractional-derivative problem). A new discrete stability inequality is derived, showing how the solution at each time level depends on the data at earlier times; this is combined with a consistency error analysis to obtain a final convergence result in the discrete maximum norm that is sharp (as demonstrated by numerical experiments) and shows exactly how the error depends on the degree of mesh grading used. Consequently one can prescribe a priori an optimal mesh grading for the problem.

Reference [2] has attracted a great deal of attention in the fractional-derivative community: a copy of it on Researchgate has had more than 700 Reads.

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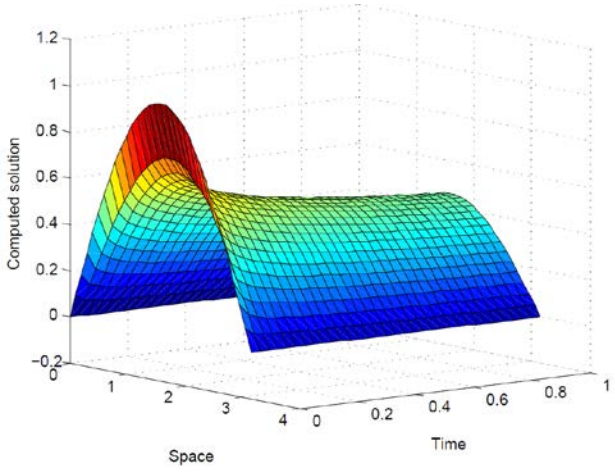

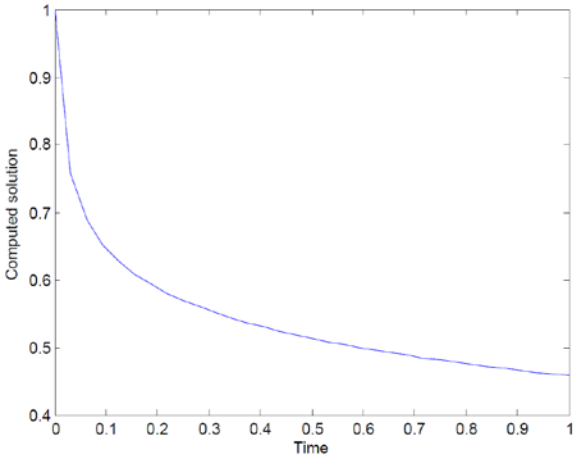

FAST EVALUATION OF THE CAPUTO FRACTIONAL DERIVATIVE AND ITS APPLICATIONS TO FRACTIONAL DIFFUSION EQUATIONS

The computational operation and storage of numerically solving the time fractional PDEs are generally huge for the traditional direct methods since they require total $O(MN)$ memory and $O(MN^2)$ work, where N and M represent the total number of time steps and grid points in space, respectively. To overcome this difficulty, an efficient algorithm for the evaluation of the Caputo fractional derivative is presented. This algorithm is based on an efficient sum-of-exponentials (SOE) approximation for the Abel kernel over the interval [dt, T] with a uniform absolute errorε. More importantly, the theoretical analysis is given to show that the number of exponentials P needed is of order $P = O(\log N)$ *for* $T>>1$ *or* $P = O(\log^2 N)$ for $T \approx 1$ for fixed accuracyε The resulting algorithm only requires only $O(MP)$ storage and $O(MNP)$ work when numerically solving the time fractional PDEs. Furthermore, the stability and error analysis of the new scheme is addressed, and several numerical examples are provided to demonstrate the performance of our scheme. For example, fast algorithm is applied to the nonlinear subdiffusion equation, Fig 1. shows the fast algorithm reduces the computational cost significantly.

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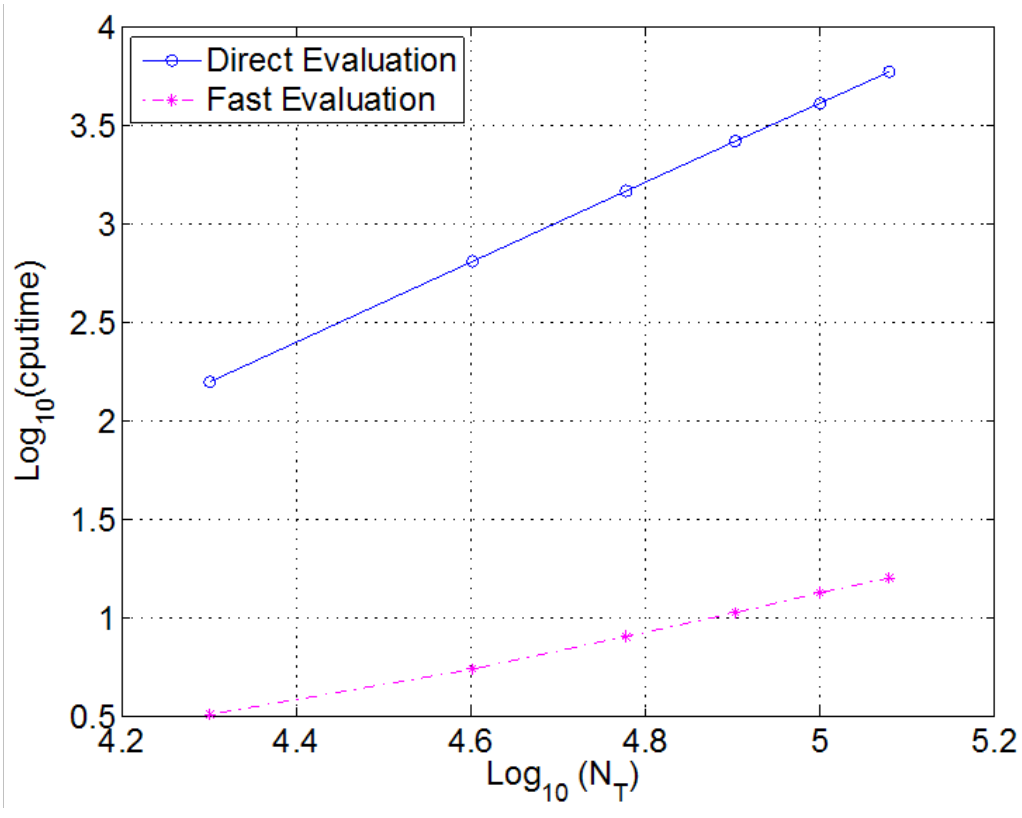

Fig. 1. The log-log (in base 10) plot of the CPU time (in seconds) versus the total number of time steps *N*.

MATHEMATICAL AND NUMERICAL ANALYSIS OF DYNAMIC GINZBURG-LANDAU EQUATIONS IN NONCONVEX POLYGONS BASED ON HODGE DECOMPOSITION

Based on the Ginzburg-Landau theory of superconductivity, the macroscopic state of a superconductor is described by the complex-valued order parameter ψ, the real scalar-valued electric potential ϕ, and the real vector-valued magnetic potential A. In the nondimensionalization form, the order parameter satisfies $0 \le |\psi|^2 \le 1$, where $|\psi|^2 = 0$ corresponds to the normal state and $|\psi|^2 = 1$ corresponds to the superconducting state, and $0 < |\psi|^2 < 1$ represents an intermediate state between the normal and superconducting states. If the superconductor occupies a long cylinder in the x_3-direction with a finite cross section and the external magnetic field is **H**=(0,0,H), then the order parameter ψ and the magnetic potential **A**=(A1,A2) are governed by the TDGL(under gauge $\phi = -\nabla \cdot \mathbf{A}$):

$$\eta \frac{\partial \psi}{\partial t} + (\frac{i}{\kappa}\nabla + \mathbf{A})^2 \psi + (|\psi|^2 - 1)\psi - i\eta\kappa\psi\nabla\cdot\mathbf{A} = 0, \qquad (1a)$$

$$\frac{\partial \mathbf{A}}{\partial t} + \nabla\times(\nabla\times\mathbf{A}) - \nabla(\nabla\cdot\mathbf{A}) + \mathrm{Re}[\psi^*(\frac{i}{\kappa}\nabla + \mathbf{A})\psi] = \nabla\times H. \qquad (1b)$$

If the computational domain Ω contains reentrant corners, then the solution of (1) is often singular there, in particular, $\mathbf{A}(t) \notin H^1(\Omega)\times H^1(\Omega)$ Hence solving (1) directly by the finite element method often yields spurious solutions. In addition, the singularity also makes it challenging to investigate the regularity of TDGL's solutions and convergence of numerical solutions.

To overcome this difficulty, Buyang Li from The Hong Kong Polytechnic University and Zhimin Zhang from CSRC reformulate the equations into an equivalent system of elliptic and parabolic equations (2) based on the Hodge decomposition. Let $\mathbf{A} = \nabla\times u + \nabla v$ then we have Eq(2).

$$\eta\frac{\partial\psi}{\partial t} + \left(\frac{i}{\kappa}\nabla + \mathbf{A}\right)^2\psi + (|\psi|^2 - 1)\psi - i\eta\kappa\psi\nabla\cdot\mathbf{A} = 0, \qquad (2a)$$

$$\Delta p = -\nabla\times\left(\mathrm{Re}\left[\psi^*\left(\frac{i}{\kappa}\nabla + \mathbf{A}\right)\psi\right]\right), \qquad (2b)$$

$$\Delta q = \nabla\cdot\left(\mathrm{Re}\left[\psi^*\left(\frac{i}{\kappa}\nabla + \mathbf{A}\right)\psi\right]\right), \qquad (2c)$$

$$\frac{\partial u}{\partial t} - \Delta u = H - p, \qquad (2d)$$

$$\frac{\partial v}{\partial t} - \Delta v = -q. \qquad (2e)$$

If $H \in L^\infty((0,T);L^2)\cap L^2((0,T);H(curl))$, $\psi_0 \in H^1$, $\mathbf{A}_0 \in \mathbf{H}_n(curl,div)$ and $|\psi_0| \le 1$ a.e. in Ω, then the system (1) admits a unique weak solution. The reformulated system (2) also admits a unique solution, which coincides with the solution of (1).

Moreover, let *xj , j = 1,..., m* be the reentrant corners of the domain Ω, then the solution has the decomposition

$$\psi(x,t) = \Psi(x,t) + \sum_{j=1}^{m} \alpha_j(t)\Phi(|x-x_j|)|x-x_j|^{\pi/\omega_j}\cos(\pi\Theta_j(x)/\omega_j),$$

$$\mathbf{A} = \nabla \times u + \nabla v,$$

with

$$u(x,t) = \tilde{u}(x,t) + \sum_{j=1}^{m} \beta_j(t)\Phi(|x-x_j|)|x-x_j|^{\pi/\omega_j}\sin(\pi\Theta_j(x)/\omega_j),$$

$$v(x,t) = \tilde{v}(x,t) + \sum_{j=1}^{m} \gamma_j(t)\Phi(|x-x_j|)|x-x_j|^{\pi/\omega_j}\cos(\pi\Theta_j(x)/\omega_j),$$

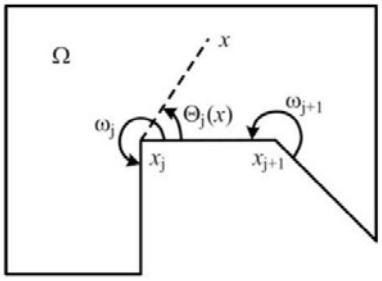

Fig. 1. Illustration of corner x_j, in-terior angle ω_j and argument $\Theta_j(x)$.

where $\Psi \in L^2((0,T);H^2)$, $\tilde{u},\tilde{v} \in L^\infty((0,T);H^2)$, $\Phi(r)$ is a given smooth cut-off function which equals 1 in a neighborhood of 0, $\Theta_j(x)$ is the angle shown in Figure 1, and $\alpha_j,\beta_j,\gamma_j \in L^2(0,T)$.

We solve (2) by the Lagrange finite element method by using the decoupled and linearized time-stepping scheme, with $P_1-P_1-P_1-P_1-P_1$ finite elements for discreted $(\psi_h^n, p_h^n, q_h^n, u_h^n, v_h^n)$, admits a unique solution when $\tau < \eta/4$ and converges to the solution of (2), i.e.,

$$\max_{1\le n\le N}\left(\left\|u^n-u_h^n\right\|_{H^1}+\left\|v^n-v_h^n\right\|_{H^1}+\left\|\mathbf{A}^n-\mathbf{A}_h^n\right\|_{L^2}+\left\|\psi^n-\psi_h^n\right\|_{L^2}\right) \le C(\tau+h^{\frac{\pi}{\omega}-\varepsilon})$$

where Ω is the maximal interior angle of the domain Ω, τ is an arbitrarily small constant, and C is a positive constant independent of ε and h.

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HESSIAN RECOVERY FOR FINITE ELEMENT METHOD

Hessian matrix is particularly significant in adaptive mesh design, since it can indicate the direction where the function changes the most and guide us to construct anisotropic meshes to cope with the anisotropic properties of the solution of the underlying partial differential equation. It also plays an important role in finite element approximation of second order non-variational elliptic problems, some fully nonlinear equations and designing nonlocal finite element technique.

Consider the following variational problem: find $u \in H^1(\Omega)$ such that

$$B(u,v) = \int_\Omega (D\nabla u + bu)\cdot\nabla v + cuvdx = f(v), \quad \forall v \in H^1(\Omega). \qquad (1)$$

Here D is 2×2 a symmetric positive definite matrix, b is a vector, c is a number and $f(\cdot)$ is a linear functional on $H^1(\Omega)$. All coefficient functions are smooth and the bilinear form $B(\cdot,\cdot)$ satisfies the continuity condition.

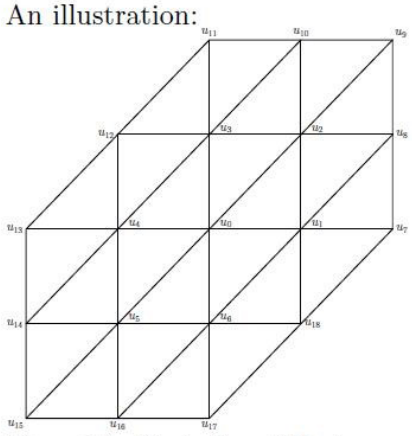
For linear element function, their first order derivative are piecewise constant and the second are not well defined. Existing methods can not guarantee the convergence even on uniform meshes and it is very hard to generalize to higher order elements, so as to build a framework of analyzing Hessian recovery methods on general unstructured meshes.

Recently, Hailong Guo from University of California, Santa Barbara and Zhimin Zhang from CSRC, in collaboration with Ren Zhao from Wayne State University proposed an effective Hessian recovery strategy for the Lagrangian FEM of arbitrary order. They define T_h be a shape regular triangulation of a polygonal domain $\widetilde{\Omega}$ with mesh size at most h and S_h be continuous finite element space of order k on T_h . Given $u \in S_h$, let $G_h u \in S_h \times S_h$ be the recovered gradient using PPR. Rewrite $G_h u$ as $G_h u = (G_h^x u, G_h^y u)^T$, in order to recover the Hessian matrix of u, gradient recovery operator G_h is applied to $G_h^x u$ and $G_h^y u$ one more time, respectively, and define the Hessian recovery operator H_h as follows

$$H_h u = (G_h(G_h^x u), G_h(G_h^y u)) = \begin{pmatrix} G_h^x(G_h^x u), G_h^x(G_h^y u) \\ G_h^y(G_h^x u), G_h^y(G_h^y u) \end{pmatrix}$$

The method preserves polynomials of degree k+1 on general unstructured meshes and superconvergences at a rate of $O(h^k)$ on mildly structured meshes. In addition, it is proved to be ultraconvergent (two order higher) for translation invariant finite element space of any order.

An illustration:



$$I_h^{xx}u)(z_0) = \frac{1}{36h^2}(-12u_0 + 2u_1 - 4u_2 - 4u_3 + 2u_4 - 4u_5 - 4u_6 + 4u_7 + 4u_8 + u_9 - 2u_{10} + u_{11} + 4u_{12} + 4u_{13} + 4u_{14} + u_{15} - 2u_{16} + u_{17} + 4u_{18}),$$

$$I_h^{xy}u)(z_0) = \frac{1}{36h^2}(6u_0 - u_1 + 5u_2 - u_3 - u_4 + 5u_5 - u_6 - 2u_7 + u_8 + u_9 + u_{10} - 2u_{11} - 5u_{12} - 2u_{13} + u_{14} + u_{15} + u_{16} - 2u_{17} - 5u_{18}),$$

$$I_h^{yx}u)(z_0) = \frac{1}{36h^2}(6u_0 - u_1 + 5u_2 - u_3 - u_4 + 5u_5 - u_6 - 2u_7 + u_8 + u_9 + u_{10} - 2u_{11} - 5u_{12} - 2u_{13} + u_{14} + u_{15} + u_{16} - 2u_{17} - 5u_{18}),$$

$$I_h^{yy}u)(z_0) = \frac{1}{36h^2}(-12u_0 - 4u_1 - 4u_2 + 2u_3 - 4u_4 - 4u_5 + 2u_6 + u_7 - 2u_8 + u_9 + 4u_{10} + 4u_{11} + 4u_{12} + u_{13} - 2u_{14} + u_{15} + 4u_{16} + 4u_{17} + 4u_{18}).$$

Fig. 1. An illustration of Hessian recovery at the point located on u_0.

Theorem 1(polynomial preserving property):
Let $u \in W_\infty^{k+2}(K_z)$; then $\|Hu - H_h u\|_{0,\infty,K_z} \le Ch^k |u|_{k+2,\infty,K_z}$.
If z is a node of translation invariant mesh and a mesh symmetric center of the involved nodes and $u \in W_\infty^{k+3}(K_z)$; then $|(Hu - H_h u)(z)| \le Ch^{k+1} |u|_{k+3,\infty,K_z}$.
Moreover, if $u \in W_\infty^{k+4}(K_z)$ and k is an even number, then $|(Hu - H_h u)(z)| \le Ch^{k+2} |u|_{k+4,\infty,K_z}$.

Theorem 2(superconvergence on arbitrary meshes):
Suppose that the solution of (1) belongs to $H^{k+2}(\Omega) \cap W_\infty^{k+1}(\Omega)$ for k=1,2, u_h be the finite element solution of (1) using S_h and T_h is a mildy unstructured mesh, then we have $\|Hu - H_h u_h\|_{0,\Omega} \le Ch^k \|u\|_{k+2,\infty,\Omega}$

Theorem 3(ultraconvergence on translation invariant meshes):
Let all the coefficients in the bilinear operator $B(\cdot,\cdot)$ be constant; $\Omega_1 \subset\subset \Omega$ be separated by d=O(1); the finite element space S_h, which includes piecewise polynomials of degree k, be translation invariant in the directions required by the Hessian recovery operator H_h on $u \in W_\infty^{k+3}(\Omega)$. Then on any interior region $\Omega_0 \subset\subset \Omega_1$, we have $\|Hu - H_h u_h\|_{0,\infty,\Omega_0} \le C(\ln(1/h))^{\tilde{r}} h^{k+1} \| \|_{k+3,\infty,\Omega}$.
(Here $\tilde{r} = 1$ for linear element and $\tilde{r} = 0$ for higher order element.)

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MODELING THE FORMATION OF TIO$_2$ ULTRA-SMALL NANOPARTICLES

Titanium dioxide has been widely used as a heterogeneous photocatalyst for various photocatalytic oxidation and reduction reactions with many applications including water treatment and water splitting.[1] Further improvements in TiO_2-based catalysts may impact solutions for major environmental and energy problems. Researchers have shown that the nanoparticle forms of TiO_2 exhibit better catalytic activities than does the bulk phase.[2] Recent studies also showed that the photoelectrochemical performance of TiO_2 nanoclusters is enhanced as the size of the nanocluster is reduced.[3] When the particle size falls below 10 nm, the particles become the so-called ultra-small nanoparticles (USNPs) and display unique properties.[4][5] Despite that he properties of the solid, the surface, and nanoparticles of TiO_2 have been studied extensively, very little has been known about TiO2 USNPs.[6][7][8] It is important to predict the atomistic structures and the structure-property relationships for TiO_2 USNPs. An extensive range of low energy (TiO_2)n clusters and USNPs (n up to 384) were predicted and validated by Chen and Dixon[9] using a novel bottom-up global optimization approach that is based on all-atom real-space calculations, and the structural evolution pathway from cluster to bulk nanoparticle was proposed (Fig. 1). This is a remarkable improvement over the previous studies on this research topic. Before this work, the largest (TiO_2)n predicted was $(TiO_2)_{13}$ by Chen and Dixon.[10]

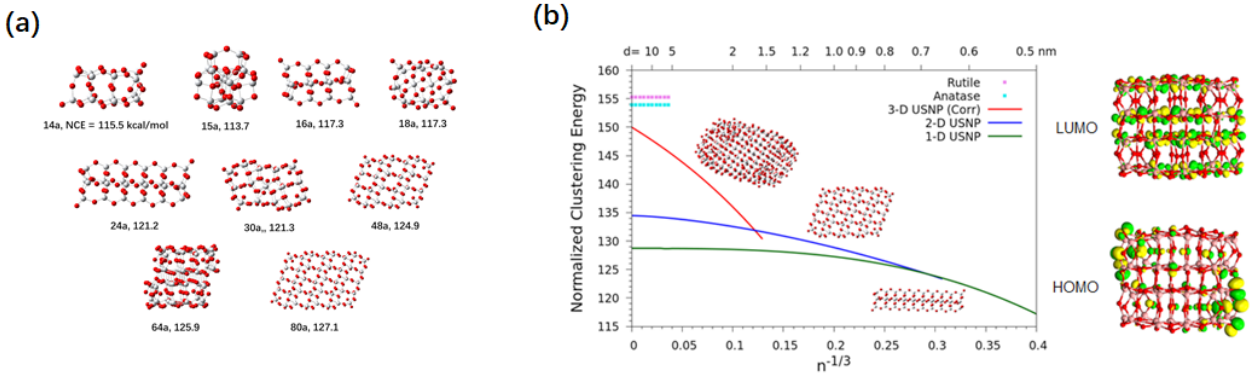

Fig. 1. (a) Selected global energy minima structures for (TiO_2)n (b) Structural phase diagram for (TiO_2)n USNPs.

To understand the structure-property relationships for the metal oxide cluster, USNP and bulk material, Chen and Dixon developed a novel fragment-based scheme (Fig. 2) [9] [11] to approximate the size-property relationships by the more computationally convenient fragment-property relationships. Surface energy densities were predicted for the surface fragments of the anatase-like USNPs using this new model. Based on the predicted surface energy densities and the partial density of states, the most catalytically active sites for the anatase-like 3-D USNPs were predicted to be the kink sites on Face-x surfaces consisting of an octahedral-Ti, the step (edge) sites between the Face-x and Face-y surfaces consisting of a square

pyramidal-Ti (on Face-x), and the step sites consisting of trigonal bipyramidal Ti on the Face-y surfaces.

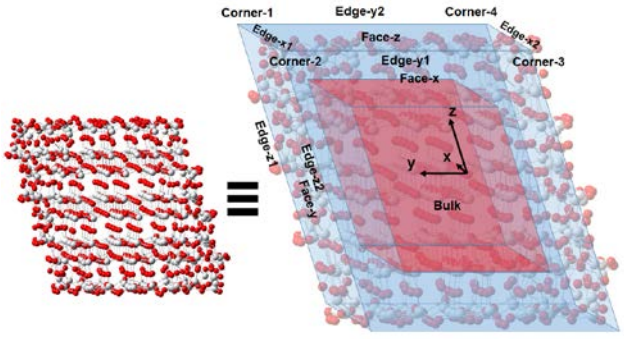

Fig. 2. Fragmentation of $(TiO_2)_{320}$.

Table 1. Surface energy densities for the anatase-like (TiO_2)n USNP series.

Fragment Types	Surface Energy Density kcal/mol per TiO2
Corners 1-4	33.1
Edge-x1 + Edge-x2	24.5
Edge-y1 + Edge-y2	27.5
Edge-z1 + Edge-z2	24.8
Face-x	12.7
Face-y	16.2
Face-z	4.7
Bulk	0

In a follow-up work on the formation of brucite-related USNPs by Chen and Dixon, [11] the fragment-based energy decomposition model was further extended. The generated fragment-based thermodynamic parameters from the energy decomposition not only can be used to predict the stabilities of the fragment types, but also to predict a range of thermodynamics-related properties for the nanoparticle series, including the structural phase diagram, ideal aspect ratio (morphology), and surface reactivities (Fig. 3). The fragment-based energy decomposition provides a “multum in parvo” way to compute the thermodynamic properties of large nanoparticles with CCSD(T)-level of high accuracy at a minimal computational cost. The high accuracy is achieved by choose appropriate DFT functional and basis set for energy calculations that produce energy landscape very close to the CCSD(T) results for the small clusters (of the benchmark set) and meanwhile produce the correct normalized dissociation energy at the thermodynamic limit.

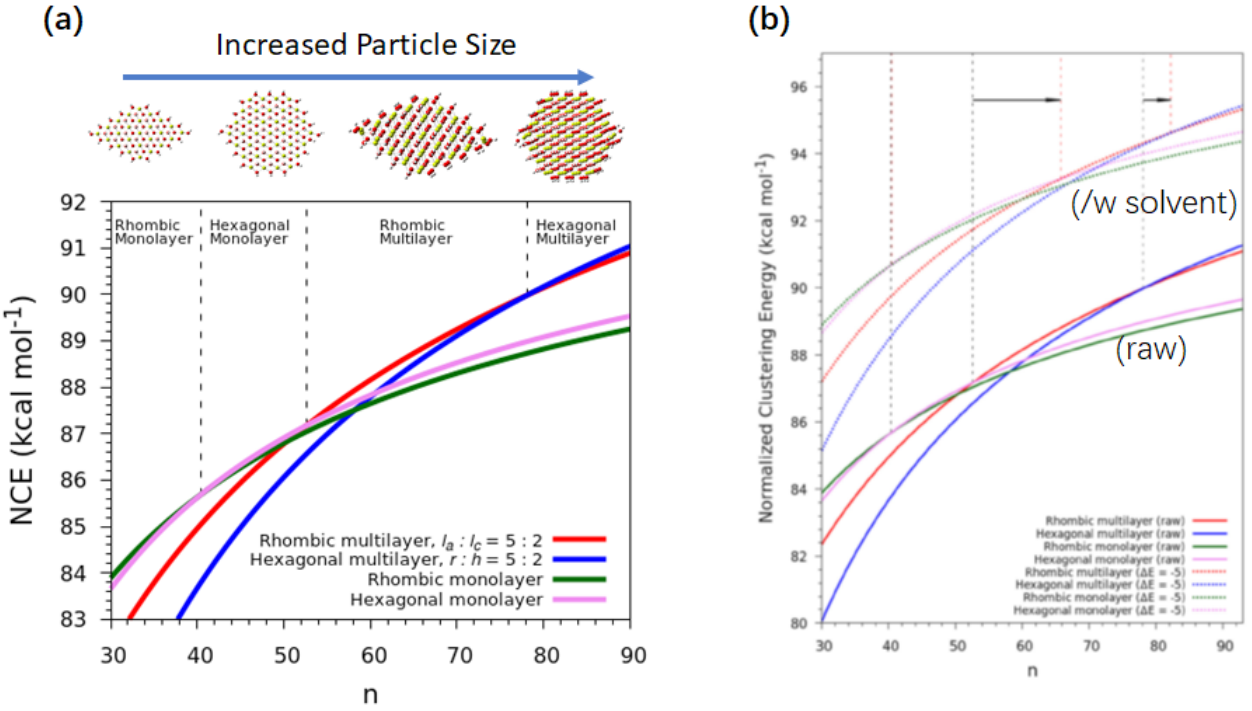

Fig. 3. (a) Structural phase diagram for brucite-related $(Mg(OH)_2)_n$ USNPs. (b) Solvent effects on the structural phase diagram for $(Mg(OH)_2)_n$ USNPs.

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NUMERICAL SOLUTION OF THE NONLOCAL DIFFUSION EQUATION ON THE REAL LINE

This paper is concerned with the numeral simulation of a nonlocal diffusion equation defined on the whole real axis. A challenging problem is how to construct artificial boundary conditions (ABCs) for these problems due to the nonlocality of the interaction. With the application of the Laplace transform in the spacial direction, rather than the classical temporal direction, a DtN-like mapping is obtained to be taken as an exact ABC for the nonlocal diffusion problem. In the practical numerical implementation, the nonlocal diffusion equation is first discretized in space to lead to a discrete nonlocal system on the whole real axis. After that, an exact ABC for the discrete nonlocal diffusion system is achieved on artificial boundary gridpoints. This exact ABC allowed one to reformulate the nonlocal system on the whole real axis into a finite nonlocal one on the truncated computational domain. So far, this is a pioneering work in the designing of exact ABCs for the nonlocal problems. The numerical examples were presented to verify the effectiveness of the approach in two parts. First, the schemes converge to the nonlocal problem by fixing horizon size δ and taking h → 0. Second, the numerical schemes are shown to converge to the correct local models when both δ and h → 0.

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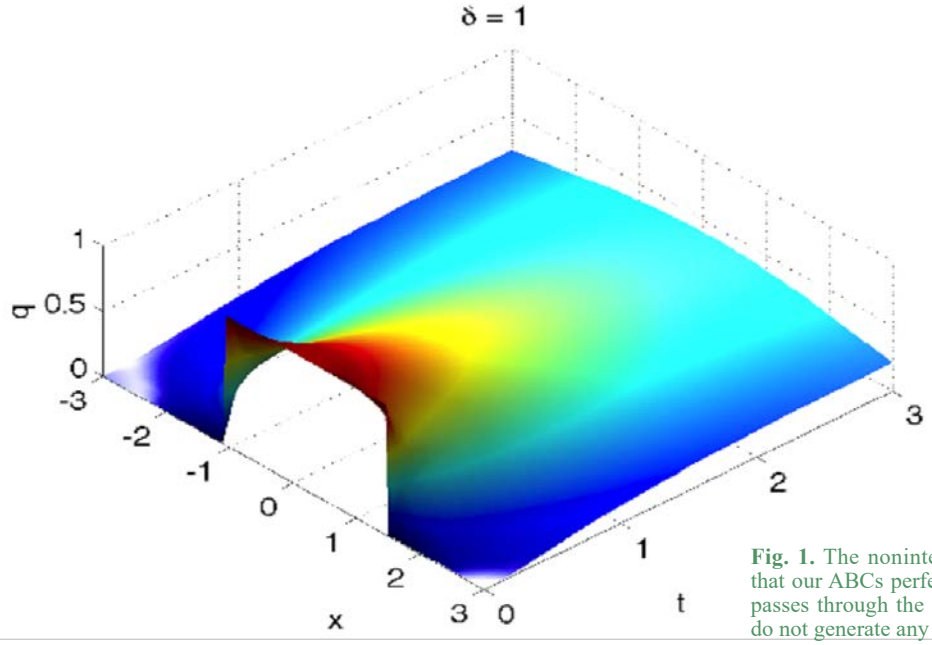

Fig. 1. The nonintegral kernel is used. One can see that our ABCs perfectly absorbed the heat flow which passes through the artificial boundary gridpoints, and do not generate any obvious approximation error.

MULTISCALE STUDY OF PLASMONIC SCATTERING AND LIGHT TRAPPING EFFECT IN SILICON NANOWIRE ARRAY SOLAR CELLS

Nanometallic structures that support surface plasmons provide new ways to confine light at deep-subwavelength scales. Plasmonics has emerged as a new technology with expanding applications in materials and device research. Experiments have demonstrated that the strong field localization of surface plasmons can effectively increase the optical path length and achieve light confinement in nanostructured solar cells. In this work, the effect of light scattering in nanowire array solar cells is studied by a multiscale approach combining classical electromagnetic (EM) and quantum mechanical simulations. A photovoltaic device is constructed by integrating a silicon nanowire array with a plasmonic silver nanosphere. (Figure 1) The light scatterings by plasmonic element and nanowire array are obtained via classical EM simulations, while current-voltage characteristics and optical properties of the nanowire cells are evaluated quantum mechanically.

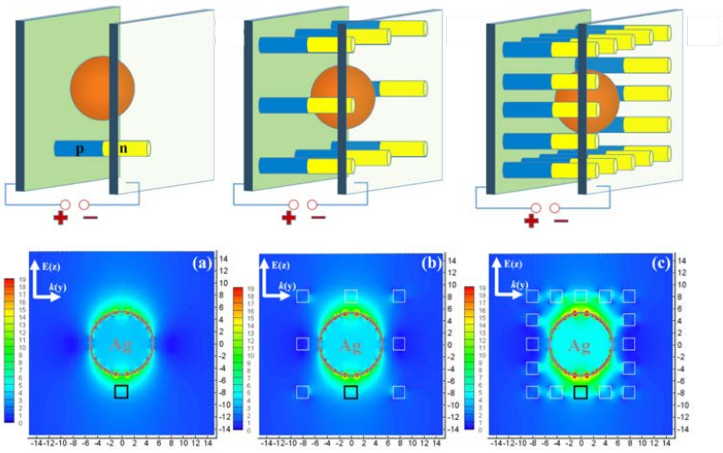

Fig. 1. Field enhancement distribution for (a) the single nanowire solar cell, (b) the 8-nanowire array solar cell, and (c) the 16-nanowire array solar cell. Squares represent the regions where the nanowire photoactive components are located.

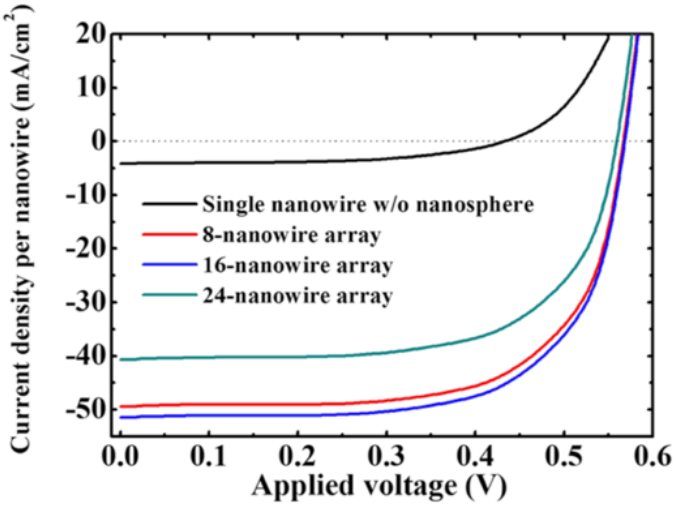

Fig. 2. Current density per nanowire versus applied voltage of the photovoltaic devices with different numbers of surrounding nanowires under illumination of monochromatic light frequency of 3.4 eV.

In this work, ChiYung Yam's group in CSRC in collaboration with Lingyi Meng in Xiamen University applied a multiscale QM/EM method[1,2] to study the performance of plasmonic devices that contain vertically aligned silicon nanowire arrays and silver nano- spheres.[3] Combining a classical EM description of plasmonic nanostructure and QM treatment of photoactive component, device performance and optical parameters of the nanowire array-based photovoltaic devices are determined. The light confinement effect due to nanowire array geometry and metallic nanoparticle is first obtained, and the actual device performance is then simulated quantum mechanically. The incorporation of metallic nanosphere leads to enhancement of light absorption in the device and results in dramatic improvement of PCE. The light trapping effect due to the nanowire array architecture was further investigated. Remarkably, it is shown that there exists an optimal nanowire number density in terms of optical confinement and solar cell PCE. To further improve the performance, plasmonic structures with different materials, shapes, sizes, and geometrical arrangements can be used for broadband plasmonic absorption. The present work demonstrates the multiscale QM/EM method as an efficient simulation tool for studying nanoscale optoelectronic devices. This is useful for understanding the mechanism of their energy conversion and helpful for improving the design of next- generation solar cells.

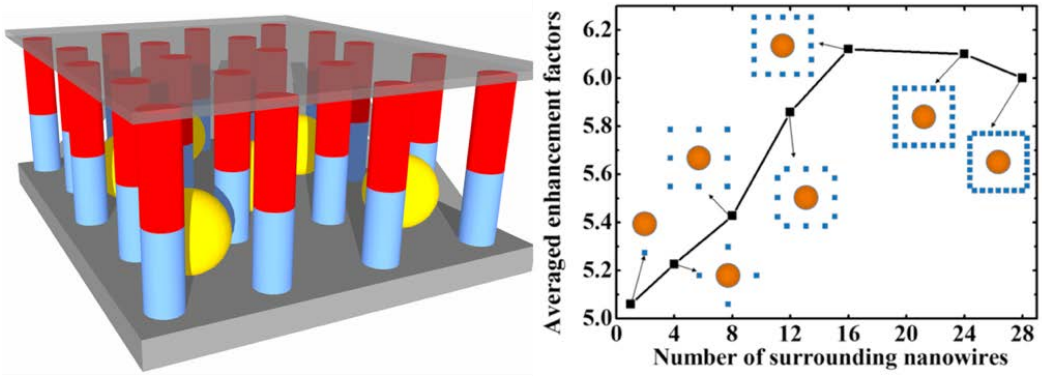

Fig. 3. Schematic diagram of silicon nanowire solar cells. (left) Averaged enhancement factors of nanowire solar cells marked in Figure 2 for devices with different nanowire densities. (right).

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DEPHASING DUE TO NUCLEAR SPINS IN LARGE-AMPLITUDE EDSR

Electric manipulation of spins in quantum dots can be achieved using Electric Dipole Spin Resonance (EDSR). The local control and the fast timescales allowed by EDSR might prove decisive advantages with respect to alternative approaches for single-spin manipulation. Therefore, this technique may become a cornerstone in complex architectures of many quantum dots, which are a promising platform to implement quantum information processing [1].

To further improve the performance of EDSR, it is necessary to characterize dominant dephasing mechanisms. An especially interesting limit is the strong electric drive regime, which was recently achieved experimentally [2, 3] and allows to further reduce the spin manipulation times. However, the main sources of noise are still poorly understood in this regime. A recent investigation [4], involving Stefano Chesi and Li-Ping Yang of CSRC and Daniel Loss from Basel University, has developed a comprehensive theory of dephasing caused by nuclear spins in EDSR, revealing new surprising features which appear in the strong-drive regime.

Nuclear spins are known for about 10 years as a dominant source of dephasing in quantum dots, but the general understanding has been that nuclear noise perpendicular to the direction of the external magnetic field has a negligible effect. On the other hand, the results of Ref. [4] show that the transverse nuclear noise becomes increasingly more effective at large drive strength, and eventually dominates over the longitudinal nuclear fluctuations. The presence of strong transverse noise causes qualitative and quantitative changes in the observed behavior of dephasing, which are in agreement with experiments. In fact, the theory developed in [4] has allowed to explain the decay of Rabi oscillation observed in recent EDSR experiments performed in Delft [2] and the University of Tokyo [3], which reached for the first time the strong–drive regime.

Despite the additional noise from transverse nuclear fields, EDSR remains a promising technique. As shown in [4], increasing the drive strength is always beneficial for accurate spin manipulation because the shorter operation time more than compensates the reduced coherence time.

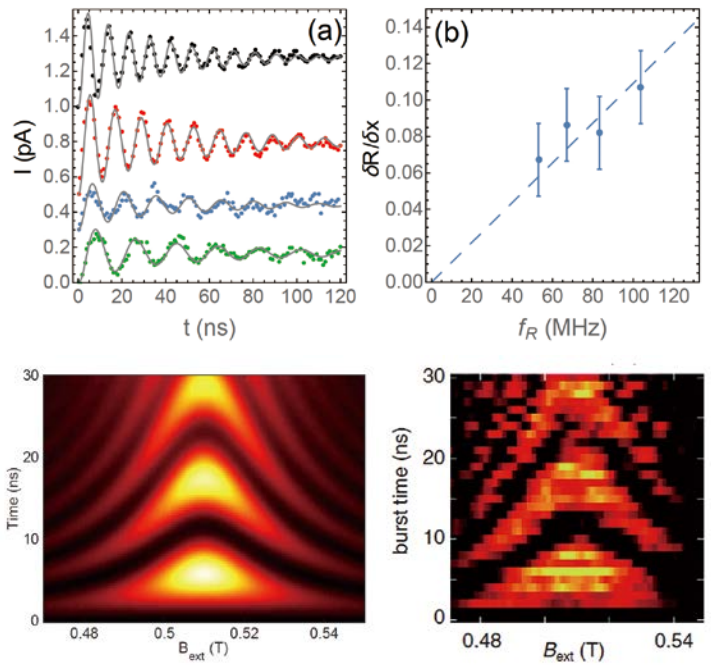

Fig. 1. Comparisons of EDSR theory [4] and experiments [2, 3]. (a): Fit of the Rabi oscillations from [2]. (b): Extracted ratio of the amplitude of the EDSR-induced motion δR and the quantum dot size δx. Bottom panels: comparison of the theoretical [4] and experimental [3] "Chevron" pattern of the Rabi oscillations, obtained at large drive strength.

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PROBINGLOCALIZATION-DELOCALIZATION IN DISORDERED ISOLATED FERMIONIC SYSTEMS OUT-OF-EQUILIBRIUM

When isolated quantum systems are taken out of equilibrium, its dynamics can be described by a time evolution which is unitary, unlike classically chaotic systems. The conditions that lead these systems to thermalize and the information regarding its initial preparations to be lost over the course of its evolution can be seen as result of the dephasing in the dynamics of the coherence between the eigenstates. Its mathematical basic grounds were fundamented in what we call nowadays as the Eigenstate Thermalization Hypothesis (ETH) [1, 2] and it became clear that interactions between the constituents of the system are essential in the thermalization mechanism. On the other hand, much attention has also been given to another aspect that may, in fact, prevent thermalization. When disorder comes into play an isolated quantum system can experience a halting of thermalization and, ultimately, localization takes place. This localization is manifest in the absence of mass transport and it can be seen as a generalization of the famous Anderson localization phenomenon when interactions are included.

Several numerical studies have shown this localization in the presence of interactions [3], which we dub as many-body localization (MBL), and also a handful number of experiments [4] have also tackled it. In the latter, the analyzed quantum system is consisted of atoms trapped in a potential generated by laser beams in an optical lattice. By introducing disorder on the onsite energy levels one can emulate the physics of the Anderson model with interactions which can be tuned in a controllable fashion. The most common way to identify this localization (and the associated lack of thermalization) is to follow the dynamical properties of a carefully prepared quantum system. Specifically, experiments in optical lattices employ high-fidelity preparation of initial states whose properties are well known, as for example, by confining the atoms in certain regions of the trapping environment. By measuring how the information of the initial prepared state is preserved for long-times after the release of this constraint one is able to identify the regimes where disorder is sufficient to lead to the MBL phenomenon. This has been shown to be the case experimentally and numerically when dealing with disorder as mathematically interpreted as a random scalar potential.

On the other hand, the latest advancements in atomic control and manipulation in optical lattices has allowed the emulation of a vector potential in these systems via the exploration of the internal degrees of freedom of these atoms, that generates an effective synthetic lattice in larger dimensions. This immediately raises the question of how a generic closed quantum system subjected to a *random vector potential* can also display localization as is observed in the random scalar potential case. In a recent publication [5], Chen Cheng and Rubem Mondaini from CSRC have investigated one of the first evidences of the interplay between interactions and a random vector potential in a quasi-one dimensional system. Specifically they tackled the problem of localization and thermalization in a triangular ladder (see cartoon in Fig. 1(a)) which hosts interacting spinless fermions whose flux ϕ per triangular plaquette is chosen at random within an uniform distribution with amplitude Φ, signifying the disorder amplitude. The actual Hamiltonian reads,

$$\hat{H} = -t\sum_{j=1}^{L-1}(\hat{c}_j^\dagger \hat{c}_{j+1} + \text{H.c.}) - t'\sum_{j=1}^{L-2}(e^{\imath\phi_j}\hat{c}_j^\dagger \hat{c}_{j+2} + \text{H.c.}) + V\sum_i \hat{n}_i\hat{n}_{i+1}$$

where t and t' represent the hopping amplitudes, V the magnitude of the nearest neighbor inter-site interactions and ϕ_j the fluxes associated with the site-dependent disordered vector potential. In the absence of interactions, this system is known to display localization (à la Anderson) for all energies away from singular points in the density of states, as in the random flux model. This is referred as *marginal* Anderson

localization. To probe whether this localization survives the effect of interactions, as in the experiments, we initially prepare this quantum system in a particular state by allowing the atomic occupancy only in sites in one of the chains that compose the ladder: $|\Psi_0\rangle = |101010\ldots\rangle$, which represents a fully formed charge density wave. An observable that quantifies this initial information is called the mass imbalance $\mathcal{I} = (\langle\hat{n}^{\rm e}\rangle - \langle\hat{n}^{\rm o}\rangle)/(\langle\hat{n}^{\rm e}\rangle + \langle\hat{n}^{\rm o}\rangle)$ which measures the different occupancies in even and odd sites of the lattice. By tracking whether the initial information is preserved or not after long time evolution, one can unquestionably specify whether localization takes place or not.

In Fig. 1(a), we display the time dependence of the average mass imbalance for the largest possible disorder amplitude $\Phi = 2\pi$ and different values of the interaction. For the proposed initial state, the initial value of the imbalance is 1 and we see that it eventually decays, equilibrating to values close to 0. To make sure that all the initial information is lost over the course of the time evolution, we systematically check the finite size effects of the infinite time-average (often called diagonal ensemble - DE) of the imbalance in the inset of panel (b). In the thermodynamical limit, it is clear that all the initial information is completely lost even for values of the interactions V of the order of 2% of the noninteracting bandwidth. We then summarize by noticing that the random vector potentials although lead to localization for non-interacting particles, delocalization takes place when interactions are included, no matter how strong is the disorder associated with the vector potentials. This is an effect completely different from the standard case of random scalar potentials and we expect it to be soon verified in actual optical lattice experiments.

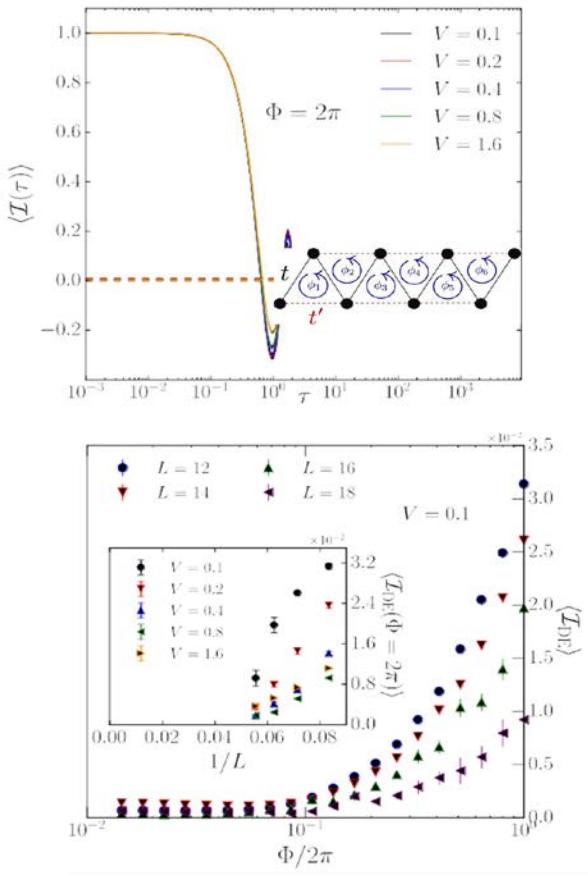

Fig. 1. Relaxation dynamics of the imbalance in the disordered environment for L = 18 and different interactions strengths V with the largest possible disorder Φ = 2π. The amplitude of the coherent fluctuations around the equilibrium value (dashed lines) for small times is inversely proportional to the value of V. (b) diagonal ensemble (DE) results (which represent the infinite time average of a given observable) of the same quantity for V = 0.1; (inset) shows the finite size scaling of the DE prediction at the largest disorder strength showing that in the thermodynamic limit the initial charge density wave information is lost in all cases.
Nevertheless, it is still an open question to understand whether the delocalization with random vector potentials still survives when including also random scalar potentials. This is an ongoing research being currently investigated at CSRC.

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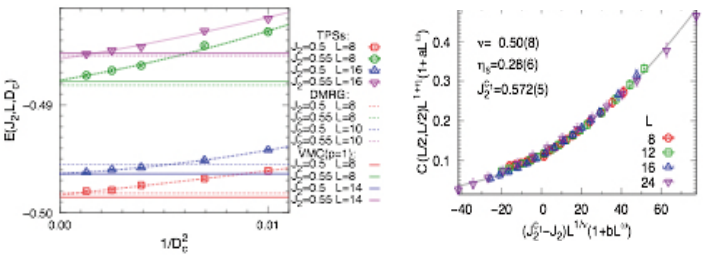
A TENSOR PRODUCT STATE APPROACH TO SPIN-1/2 SQUARE J_1-J_2 ANTIFERROMAGNETIC HEISENBERG MODEL: Evidence For Deconfined Quantum Criticality

The ground state phase of spin-1/2 J_1-J_2 antiferromagnetic Heisenberg model on square lattice around the maximally frustrated regime ($J_2 \sim 0.5J_1$) has been debated for decades. Here we study this model using the cluster update algorithm for tensor product states (TPSs). The ground state energies at finite sizes and in the thermodynamic limit (with finite size scaling) are in good agreement with exact diagonalization study. Through finite size scaling of the spin correlation function, we find the critical point $J2^{c1} = 0.572(5)J_1$ and critical exponents $\nu = 0.50(8)$, $\eta_s = 0.28(6)$. In the range of $0.572 < J_2/J_1 < 0.6$ we find a paramagnetic ground state with exponentially decaying spin-spin correlation. Up to 24×24 system size, we observe power law decaying dimer-dimer and plaquette-plaquette correlations with an anomalous plaquette scaling exponent $\eta_p = 0.24(1)$ and an anomalous columnar scaling exponent $\eta_c = 0.28(1)$ at $J_2/J_1 = 0.6$. These results are consistent with a potential gapless U(1) spin liquid phase. However, since the U(1) spin liquid is unstable due to the instanton effect, a VBS order with very small amplitude might develop in the thermodynamic limit. Thus, the numerical results strongly indicate a deconfined quantum critical point (DQCP) at J_2^{c1}. Remarkably, all the observed critical exponents are consistent with the J − Q model.



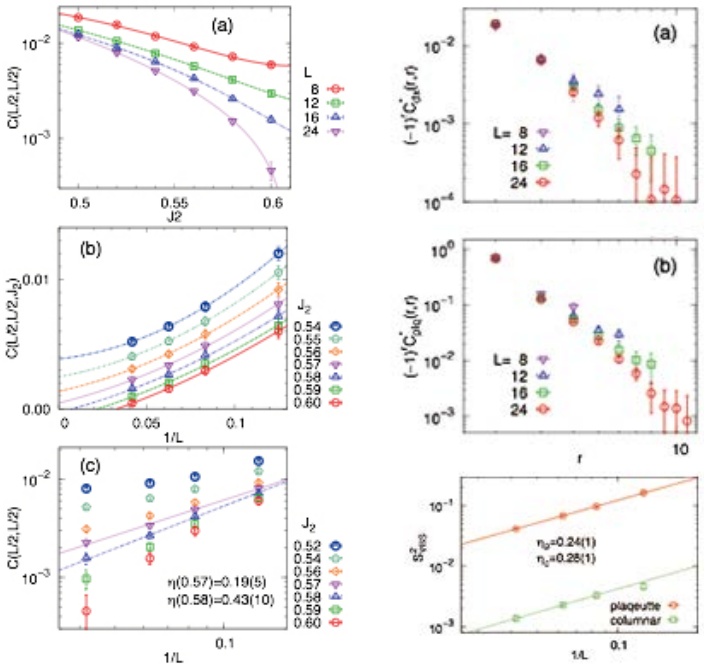


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Fig. left: A benchmark of ground state energy with the SU(2) symmetric DMRG results on tori and the VMC calculation with one Lanczos projection step on tori at $J_2 = 0.5, 0.55$, where Dc is the Schmidt number kept in our VMC-tensor renormalization algorithm.
Fig. right: The finite size scaling function of C(L/2,L/2), from where we determine the critical point J_2^{c1}, and spin-correlation length exponent ν and the anomalous spin correlation exponent η_s.

Fig. left: (a) The largest distance spin-spin correlation as a function of J_2 at L = 8, 12, 16, 24. The same correlations C(L/2,L/2) presented against 1/L in a regular plot (b) and in a log-log plot (c) for various J_2.
Fig. right: The modified dimer-dimer correlation C_{dx}^* (r, r) (a) and plaquette-plaquette correlation C_{plq}^* (r, r) (b) as a function of separation r at $J_2 = 0.6$ in log-log plots. (c) The valence bond solid order parameters S^2_{col} and S^2_{plq} at $J_2 = 0.6$ as functions of 1/L in log-log plot. The power law decay behaviors are captured by decay exponents $1 + \eta_p = 1.24(1)$ and $1 + \eta_c = 1.28(1)$ for the plaquette and columnar VBS order respectively.

HIDDEN QUANTUM MIRAGE BY NEGATIVE REFRACTION IN SEMICONDUCTOR P-N JUNCTIONS

Half a century ago, Veselago [1] proposed the concept of negative refraction for electromagnet-ic waves: a sharp interface between a medium with positive refractive index and a negative index medium could refocus a diverging pencil of rays to form an image or "quantum mirage", similar to the bending of light to create mirages in the atmosphere. In 2007, Cheianov et al. [2] shows that a sharp and specular graphene P-N interface can exhibit anomalous focusing and produce a quantum mirage. This effect has been widely used in theoretical proposals to control charge and/or spin transport for massless Dirac fermions in semiconductors. However, over many years anomalous focusing has not been clearly confirmed in experiments until very recently [3], because of its fragility to the finite width and disorder of the P-N interface [see Fig. 1(c) and (d)].

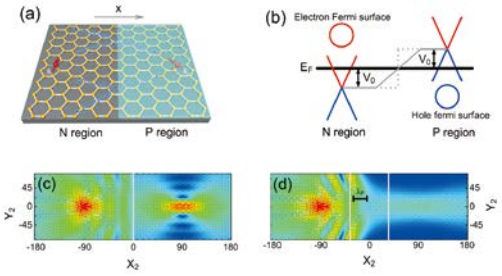
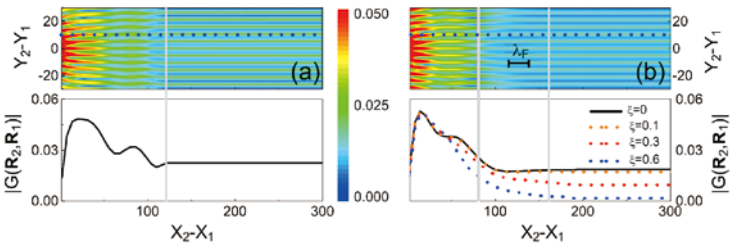


Fig. 1. Graphene P-N junction in real space (a) and gate-induced shift of the Dirac cones in momentum space (b). The quantum mirage is visible in a sharp P-N junction (c), but is gradually smeared out in a smooth junction (d).

Fig. 2. (a) and (b) Response amplitude (Green's function) vs. pump-probe distance $R_2 - R_1$ in (a) sharp or (b) smooth graphene P-N junctions. One slice (blue dashed line) of the contour is shown as the black solid lines in the lower panel. The dashed lines in the lower panel of (b) include on-site disorder of different strengths ξ inside the junction.



Recently, Wen Yang and Haiqing Lin's group in CSRC in collaboration with Kai Chang's group in the Institute of Semiconductors, CAS proposed a new interference phenomenon observable in a wide range of semiconductor P-N junctions [4]. Compared with the interface-induced anomalous focusing, this phenomenon enjoys two distinguishing features [see Fig. 2(a) and (b)]. First, it originates from the symmetry of the Fermi surfaces of the constituent materials, so it is insensitive to the details of the interface, such as the width, potential profile, and even disorder. Second, it does not produce a visible quantum mirage, but instead can be detected as a distance-independent response across the P-N interface, in sharp contrast to the nearly universal $1/R^{(d-1)/2}$ decay with distance R of the response in d-dimensional uniform systems. The predicted phenomenon could dramatically enhance many response properties in various semiconductors. The recently fabricated P-N junctions in 2D semiconductors provide ideal platforms to explore this phenomenon and its applications to dramatically enhance charge and spin transport as well as carrier-mediated long-range correlation between localized magnetic moments.

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PHOTOELECTRIC CONVERTERS WITH QUANTUM COHERENCE

Carnot's theorem states that all real heat engines operating between two heat baths undergo irreversible processes and are less efficient than a reversible heat engine, regardless of the working substance used or the operation details. Numerous studies have attempted to design more efficient heat engines and improve the work extraction when quantum effects come into play[1]. Most of quantum thermodynamic studies only emphasized on achieving a conversion efficiency limit, which is inevitably accompanied by vanishing power output[2]. More extensive research needs to be conducted regarding the interdependence of efficiency and power for practical applications. Based on the Newton heat transfer law, Curzon and Ahlborn found that the efficiency at maximum power of an endoreversible Carnot heat engine with irreversible heat transfer processes is given by $\eta_{CA} = 1\text{-}T_c / T_h$, where T_h is the temperature of the heat source and T_c is the temperature of the heat sink[3]. Other various thermodynamic machines indicate that η_{CA} gives a good approximation for estimating the efficiency at maximum power[4]. In particular, Rutten et al. proved that the efficiency at maximum power of a nanosized photoelectric converter can be well predicted by the Curzon and Ahlborn efficiency[5]. Only in the case of the strong coupling condition between electron and heat flows and negligible nonradiative effects, can the efficiency more closely approach to η_{CA} .

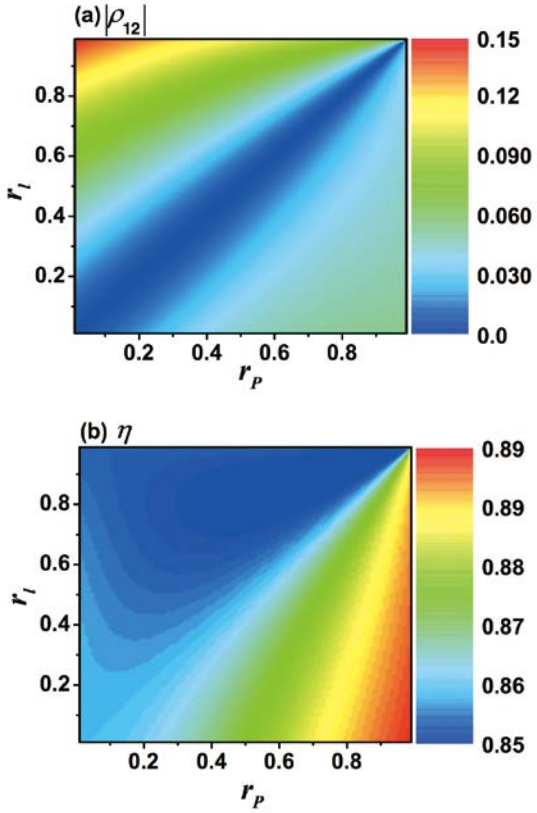

Fig. 1. The absolute value of coherence (a) and the efficiency (b) as a function of the dimensionless strengths of coherences r_P and r_l.

An interesting question arises here: might quantum coherence survive stably in nano-electronic systems and help to increase the efficiency at maximum power beyond the bound of the Curzon and Ahlborn efficiency? By considering a three-level quantum dot (QD) in thermal contact with two boson reservoirs, Li et al. confirmed that the interferences of two transitions in a non-equilibrium environment can give rise to non-vanishing steady quantum coherence[6]. Noise-induced coherence is capable of breaking the detailed balance condition and enhancing the laser power of a quantum heat engine[7]. The efficiency at maximum power of the laser quantum heat engine has been shown to depend on the proper adjustment of the coherence parameters[8]. In these previous studies, the interaction between quantum systems and bosonic baths plays a key role in generating coherence. However, whether an electronic system in a fermionic environment enables the realizations of steady coherence and performance improvement is rarely discussed.

Prof. Chang-Pu Sun's group in CSRC apply quantum effects to design a photoelec-tric converter based on a three-level QD under non-equilibrium environment. We show that, by adopting a pair of suitable degenerate states, quantum coherences exist steadily in nano-electronic systems. It follows from the Born-Markov approximation that the interference due to coherent transitions can be simultaneously induced by the sunlight and the left-fermionic bath, leading to two different nondiagonal terms in the Lindblad-like master equation. The results of the thermodynamic analysis show that the quantum coherence is capable of improving the efficiency beyond the limit of a system whose quantum

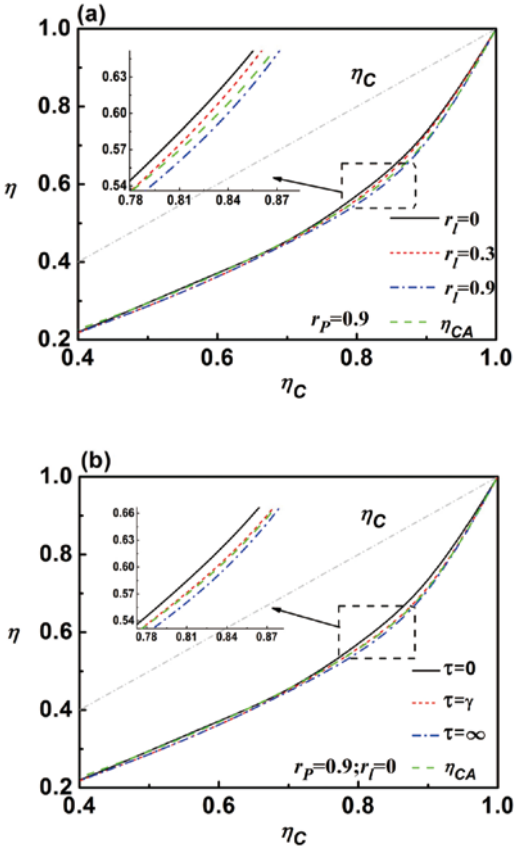

Fig. 2. The efficiency at maximum power and the Curzon-Ahlborn efficiency (green dashed line) as a function of Carnot efficiency η_c for different values of r_l (a) and the decoherence rate τ (b). The inserted figure shows an enlargement of the representative part of each plot.

effects are absent. Particularly, the efficiency at maximum power is no longer limited to η_{CA} through the manipulation of carefully controlled quantum coherences. The application of quantum mechanics will bring new insight into understanding the fundamental problem in thermodynamics when it is applied to nano-electronic systems.

This work is supported by the by the National Natural Science Foundation of China (Grants No. 11421063 and No. 11534002), the National 973 program (Grants No. 2012CB922104 and No. 2014CB921403), and the Postdoctoral Science Foundation of China (Grant No. 2015M580964).

For more information, please see the paper: *"Photoelectric converters with quantum coherence"*, Su, Shan-He; Sun, Chang-Pu; Li, Sheng-Wen; Chen, Jin-Can, Phys. Rev. E 93, 052103. http://dx.doi.org/10.1103/PhysRevE.93.052103.

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MAGNON KERR EFFECT IN A STRONGLY COUPLED CAVITY-MAGNON SYSTEM

Hybridizing two or more quantum systems can harness the distinct advantages of different systems to implement quantum information processors 1. Recently, a cavity microwave photon-magnon system has attracted considerable attention (see, e.g., Refs. 2-4), because of the enhanced coupling between magnons in an yttrium iron garnet (YIG) single crystal and microwave photons in a high-finesse cavity. Based on the strongly coupled cavity-magnon system, coherent interaction between a magnon and a superconducting qubit was realized 5, and magnon dark modes in a magnon gradient memory 6 were utilized to store quantum information. Potentially acting as a quantum information transducer, microwave-to-optical frequency conversion between microwave photons generated by a superconducting circuit and optical photons of a whispering gallery mode supported by a YIG microsphere was also explored 7. Now, a versatile quantum information processing platform based on the coherent couplings among magnons, microwave photons, optical photons, phonons, and superconducting qubits is being established.

However, all the outcomes were achieved in the linear regime. An extension of the cavity-magnon system to the nonlinear regime is expected to show interesting nonlinear effects in this system. Here Prof. Tie-Fu Li and Prof. Jian-Qiang You's group in CSRC report an experimental study of the nonlinear effect in a coupled cavity-magnon system at cryogenic temperature. The nonlinearity comes from the magnetocrystalline anisotropy of the YIG sphere, which corresponds to the Kerr term in the derived Hamiltonian of the system. The YIG sphere is attached on the inner wall of a three-dimensional rectangular cavity and the magnons in the YIG sphere are strongly coupled to the cavity microwave photons. When the YIG sphere is pumped to generate considerable magnons, the Kerr effect yields a perceptible shift of the cavity's central frequency and more appreciable shifts of the magnon modes. They derive an analytical relation between the magnon frequency shift and the drive power for the uniformly magnetized YIG sphere:

$$\left[\Delta_{\mathrm{m}}^2 + \left(\frac{\gamma_{\mathrm{m}}}{2}\right)^2\right]\Delta_{\mathrm{m}} - cP = 0 \qquad (1)$$

where Δ_{m} is the frequency shift of the magnon mode, γ_{m} is the damping rate of the magnon mode is the power of the microwave drive field on the YIG sphere, and P is a constant that reflects the coupling strength between the drive field and the YIG sphere. They found that it agrees very well with the experimental results of the ferromagnetic resonance mode (i.e., Kittel mode) of the YIG sphere. Our study paves the way to explore nonlinear effects in the cavity-magnon system.

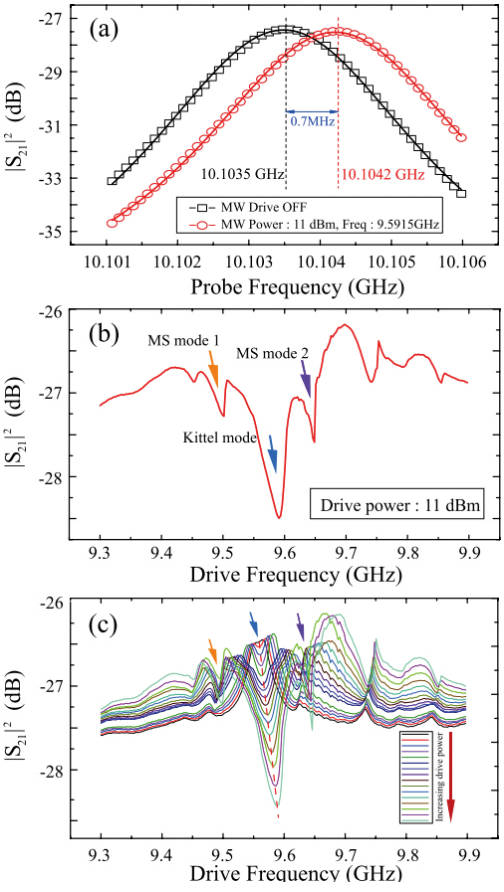

Fig. 1. (a) Central frequency shift of the cavity mode TE102 when the drive field is on (red curve) and off (black curve), respectively. (b) Transmission spectrum of the cavity measured as a function of the drive-field frequency. The blue arrow indicates the response of the Kittel mode, whereas the orange and purple arrows indicate the magnetostatic mode (MS) modes 1 and 2, respectively. (c) Transmission spectrum of the cavity measured as a function of the drive frequency by successively increasing the driving power. The probe field is fixed at 10.1035 GHz in both (b) and (c).

This work was supported by the National Key Research and Development Program of China (Grant No.2016YFA0301200), the MOST 973 Program of China (Grant No. 2014CB848700), and the NSAF (Grants No. U1330201 and No. U1530401).

For more information, see the paper: *"Magnon Kerr effect in a strongly coupled cavity-magnon system"*, Yi-Pu Wang, Guo-Qiang Zhang, Dengke Zhang, Xiao-Qing Luo, Wei Xiong, Shuai-Peng Wang, Tie-Fu Li, C.-M. Hu, and J. Q. You, **Physical Review B 94**, 224410 (2016). DOI: 10.1103/PhysRevB.94.224410.

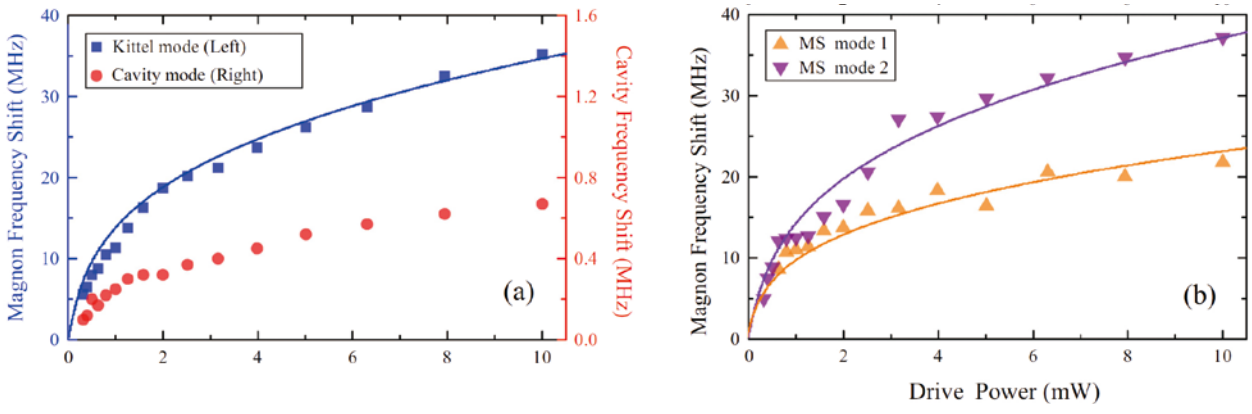

Fig. 2. (a) Frequency shift of the Kittel mode (blue square) and the central frequency shift of the cavity mode TE102 (red circle) measured at various values of the drive power. The blue fitting curve for the Kittel mode is obtained using Eq. (1). (b) Frequency shifts of the MS mode 1 (orange up-triangle) and MS mode 2 (purple down-triangle) measured at various values of the drive power. The corresponding orange and purple fitting curves also are obtained using Eq. (1). The frequency shifts of the Kittel mode, MS mode 1, and MS mode 2 are here referenced from 9.5526, 9.4758, and 9.6174 GHz, respectively.

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METALLIC GLASS AS HIGH PERFORMANCE CATALYST FOR HYDROGEN PRODUCTION

Hydrogen is one of the most promising and appealing alternative energy resources of fossil fuels to tackle the current energy crisis and environmental issues. Electrochemical water splitting with high efficient catalyst is one of the main methods to produce hydrogen. How to improve the performance of the catalysts, including the activity and durability, is crucial for promoting the application of hydrogen energy. The currently reported catalysts including the commercial Pt/C catalyst are mainly crystalline, in which the activity is influenced by the metastable local structures. Recently, by combining experimental characterizations and theoretical computations, the research group lead by Prof. **Peng-Fei Guan at Beijing Computational Research Center (CSRC)**, collaborated with Prof. Wei-Hua Wang's group in Institute of Physics, Chinese Academy of Sciences, and Prof. Chun-Wen Sun's group in Beijing Institute of Nanoenergy and Nanosystems, Chinese Academy of Sciences, National Center for Nanoscience and Technology (NCNST), discovered that metallic glass could be highly efficient and self-stabilizing catalyst for water splitting. The work is mainly done by the visiting student, Yuanchao Hu and the postdoc, Rui Su of our Center.

Metallic glasses are amorphous materials fabricated by rapidly quenching the high-temperature melts. The disordered structure gives rise to their outstanding mechanical and physical properties, such as high strength, excellent corrosion resistance and superior soft magnetism etc. In addition, this latest research shows the astonishing potential of metallic glasses as functional materials to catalyze electrochemical reactions. Based in the computational simulations, we unveil the underlying atomic-scale mechanism of the excellent comprehensive performances of the amorphous alloys, which provides new approaches for designing novel catalysts with better performance.

For more information, please see the paper: 'A Highly Efficient and Self-stabilizing Metallic Glass Catalyst for Electrochemical Hydrogen Generation' Hu YC, Wang YZ, Su R, Cao CR, Li F, Sun CW, Yang Y, Guan PF, Ding DW, Wang ZL, Wang WH Advanced Materials, 2016; DOI: 10.1002/adma.201603880.

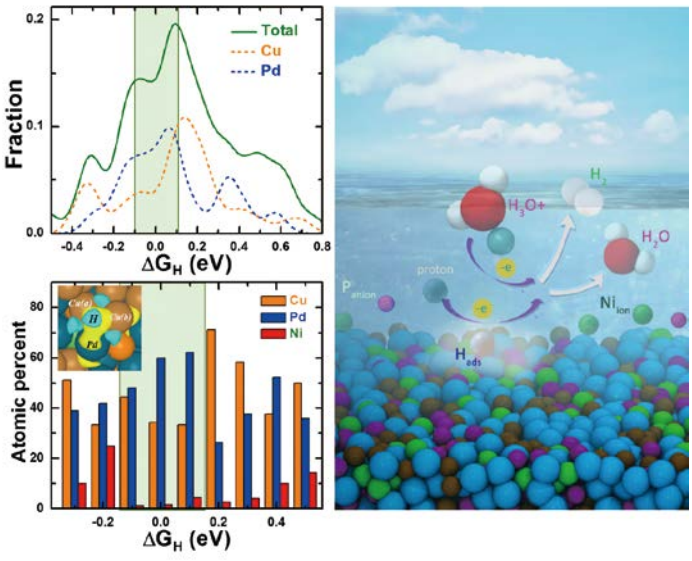

Figure: (left) Free energy ΔG_H distribution of HER on different adsorption sites on the amorphous surface and the chemical environment of adsorption sites with various ΔG_H. (right) The diagram related to the atomic-scale mechanism of the excellent comprehensive performances of the amorphous alloys.

RESEARCHS REVEAL THE ORIGIN OF HIGH H EVOLUTION ACTIVITY OF SINGLE PLATINUM CATALYSTS ON NITROGEN-DOPED GRAPHENE

Hydrogen is generally thought to be one of the most promising energy sources of the 21st century, and platinum-based catalysts are widely considered to be the most effective electrocatalysts for the hydrogen evolution reaction (HER). Unfortunately, Pt is expensive and scarce, limiting the commercial potential for such catalysts. In order to overcome the challenges associated with the Pt HER catalysts and to drive the cost of H2 production down from water electrolysis, it is very important to dramatically decrease the Pt loading and increase the Pt utilization efficiency. Currently, the typically supported Pt nanoparticles (NPs) catalyst limit the majority of the Pt atoms to the particle core, deeming them ineffective as only surface atoms are involved in the electrochemical reaction. Thus, further reducing the size of the Pt NPs to clusters or even single atoms to decrease the noble metal usage and increase their catalytic activity is highly desirable. However, in practical applications, controlled and large-scale synthesis of stable single atoms and clusters remains a considerable challenge due to the natural tendency for these active metal atoms to diffuse and agglomerate.

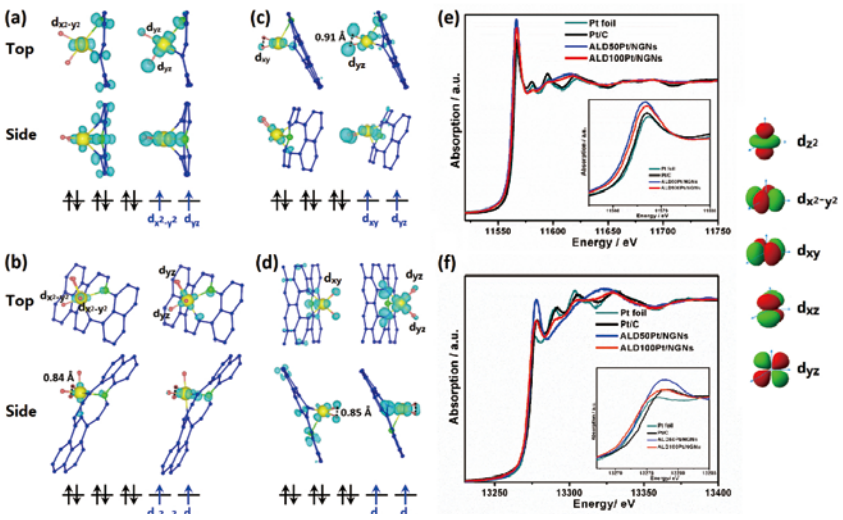

Fig. 1. (a)-(d) The hybrid orbitals between the Pt and H atoms for the 2 H and 4 H atoms adsorption on the Pt single atom. (e)-(f) The normalized XANES spectra at the Pt L_3- and L_2- edge of the ALDPt/NGNs, Pt/C catalysts, and Pt foil, respectively.

A group of researchers at CSRC, led by Dr. Li-Min Liu, has worked together with Prof. Xueliang Sun' group at University of Western Ontario and Prof. Gianluigi A. Botton at McMaster University to explore an effective means to synthesize the stable single-atom catalyst on a large scale. Utilizing a combined aberration corrected scanning transmission electron microscopy (STEM) and density functional theory (DFT) calculations, the atomic layer deposition (ALD) technique has been proven to successfully fabricated single Pt atoms supported by nitrogen-doped graphene nanosheets (NGNs) for the HER. From DFT analysis, the stabilization mechanism of single Pt atom on N-doped graphene was uncovered. They have discovered that the remarkable performance of the single Pt atoms on the NGNs arise from their small size and the unique electronic structure originating from the partially unoccupied density of states of the platinum atoms' 5d orbitals. This study paved the way for the investigation of the electrocatalytic activity properties and the electronic structure of other single atom catalysts.

For more information, please see the paper: *"Platinum single-atom and cluster catalysis of the hydrogen evolution reaction"*, Niancai Cheng#, Samantha Stambula#, Da Wang# , Mohammad Norouzi Banis, Jian Liu, Adam Riese, Biwei Xiao, Ruying Li, Tsun-Kong Sham, Li-Min Liu*, Gianluigi A. Botton*, and Xueliang Sun*, **Nature Commutations**, 7, 13638 (2016). (#equal contribution to this work).

UNCOVER THE EFFECTIVE CONFINEMENT OF LITHIUM-POLYSULFIDES AND ENHANCED REACTION KINETICS OF SULFUR ON MONOXIDE@ CARBON HOLLOW NANOSPHERES

Lithium-sulfur (Li-S) batteries exhibit great advantages for next generation electrical energy storage and conversion due to their high theoretical energy density, low cost and environmental friendliness. However, the commercialization of the rechargeable Li-S battery is still hindered by several issues such as the inherent poor electronic conductivity of sulfur and its discharge products (Li2S/Li_2S_2), the dissolution of intermediate lithium polysulfides (LiPSs), as well as the large volumetric expansion upon full lithiation. Thus, it is vital to enhance the conductivity of the sulfur cathode and moderate the dissolution of lithium polysulfides for the application of lithium-sulfur batteries.

A group at CSRC, led by Dr. Li-Min Liu, has worked together with Prof. David Lou's group at Nanyang Technological University, and they discovered a new sulfur host based on highly conductive polar TiO@C hollow nanospheres for lithium-sulfur batteries. This host can maximize the effectiveness of moderating LiPSs diffusion and enhance the redox reaction kinetics of sulfur species at the same time. The extensive first-principles calculations and the experiments indicate that titanium monoxide@carbon hollow nanospheres with inherent metallic conductivity and strong adsorption capability for lithium-polysulfides can not only generate sufficient electrical contact to the insulating sulfur for high capacity, but also effectively confine lithium-polysulfides for prolonged cycle life. This work overcomes the major limitations associated with other polar and nonpolar sulfur hosts, and may open up the prospect of constructing more efficient nanostructures for moderating the diffusion of LiPSs and enhancing the reaction kinetics of sulfur.

For more information, please see the paper: *"A sulfur host based on titanium monoxide@carbon hollow spheres for advanced lithium-sulfur batteries"* Zhen Li, Jintao Zhang, Buyuan Guan, Da Wang, Li-Min Liu*, Xiong Wen (David) Lou*, **Nature Commutations**, 7, 13065 (2016).

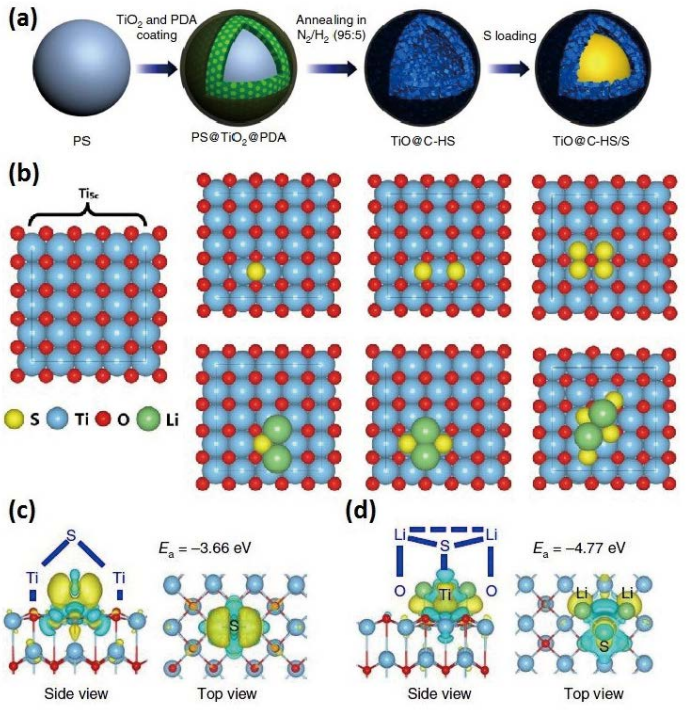

Fig. 1. (a) Synthesis process of the TiO@C-HS/S composite. (b) The optimized geometries for the interaction between Sx and Li_2S_x (x = 1, 2 and 4) on TiO (001) surfaces. (c)-(d) Isosurface of the charge density difference for (c) S and (d) Li_2S adsorbed on TiO (001).

TWO-DIMENSIONAL SIS LAYERS ARE PREDICTED TO HAVE SUPERB ELECTRONIC AND OPTOELECTRONIC PROPERTIES

Converting solar energy into electricity or chemical energy with high efficiency and low cost plays an important role in our nation's long term energy security, economy, and environmental sustainability. A key issue in this endeavor is to find or design new renewable energy materials with stable structure and superb electronic and optoelectronic properties. Two-dimensional (2D) materials have many novel properties suitable for electronic and optoelectronic applications. However, all current 2D materials have shortcomings that limit their performances. For example, graphene, as the first extensively studied 2D material, has excellent carrier mobility, but its semi-metallic behavior and lack of bandgap limit its applications in electronics. Monolayer TMDs such as MoS2, show direct bandgaps and self-healing properties in air, but their less dispersive band edges with relatively localized transition metal d character result in relatively heavy carrier effective masses and thus not so good mobility for high-performance applications. Moreover, bandgaps change from being direct into indirect when TMDs change from mono- to multi-layers, thus limiting the flexibility of tuning its electronic properties through layer controls. Phosphorene and few-layer black phosphorous have shown good mobility and good flexibility of tuning properties by layer control and anisotropic engineering. However, their poor stability leads to rapid degradation when exposed to air. While much effort has been devoted to improve the properties of these current 2D materials, it is still highly desirable to find new 2D materials with exceptional material properties for renewable energy applications.

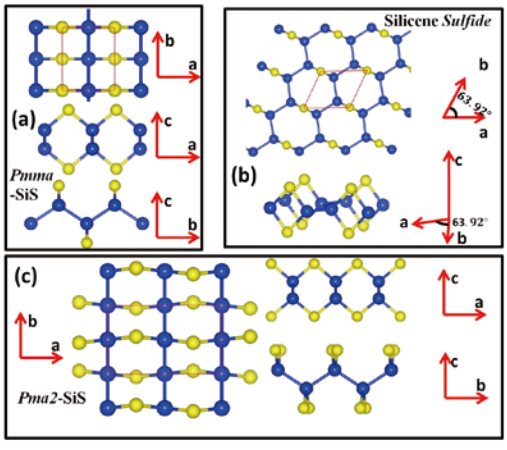

Fig. 1. Top and side views of structures for (a) *Pmma*-SiS, (b) silicene sulfide of Cmmm symmetry, and (c) *Pma2*-SiS. Blue is for Si and yellow is for S atoms.

Prof. Su-Huai Wei at the **Beijing Computational Science Research Center**, in collaboration with Dr. Ji-Hui Yang at the National Renewable Energy Laboratory and Rice University, USA, and a group led by Prof. X. G. Gong in Fudan University, have predicted, by using atomic transmutation and differential evolution global optimization methods in conjunction with first-principles density functional theory (DFT) calculations, two group IV-VI 2D materials, *Pma2*-SiS and silicene sulfide with superp material properties. *Pma2*-SiS is found to be both chemically, energetically, and thermally stable. Most importantly, *Pma2*-SiS has shown good electronic and optoelectronic properties, including direct bandgaps suitable for solar cells, good mobility for nanoelectronics, low thermal conductivity for thermal electric devices, good flexibility of property tuning by layer control and strain appliance, and good air stability as well. Therefore, *Pma2*-SiS is expected to be a promising 2D material in the field of 2D electronics and optoelectronics. The designing principles demonstrated in identifying these two tantalizing examples have great potential to accelerate finding of new functional 2D materials.

For more information, please see the paper: "*Two-dimensional SiS layers with promising electronic and optoelectronic properties: Theoretical prediction*", J.-H. Yang, Y. Zhang, W.-J. Yin, X. G. Gong, B. I. Yakobson, and S.-H. Wei*, **Nano Lett. 16**, 1110-1117 (2016), (Pub. 7 Jan. 2016). **DOI**: 10.1021/acs.nanolett.5b04341.

This research was supported by Development Fund of China Academy of Engineering Physics and NSFC.

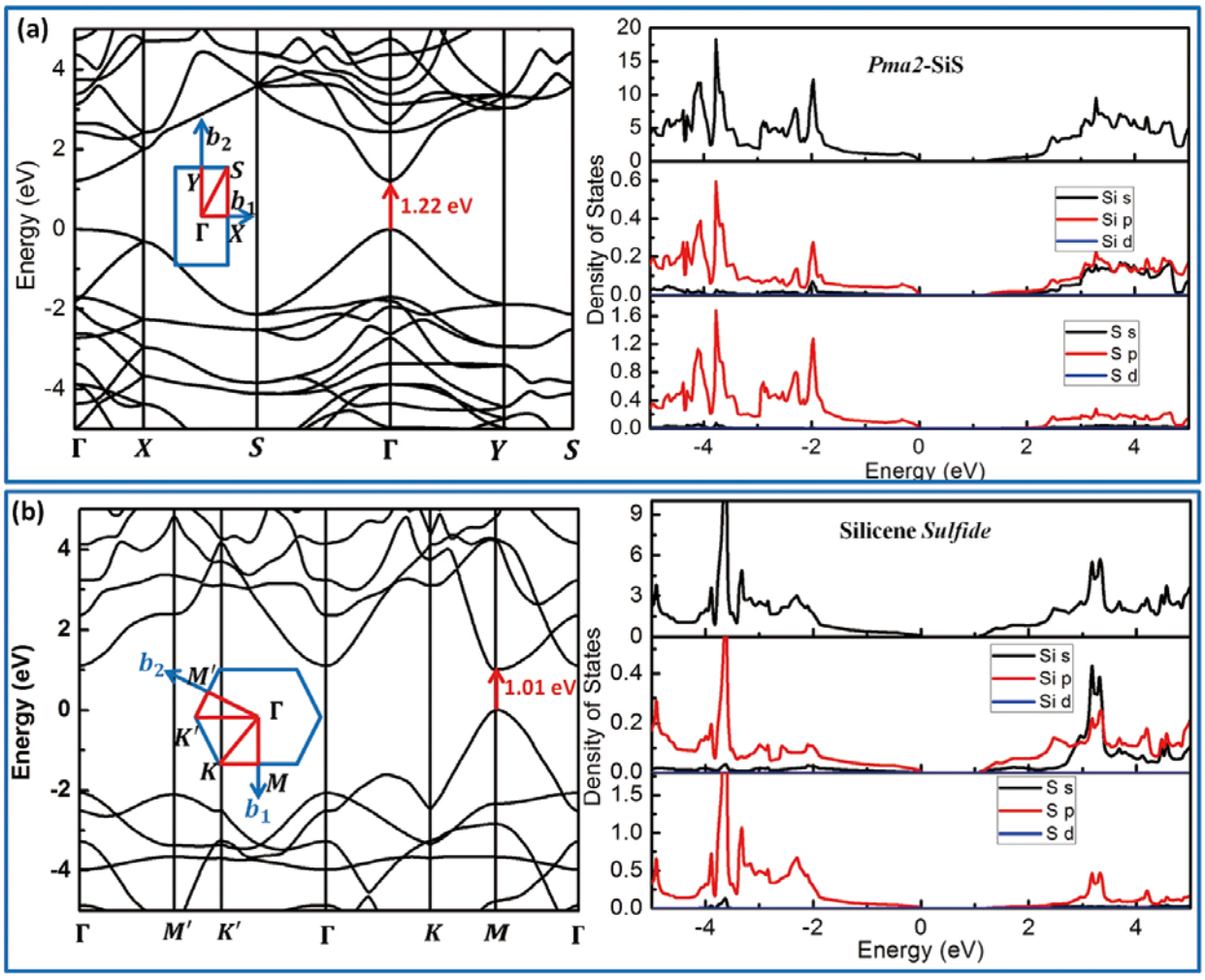

Fig. 2. Band structures and (partial) density of states for (a) *Pma2*-SiS and (b) *silicene sulfide*.

ORIGIN OF THE PUZZLING DIFFUSION BEHAVIORS OF CU AND AG IN SEMICONDUCTORS ARE UNRAVELED

Atomic diffusion is one of the critical factors in determining the performance and stability of semiconductor electronic and optoelectronic devices. Group IB elements Cu and Ag are important contact materials in semiconductor devices due to their low resistivity and high resistance to electromigration damage. However, they have very different diffusion behaviors in semiconductors: Cu diffuses much faster than Ag in covalent semiconductors like Si and GaAs, but Ag diffuses faster than Cu in more ionic II-VI semiconductors such as CdS and CdTe despite Ag has larger size than Cu. These puzzling behaviors have not only scientific interest but also technology applications because they hindered some practical application of Cu and Ag in semiconductor devices. For example, because of challenges related to the high diffusivity of Cu in Si, one has to use Ag as contact materials in Si solar cell despite Ag is more expensive. On the other hand, because Ag diffuses faster than Cu in more ionic CdTe, replacing Cu by Ag has failed because the fasr diffusion of Ag introduce instability despite Ag has better doping properties than Cu in CdTe. Despite the importance of Cu and Ag in semiconductor technology, the mechanisms behind their distinct diffusion behaviors in covalent and ionic semiconductors have not been addressed.

Working with Hui-Xiong Deng, Jun-Wei Luo, and Shu-Shen Li of the Institute of Semiconductors, CAS, Prof. Su-Huai Wei at the Beijing Computational Science Research Center have unraveled the underlying mechanisms of the puzzling diffusion behavior of Cu and Ag in semiconductors by combining the first-principles calculations and group theory analysis. They show that the important roles of the Coulomb energy, strain energy, and most importantly crystal symmetry enforced s-d coupling plays important roles in determining the diffusion behaviors of Cu and Ag in the covalent and ionic semiconductors. The s-d coupling is absent in pure covalent semiconductors but increases with the ionicity of the zinc-blende semiconductors, and the coupling strength of Cu, owing to its higher d orbital energy, is much larger than Ag. In conjunction with

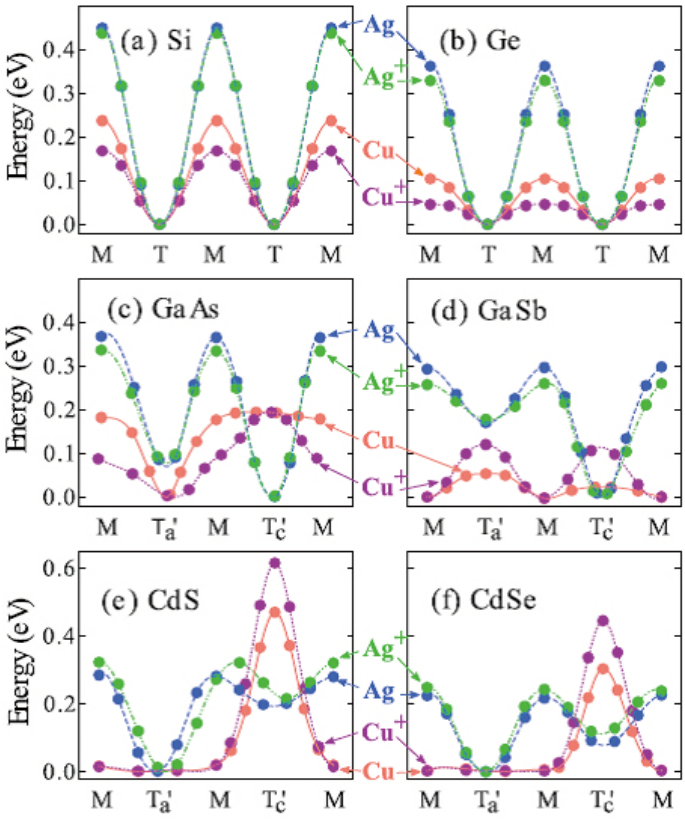

Fig. 1. The diffusion energy curves of Cu, Cu^+, Ag, and Ag^+ in the group IV elemental compounds, Si and Ge; group III-V compounds, GaAs and GaSb; and group II-VI compounds, CdS and CdSe. The Ta' and Tc' sites for Cu and Ag diffusion are slightly different.

Coulomb interaction and strain energy, the s-d coupling is able to explain all the diffusion behaviors of Cu and Ag in covalent to ionic semiconductors. The calculated results and explanation, therefore, provide deep understanding on the important diffusion behavior of impurity in semiconductors and enables us to engineering doping in semiconductors through diffusion, e.g., by designing alternative diffusion barriers for Cu and Ag or choosing different diffusers.

For more information, please see the paper: "*Origin of the distinct diffusion behaviors of Cu and Ag in covalent and ionic semiconductors*", H.-X. Deng, J.-W. Luo*, S.-S. Li, and S.-H. Wei*, **Phys. Rev. Lett. 117**, 165901 (2016), (Pub. 11 Oct. 2016). **DOI**: 10.1103/PhysRevLett.117.165901.

This research was supported by Development Fund of China Academy of Engineering Physics and NSFC.

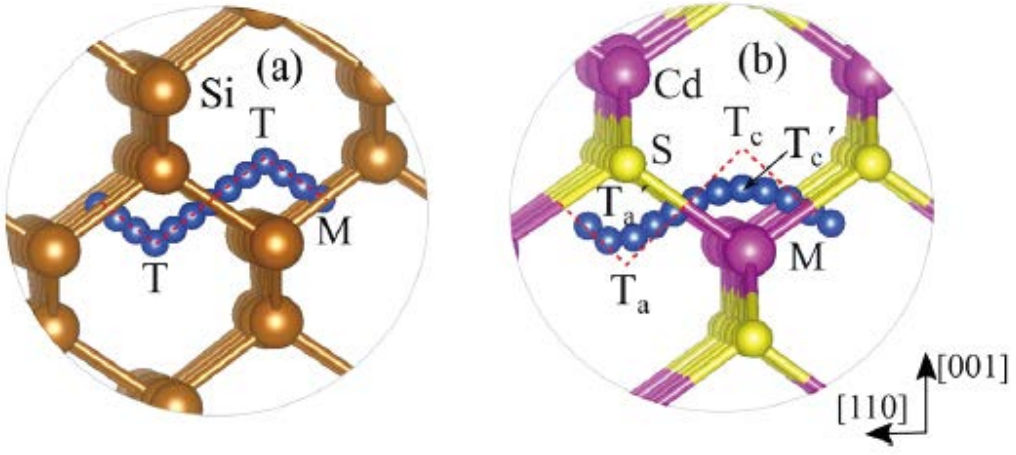

Fig. 2. The diffusion pathways of Cu in (a) Si and (b) CdS semiconductors. The red dashed lines indicate the [111] (or equivalent directions). In Si, the Cu diffusion path is exactly along the [111] (or equivalent directions). However, in CdS, it deviates from the [111] direction (or equivalent directions). We label the new sites near the Ta and Tc as the Ta' and Tc', respectively.

DISCOVER HIDDEN DISSIPATION FROM TRAJECTORY MEASUREMENT

Man-made and biological nano-devices and machines perform their function by staying out of thermal equilibrium. Recent advances in stochastic thermodynamics have made it possible to deduce entropy production and heat transfer from the system trajectory in the *full* phase space. Yet only the time series of a tiny subset of system variables is usually available in experimental measurements. A question of practical importance is whether one can reconstitute the "hidden energy dissipation" involving the vast number of unobserved variables through a *full temporal* measurement of the reduced set of variables[1-4]. Recently, Shou-Wen Wang and Lei-Han Tang at CSRC, together with their Japanese collaborators Kyogo Kawaguchi and Shin-ichi Sasa, have answered the question in the affirmative for a broad class of nano systems[5]. Their key idea is to employ the frequency spectrum of FDT violation to estimate hidden energy loss.

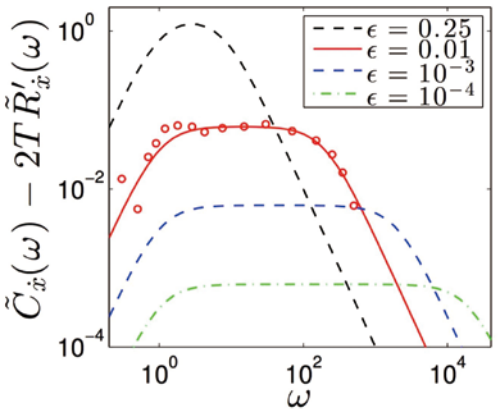

Fig. 1. Violation spectrum of the fluctuation-dissipation theorem (FDT) computed from the partially observed trajectory. The system (a colloidal particle) is imbedded in a fluid and is driven by an active process on a time scale $t_f = \varepsilon\tau$, where τ is time scale for viscous relaxation.

The fluctuation-dissipation theorem (FDT) is a hallmark of systems in thermal equilibrium. Previously, Harada and Sasa established an equality to connect energy dissipation in a given viscous channel to the violation of the FDT applied to the corresponding displacement variable. One way to generate energy flow through the system, as considered in Ref. [5], is to stir the displacement variable of a colloidal particle with an active noise. This active noise also brings the system out of equilibrium. When the perturbation is applied on a time scale much faster than the typical relaxation time of the variable in question, the frequency spectrum of the FDT violation, which can be constructed from high frequency time series measurement of the displacement variable, exhibits a characteristic plateau as shown in Fig. 1. Stiring increases fluctuations of the displacement variable and, at the same time, produces heat flow into the fluid. FDT violation in the displacement variable thus presents the "smoking gun" for hidden heat flow.

It turns out that the FDT violation plateau is a general feature of Markov systems whose state space can be partitioned into different coarse-grained blocks, with fast intra-block transitions and slow inter-block transitions. As the timescale separation parameter increases, the plateau extends proportionally in size while its amplitude diminishes, leaving the area underneath constant.

To our knowledge, the method proposed in Ref. [5] is currently the only protocol that can be used to reveal hidden dissipation from partially observed trajectories. The CSRC team is actively seeking collaboration with experimentalists to carry out proof-of-principle measurements in, e.g., laser manipulated colloidal systems.

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DIFFUSION OF ELLIPSOIDS IN BACTERIAL SUSPENSIONS

The diffusion of a small tracer in a surrounding medium provides a reliable means for probing material properties of complex fluids. Particularly, such a method has been used to investigate unique features of active fluids—a novel class of non-equilibrium soft materials where each individual in the system propels itself. The behavior of spherical tracers in active fluids is most clearly illustrated by the diffusion of colloidal spheres in suspensions of swimming microorganisms, which exhibit a super-diffusive behavior at short times and a dramatically enhanced translational diffusion at long times. The enhanced diffusion of passive particles such as nutrient granules, and extracellular products is of great biological importance, which maintains an active ecological balance, stimulates biomixing, and promotes intercellular signaling and metabolite transports. However, few natural particles have the perfect spherical symmetry and usually possess more than translational degrees of freedom. It is still an open question how and to what extent the enhanced translational diffusion of an anisotropic particle is influenced by other degrees of freedom, especially by its rotation.

Recently, the research group led by Prof. X. L. Xu at Beijing Computational Science Research Center, together with Prof. X. Cheng's group at the University of Minnesota investigated the diffusion of isolated ellipsoids in a quasi-two-dimensional bacterial bath. Their study shows a nonlinear enhancement of both translational and rotational diffusions of ellipsoids. More importantly, they uncover an anomalous coupling between particles' translation and rotation that is strictly prohibited in Brownian diffusion. The coupling reveals a counter-intuitive anisotropic particle diffusion, where an ellipsoid diffuses faster along its minor axis. Combining experiments with theoretical modeling, it is shown that such an anomalous diffusive behavior arises from the generic straining flow of swimming bacteria. This work illustrates an unexpected feature of active fluids and deepens the understanding of transport processes in microbiological systems.

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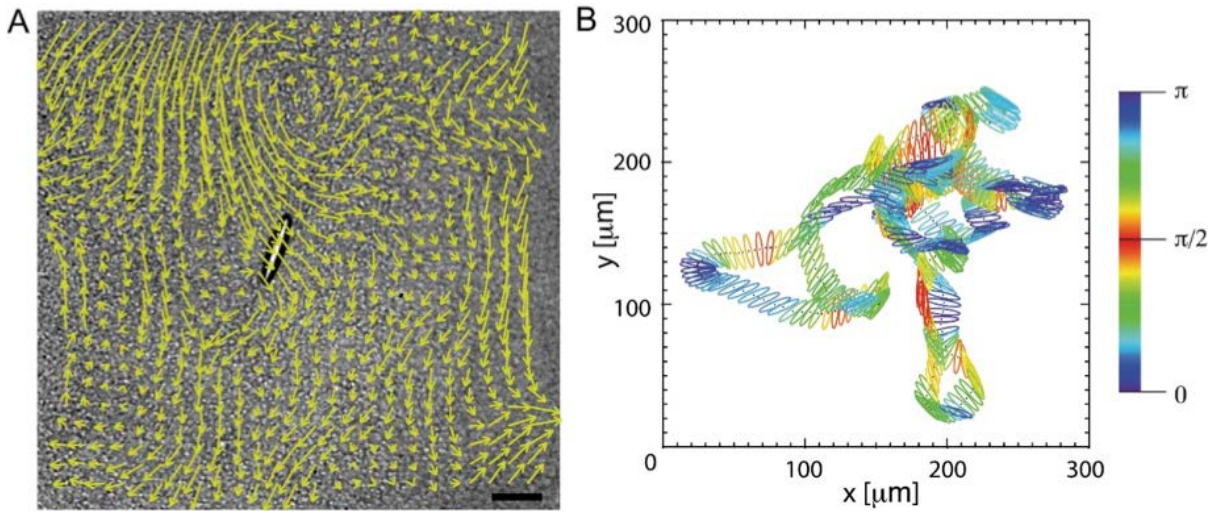
Fig. 1. Diffusion of an ellipsoid in quasi-two-dimensional bacterial bath. (A) Velocity field of swarming bacteria around an ellipsoid obtained from particle image velocimetry (PIV). Scale bar: 20 um. (B) Trajectory of an ellipsoid in a time interval $\Delta t = 0.2$ s. The trajectory is obtained from a custom algorithm for particle tracking velocimetry (PTV). The center of mass of the tracer at each time is indicated by one black dot. The color indicates the orientation of the tracer with respect to the x axis fixed in the lab frame.



TOO MUCH REGULARITY MAY FORCE TOO MUCH UNIQUENESS

The numerical solution of fractional-order differential equations has attracted much attention in the last 10 years; the MathSciNet database records 432 papers in this category since 2007. But there is an anomaly in almost all of this work: although it is well known that for smooth data, typical solutions of fractional-derivative initial-value and boundary value problems exhibit weak singularities at one or more boundaries of the domain, nevertheless the vast majority of published papers assume that the solutions that they approximate are very smooth globally — which of course simplifies greatly their numerical analysis. This assumption of smoothness has been "sold" as putting only a mild restriction on the problem and thereby justifying this simplification in the analysis. But now, in a new paper, Prof. Martin Stynes at CSRC show that the smoothness assumption greatly restricts the class of problems studied and is therefore unacceptable.

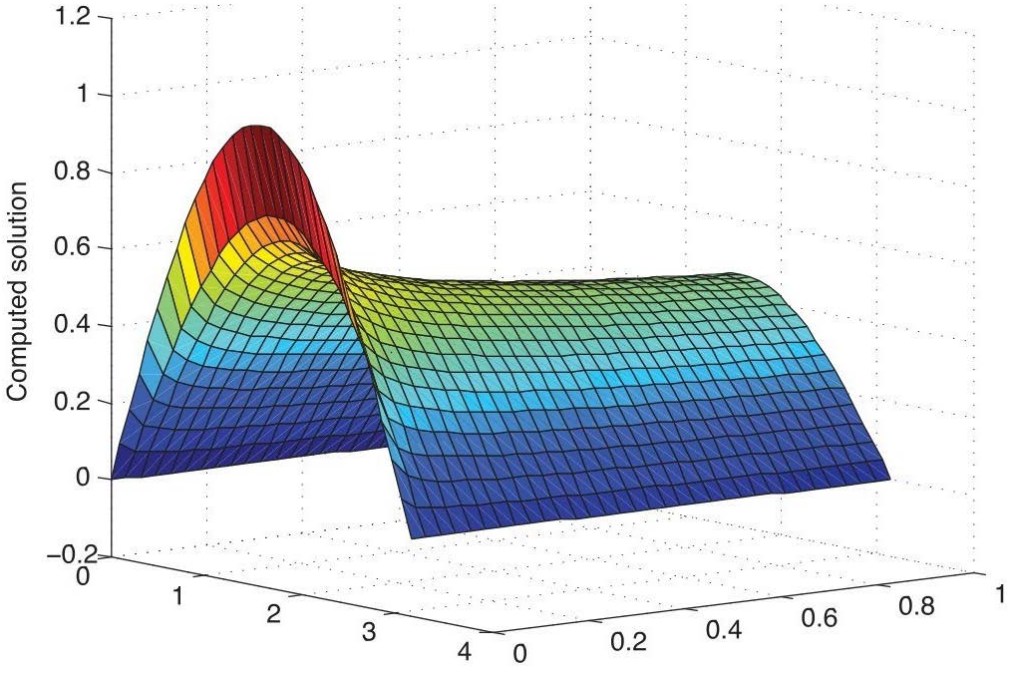
The type of problem that he consider in his paper is the most popular one studied in the literature: time-dependent initial-boundary value problems on a bounded domain in one space variable, where the time derivative is a Caputo fractional derivative of order α, with $0 < \alpha < 1$ (fractional parabolic type) or $1 < \alpha < 2$ (fractional hyperbolic type). For smooth and compatible data, typical solutions $u(x, t)$ to such problems are continuous on the closed space-time domain but are weakly singular: when $0 < \alpha < 1$ the derivative $\partial u / \partial t$ blows up at the initial time $t = 0$, and when $1 < \alpha < 2$ the derivative $\partial^2 u / \partial t^2$ blows up at $t = 0$.

A typical solution for a fractional parabolic problem is shown in the Figure: it is continuous on the closed domain, smooth in the space variable, but its derivative $\partial u/\partial t$ becomes infinite at the initial time $t = 0$.

The main result in our paper is that, if one assumes even slightly more regularity than is generally true of typical solutions, then the initial condition is determined uniquely by the other data of the problem — which is completely unnatural. For example, if one considers the fractional heat equation with zero boundary data and an arbitrary smooth initial condition that vanishes at the two corners of the space-time domain, then the assumption that $\partial u/\partial t$ is continuous on the closed domain will imply that the solution of the problem must be the trivial function $u(x, t) \equiv 0$.

Reference:

Martin Stynes, Too much regularity may force too much uniqueness, Fract. Calc. Appl. Anal. 19 (2016), no.6, pages 1554--1562.



OPTIMIZATION-BASED SHRINKING DIMER METHOD FOR FINDING TRANSITION STATES

Finding transition states on a complex energy landscape, that are given by index-one saddle points of the energy,is a challenging problem that arises in various scientific fields like physics, chemistry, biology and materials science[1]. It has attracted much attention in many interesting applications. A recent review on numerical algorithms for transition states can be found in [?].

In [3], Zhang and Du proposed the shrinking dimer dynamics (SDD) to compute index-1 saddle points, which may be viewed as the continuous limit of the original dimer method popularized by [4]. Inspired by the SDD, we propose a novel optimization-based shrinking dimer (OSD) method.

In the new OSD algorithm, by constructing the rotation and translation steps in the classical dimer method under an optimization framework, we are able to take advantage of more powerful optimization methods to substantially speed up the computation of transition states. Specifically, the Barzilai-Borwein gradient method [5] is proposed as an effective implementation of OSD. We show that the OSD method is the generalized formulation of the original shrinking dimer dynamics (SDD) and enjoys superlinear convergence. Various numerical examples are tested for both OSD and SDD methods, including some standard lower dimensional test examples, a cluster of seven particles, and nucleation in phase transformations. The results demonstrate that the OSD method with the proposed Barzilai-Borwein step size is very effective and provides a more efficient implementation than the original SDD algorithm. Our new algorithms offer potential to significantly advance the state-of-the-art in transition state search.

Lei Zhang (PKU) Qiang Du Zhenzhen Zheng (Postdoc, CSRC)
SIAM J. Sci. Compu., 38, A528A544, 2016.

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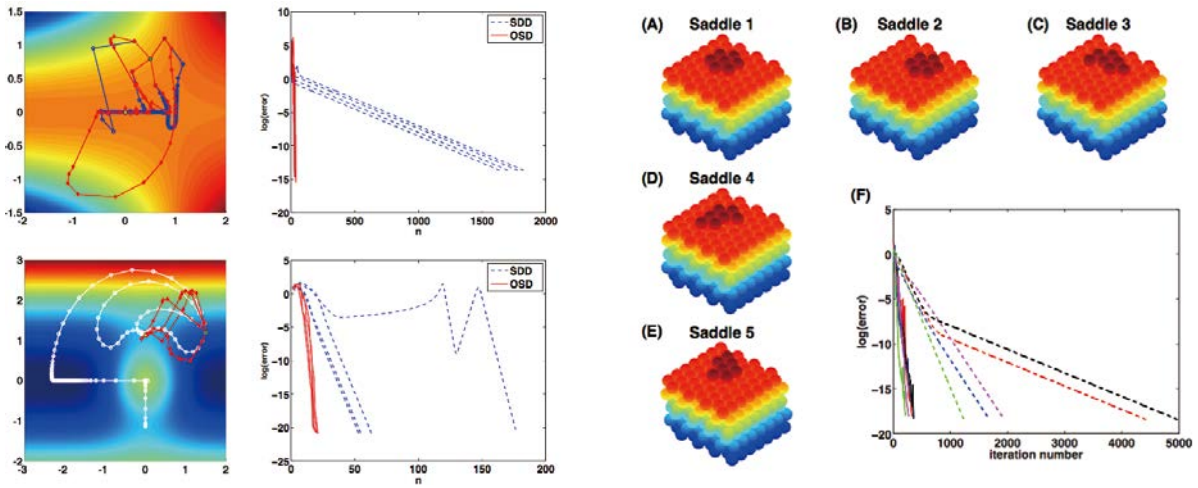
Fig. 1. Comparison of SDD and OSD for stingray and Eckhardt energies and a 7-atom island in an FCC crystal.



EFFICIENT SPECTRAL ELEMENT METHODS FOR EIGENVALUE PROBLEMS OF THE SCHRÖDINGER OPERATOR WITH AN INVERSE SQUARE POTENTIAL

The Schrödinger operator is extremely important in science and there are several different forms of this remarkable operator. The Schrödinger operator with the inverse square singular potential has attracted quite a large interest in the recent literature owing to its fundamental role both in mathematics and in physics. The inverse square potential represents an intermediate threshold between the regular potential and singular potential in nonrelativistic quantum mechanics [2,4]. Mathematically, the inverse square potential usually invokes strong singularities of the Schrödinger eigenfunctions [1,3]. In addition, the geometry of the domain such as the presence of reentrant corners also plays a critical role which may reduce the regularity of the eigenfunctions.

New tools and approaches are urgently needed for such Schrödinger operators both in analysis and in numeric. A breakthrough work in this direction was recently developed by the group of Prof. Zhimin Zhang in CSRC.
Consider the eigenvalue problem:

$$-\Delta u + \frac{c^2}{|x|^2}u = \lambda u \ \text{ in } \ \Omega, \qquad u = 0 \ \text{ on } \partial\Omega,$$

where Ω is a bounded domain in $\mathbb{R}^d$ such that the origin $0 \in \overline{\Omega}$.

There are three stages in our investigation: We start from a ball of any dimension, and design our novel spectral methods with non-polynomial basis functions to fit the singularities of the eigenfunctions. This effort immediately upgrades the spectral methods for this singular problem from an algebraic order of convergence to an exponential order.

At the second stage, we move to circular sectors in the two dimensional setting. Only in the tangential direction some modifications are needed from stage one.

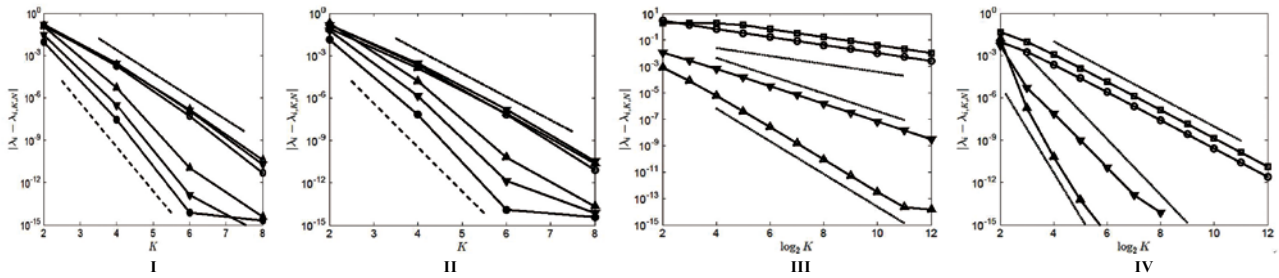


Fig. 1. Exponential order of convergence of our novel spectral method (I and II) vs. algebraic order of convergence of the traditional method (III, IV).

At the final stage, we extend the idea to arbitrary polygonal domains. We propose a mortar spectral element approach: a polygonal domain is decomposed into several sub-domains with each singular corner including the origin covered by a circular sector, in which origin and corner singularities are handled similarly as in the former stages, and the remaining domains are either a standard quadrilateral/triangle or a quadrilateral/triangle with a circular edge, in which the traditional polynomial based spectral method is applied. All sub-domains are linked by mortar elements.
In all three stages, exponential convergence rates are achieved. Numerical experiments indicate that our new methods are superior to the standard polynomial based spectral (or spectral element) methods and the hp-version finite element method using geometric meshes

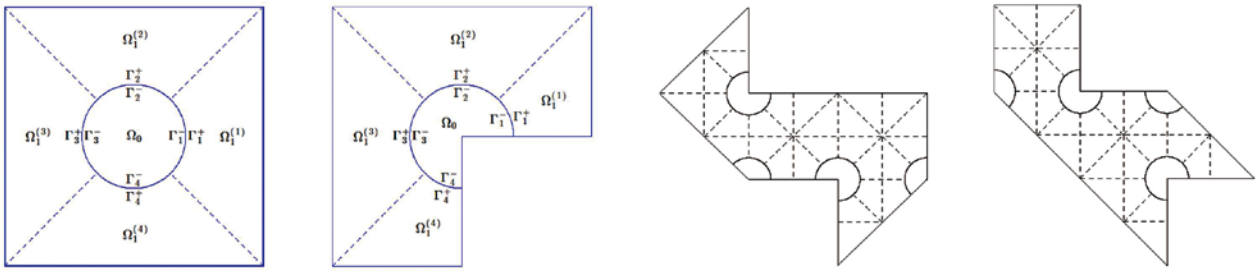


Fig. 2. Meshes on various geometries (square, L-shape domain and two iso-spectral domains).

which is known for the best convergence rate with the presence of corner singularities [5]. Our study offers a new and effective way to handle eigenvalue problems of the Schrödinger operator including the Laplacian operator on polygonal domains with reentrant corners.

For more information, please see a recent paper by Huiyua Li and Zhimin Zhang, *"Efficient Spectral and Spectral Element Methods for Eigenvalue Problems of Schrödinger Operator with an Inverse Square Potential"*, accepted for publication by SIAM Journal on Scientific Computing 39-1 (2017), A114-A140.

This research was supported by the National Natural Science Foundation of China under grants 11471031, 91430216.

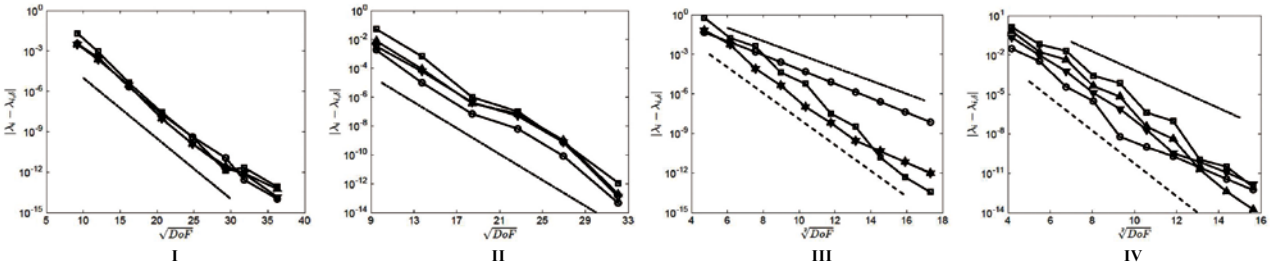


Fig. 3. A comparison on the convergence rates. I and II: $\exp(-\alpha_1\sqrt{DoF})$ of our novel SE methods; III and IV: $\exp(-\alpha_2\sqrt[3]{DoF})$ of the best-known hp-adaptive methods

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ENERGY QUADRATIZATION--A NEW TECHNIQUE FOR DISSIPATIVE PARTIAL DIFFERENTIAL EQUATION SYSTEMS

Models for thermodynamic systems and hydrodynamic systems can be derived using a nonequilibrium thermodynamic paradigm known as the generalized Onsager principle [2]. The models developed under this framework possess energy dissipative properties and variational structures. In order to solve the partial differential equations in the models, numerical methods should be designed in such a way to respect energy dissipation as wel as the variational structure. Such methods are called energy stable schemes. We have developed a fairly general strategy to develop energy stable numerical schemes for models derived from the generalized Onsager principle. The strategy has been applied to various model systems ranging from multiphase fluid flows to multiphase phase field models.

When the system is subject to periodic boundary conditions, we have developed fully discretized energy stable schemes for multiphase and liquid crystal fluid flows. For physical boundary conditions, we have energy stable schemes for semi-discretized systems. In some of the works, a new method, which we call the energy quadratization technique, was introduced to arrive at linear energy stable schemes. Both first order and second order in time schemes are developed [1, 3-17]. These methods are shown to be more accurate and efficient compared with the non-energy stable schemes.

In [17], we compare the model prediction of an incompressible binary fluid mixture flow model with a more physically sound quasi-incompressible model. The incompressible model gives a prediction that is independent of the density ratio of the two fluid components, while the quasi-incompressible model shows the sensitivity to the density ratio. The deviation is drastic when the density ratio is large, which directly cast a doubt on the appropriateness of using the incompressible model for mixture.

Fig 1 depicts the drop

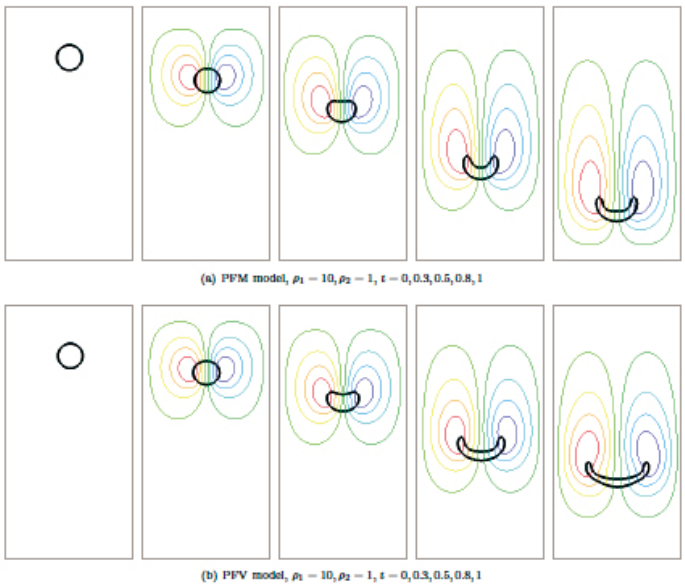

Fig. 1. Drop dynamics subject to gravity. A heavy fluid drop is falling under the influence of gravity. The top panel is the model prediction using a quasi-incompressible model, while the bottom one is the one using an incompressible model.

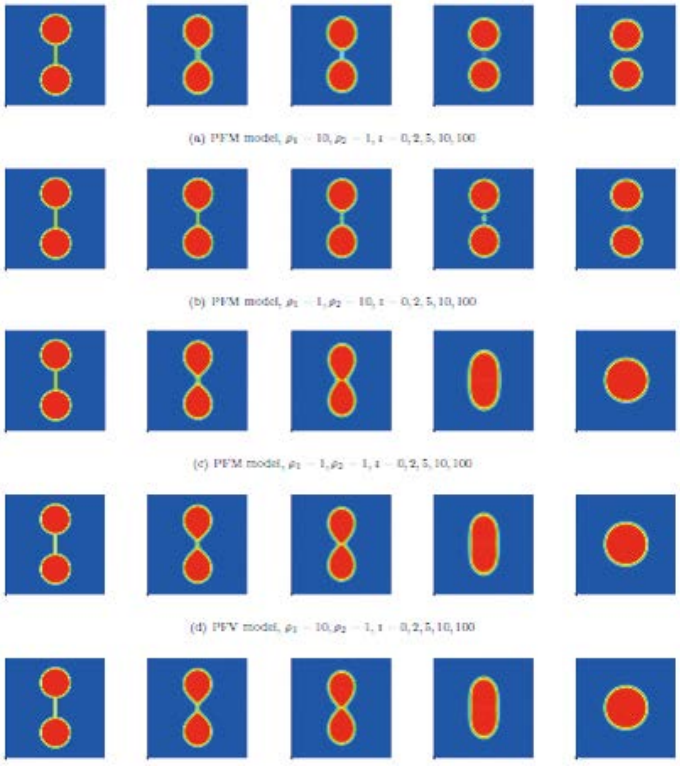

Fig. 2. Drop dynamics without the influence of gravity. The top three panels are the model prediction using the quasi-incompressible model with three different density ratios. The bottom two panels are the model prediction using the incompressible model with two differential density ratios, where the model does not discern the difference of the density ratio.

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QUANTUM MECHANICAL MODELING OF NANOSCALE LIGHT EMITTING DIODES

Understanding the electroluminescence (EL) mechanism in nanoscale light emitting diodes (LED) devices is crucial to further advance the technology for more efficient lighting and enhanced communications. From the theoretical perspective, accurate description of the electrical-to-optical conversion processes is a challenging task, since the system is in the non-equilibrium state driven by an optical and electric field. The prevailing studies evaluate the performance of LED devices based on classical models, relying on parameters obtained either from experiments or first-principles calculations. However, these models fail to capture quantum phenomena and break down at the nanoscale. Chi-Yung Yam's group in CSRC formulate a quantum mechanical approach for modeling the EL processes in nanoscale LED. Based on non-equilibrium Green's function quantum transport equations, interactions with the electromagnetic vacuum environment are included to describe electrically driven light emission in the devices. Taking into account the atomistic details and non-equilibrium statistics, EL spectra of nanoscale devices under different bias conditions can be simulated. Furthermore, the method offers the possibility of determining the radiation pattern and polarization of emitted light. This provides useful information for further improvement of the device performance as well as probing structural details in the junctions. The presented framework is illustrated by numerical simulations of a silicon nanowire LED device. EL spectra and emission characteristics of the nanowire device under different bias voltages are plotted in Fig.1.

A single broad emission peak is observed corresponding to transitions from the conduction band to the valence band. They note that the intensity of photon emission in general increases with an applied bias voltage. For a low bias voltage, no light emission is observed. As the forward bias approaches the flat band position, electrons and holes are injected simultaneously from electrodes. For carriers injected into the device, they can either flow directly from source to drain electrodes or undergo inelastic scattering through electron–photon interactions. The latter results in radiative recombination and gives rise to photon emission. The emission intensity therefore increases substantially when the applied bias exceeds the built-in potential of the system. The frequency of emitted photons is mainly determined by DOS and the electron distribution in the conduction and valence bands.

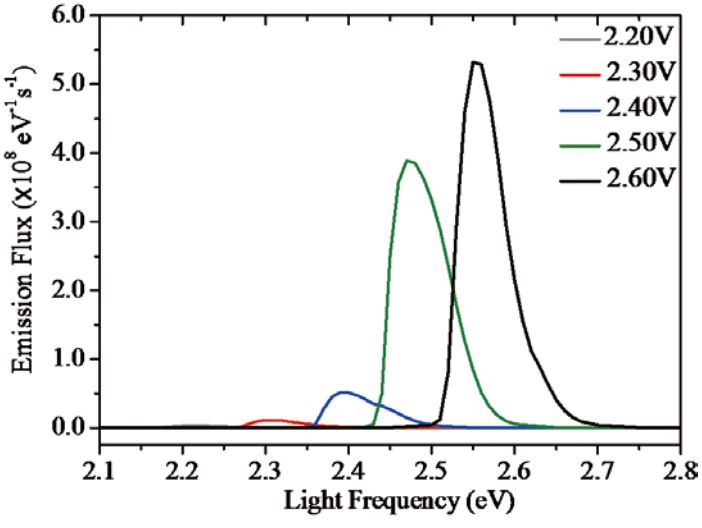

Fig. 1. Electroluminescence spectrum of the silicon nanowire LED device for various forware bias voltages.

For more information, please see the paper: *"Quantum mechanical modeling the emission pattern and polarization of nanoscale light emitting diodes"*, Wang, Rulin; Zhang, Yu; Bi, Fuzhen; Frauenheim, Thomas; Chen, GuanHua; Yam, ChiYung; **Nanoscale 8**, 13168-13173 (2016).

This research was supported by Development Fund of China Academy of Engineering Physics, NSFC and MOST.

COLLOIDAL MODERATE-REFRACTIVE-INDEX CU_2O NANOSPHERES AS VISIBLE-REGION NANOANTENNAS WITH ELECTROMAGNETIC RESONANCE AND DIRECTIONAL LIGHT-SCATTERING PROPERTIES

Magnetic resonance is required when producing negative-refractive-index metamaterials. However, nature lacks such materials that can support strong magnetic resonance in visible region. By properly designing plasmonic metal nanostructures, artificial magnetic resonance in visible region can be achieved, but the unavoidable electromagnetic energy loss due to Ohmic heating in metals reduces the performance of metamaterials made of metal nanostructures. Another type of materials that have been shown to support both electric and magnetic resonances is high-refractive-index dielectric nanoparticles, such as Si and Ge. In such nanoparticles, the electric resonances are derived from the oscillation of polarization charges, while the magnetic resonances are originated from the circular displacement currents that are excited inside the particle by incident light. However, the difficulty in the preparation of well-shaped and sized high-refractive-index dielectric nanostructures limits their practical use in materials.

Recently, the research group led by Prof. H. Q. Lin at Beijing Computational Science Research Center, together with Prof. J. F. Wang's group at the Chinese University of Hong Kong demonstrated that comparing with high-refractive-index dielectric nanospheres, moderate-refractive-index nanospheres

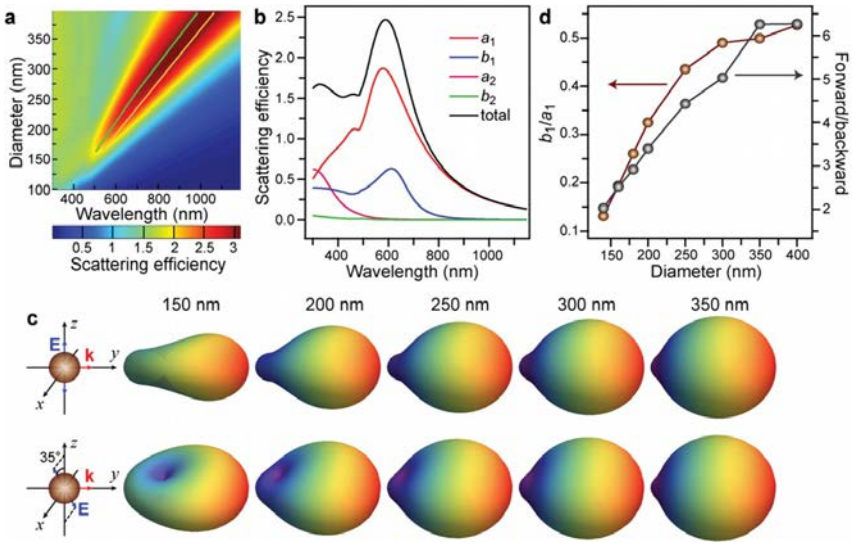

Fig. 1: Scattering properties of Cu_2O nanospheres. a) Evolution of the scattering of Cu_2O nanospheres as a function of the diameter. The orange and green lines indicate the spectral evolutions of the magnetic and electric dipole resonances, respectively. b) Total scattering spectra of a 200 nm Cu_2O nanosphere and the contributions from the electric and magnetic dipole and quadrupole resonances. c) FDTD-simulated far-field scattering patterns of five representatively sized Cu_2O nanospheres. In the lower row are the corresponding scattering patterns in a tilted view. The number above each scattering pattern is the diameter of the corresponding Cu_2O nanosphere. d) Ratios of b_1/a_1 and forward-to-backward scattering. In calculating the forward-to-backward scattering ratios, the scattering intensities at 0° and 180° directions are taken as the forward and backward scattering intensities, respectively.

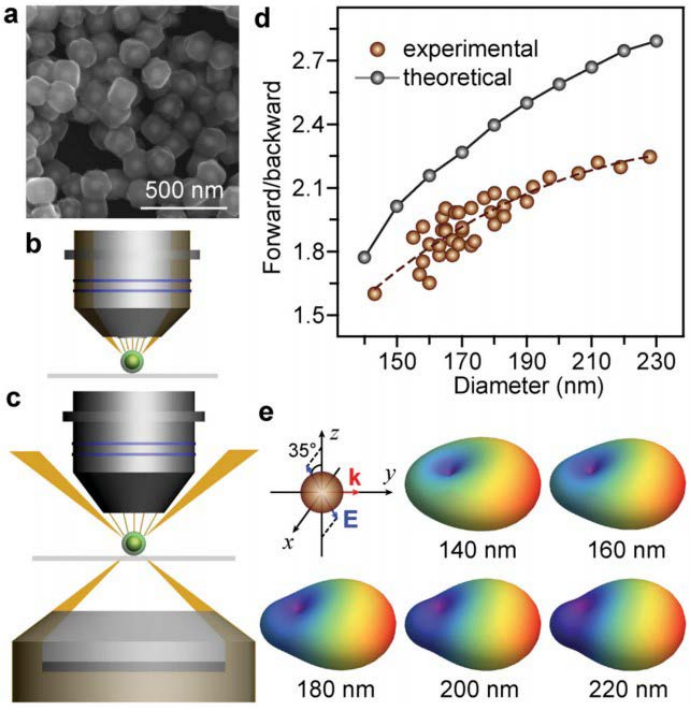

Fig. 2: Directional forward scattering of the Au@Cu_2O nanostructures. a) SEM image of the core@shell nanostructures with an overall diameter of 173 ± 9 nm and a gold core diameter of 60 ± 3 nm. b,c) Schematics of the setups for the backward and forward scattering measurements, respectively. d) Evolution of the ratio between the forward and backward scattering at the Cu_2O scattering peak as a function of the diameter of the entire nanostructure. The theoretical values were obtained from the FDTD simulations. The lines are guides to eyes. e) Far-field scattering patterns of five representatively sized Au@Cu_2O nanostructures at the Cu_2O scattering peak. The diameter of the entire nanostructure is given below each scattering pattern. The Au cores used in the FDTD simulations are all 60 nm in diameter.

were more suitable as directional nanoantennas. Although both high-refractive-index dielectric nanospheres and moderate-refractive-index ones can support strong magnetic resonances, the magnetic dipole resonance is well separated spectrally from the electric dipole resonance in high-refractive-index nanoparticles, while in moderate-refractive-index nanoparticles the magnetic dipole resonance overlaps with the electric dipole resonance. The spectral overlap of electric and magnetic dipole resonances enables directional forward scattering to occur at the total scattering peak of nanospheres in visible region, and the appropriate refractive index for the occurrence of spectral overlap is identified to be in the range of ≈1.7–3.0. Colloidal Cu_2O nanospheres synthesized chemically are chosen to demonstrate experimentally the directional forward scattering induced by spectral overlap of electric and magnetic dipole resonances in visible region, and the variation trend of measured forward-to-backward scattering ratios is in good agreement with those obtained from numerical simulations. This study opens a new direction for developing materials that can support magnetic resonances and for the design of dielectric nanoantennas and metamaterials.

Ref.: Zhang, S., Jiang, R., Xie, Y. M., Ruan, Q., Yang, B., Wang, J. & Lin, H.-Q. Colloidal moderate-refractive-index Cu_2O nanospheres as visible-region nanoantennas with electromagnetic resonance and directional light-scattering properties. Adv. Mater. 27, 7432; DOI: 10.1002/adma.201502917 (2015).

DIABOLICAL POINTS IN MULTI-SCATTERER OPTOMECHANICAL SYSTEMS

Optomechanical system, where radiation modes interact with mechanical elements, are receiving growing attention due to their promising applications as ultrasensitive sensors, quantum information processing elements and for preparing motional quantum states of large-scale structures. Remarkably, the ground-state cooling of the center-of-mass motion of a mechanical element was recently achieved. While the most basic optomechanical setup comprises of a driven optical cavity interacting with a mechanical mode, systems with multiple optical and mechanical modes offer much greater flexibility, and are currently actively investigated. Such more complex configurations can also give rise to phenomena that are qualitatively different from standard optomechanics.

A recent investigation [1] involving Stefano Chesi of CSRC and collaborators from ITP (Beijing) and Macquarie University has explored the occurrence of diabolical points in optomechanical systems. Suitable geometries of toroidal cavities with multiple scatterers were identified, where such singularities are shown to appear. The proposed configurations are relatively simple, being already close to several existing optomechanical setups. While the optomechanical coupling is usually derived by linearization in the (small) mechanical displacement, the coupling at such diabolical points would be necessarily non-analytic, since it is associated with an intrinsic singularity of the spectrum. The mechanical motion of the scatteres would make it possible to explore the conical spectrum and topological Berry phase associated to the diabolical point, as well as realize coherent transduction of photons in the two optical branches.

Ref.: [1] S. Chesi, Y.-D. Wang, and J. Twamley, "Diabolical points in multi-scatterer optomechanical systems", Scientific Reports 5, 7816 (2015), (pub. 15 January 2015). DOI: 10.1038/srep07816

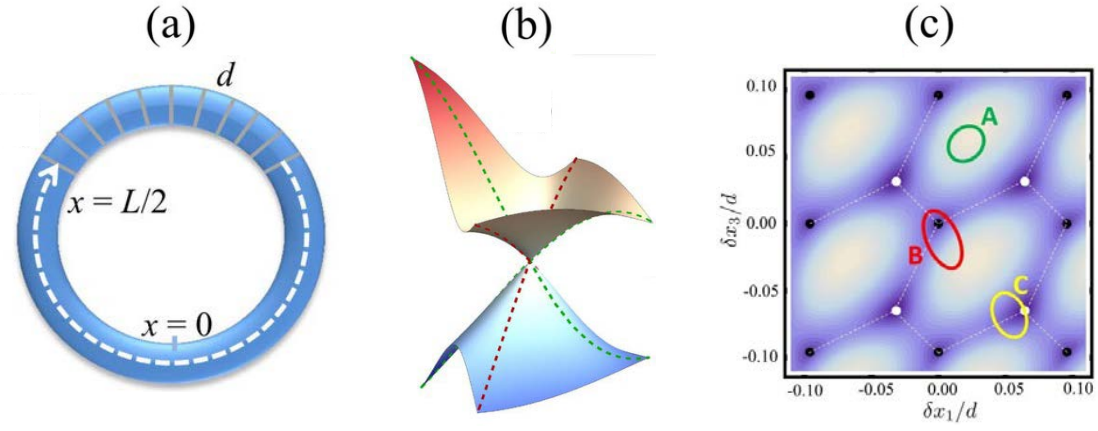

Fig. 1: (a): Schematics of a toroidal cavity with multiple scatterers. (b): Conical intersection in the optical spectrum. (c): Positions of diabolical points (black/white dots) as functions of the displacements of two of the scatterers. Different types of mechanical trajectories (A, B, C) of these two scatterers are illustrated.

THEORY OF NUCLEAR SPIN DEPHASING AND RELAXATION BY OPTICALLY ILLUMINATED NITROGEN-VACANCY CENTER

The electronic spin of the nitrogen-vacancy (NV) center in diamond and a few surrounding nuclear spins form a hybrid quantum register for applications in various quantum technologies such as quantum computation, communication, and nanoscale sensing. An important advantage of this solid-state quantum register is the long electron and nuclear spin coherence time *in the dark* and the capability of high-fidelity initialization and readout by optical illumination. However, the optically illuminated NV becomes a noisy environment that significantly shortens the coherence time (both the dephasing time T_2 and relaxation time T_1) of the nuclear spin qubits. In the past few years, this issue has been studied by many works, e.g., Dutt *et al.* [1] found the T_2 of a strongly coupled ^{13}C nuclear spin first increases and then saturates when the transverse magnetic field is decreased to zero. Dreau *et al.* [2] found the T1 of the ^{13}C nuclear spin is also limited by optical illumination under a longitudinal magnetic field. Up to date, the understanding about these experimental results remains phenomenological and qualitative [3].

In this year, Prof. Wen Yang and his group member bridge this gap between experimental observation and theoretical understanding by presenting a quantitative theory [4] that reveals the dependence of nuclear spin T_1 and T_2 on various experimentally measurable microscopic parameters. It not only provides a clear physical picture and quantitative explanation of the experimentally observed nuclear spin T_1 over a wide range of magnetic field (left panel of Fig. 1), but also identifies a hitherto undiscovered contribution to the nuclear spin T_2 that is not suppressed even under saturated illumination and/or vanishing magnetic field. This provides a possible solution to the puzzling observation of nuclear spin dephasing in zero transverse magnetic field [1] (right panel of Fig. 1).

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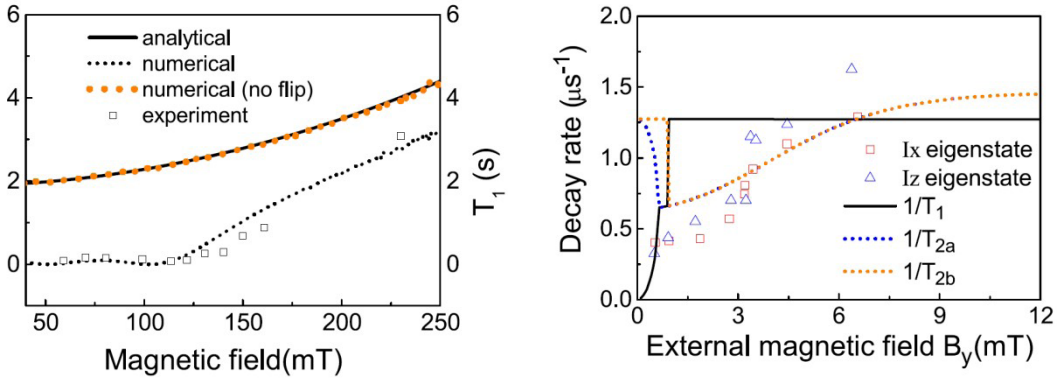

Fig. 1: Comparison between our theory and experimentally measured T_1 (left panel) from Ref. [2] and T_2 (right panel) from Ref. [1].

CAVITY QUANTUM ELECTRODYNAMICS WITH FERROMAGNETIC MAGNONS IN A SMALL YTTRIUM-IRON-GARNET SPHERE

Hybrid quantum circuits combining two or more physical systems can harness the distinct advantages of different physical systems to better explore new phenomena and potentially bring about novel quantum technologies. Among them, a hybrid system consisting of a coplanar waveguide resonator and a spin ensemble was proposed [1] and experimentally utilized [2] to implement both on-chip cavity quantum electrodynamics and quantum information processing. This spin ensemble is usually based on dilute paramagnetic impurities, such as nitrogen-vacancy centers in diamond and rare-earth ions doped in a crystal. By increasing the density of the paramagnetic impurities, strong and even ultrastrong couplings between the cavity and the spin ensemble can be achieved, but the coherence time of the spin excitations is drastically shortened. Indeed, it is a challenging task to realize both good quantum coherence of the spin ensemble and its strong coupling to a cavity.

Recently, collective spins in a yttrium-iron-garnet (YIG) ferromagnetic material were explored to achieve their strong [3] and even ultrastrong couplings [4] to a microwave cavity. In contrast to spin ensembles based on dilute paramagnetic impurities, these spins are strongly exchange-coupled and have a much higher density ($\sim 4.2\times10^{21}$cm^{-3}). Because of this high spin density, a strong coupling of the spin excitations to the cavity can be easily realized using a YIG sample as small as sub-milimeter in size. Moreover, the contribution of magnetic dipole interactions to the linewidth of spin excitations, which can have a dominant role among paramagnetic impurities, is suppressed by the strong exchange coupling between the ferromagnetic electrons. Thus, when the same spin density is involved, the spin excitations in YIG can exhibit much better quantum coherence than those of the paramagnetic impurities.

Very recently, Dengke Zhang *et al*. in the CSRC Quantum Physics and Quantum Information Division reported an experimental study of cavity quantum electrodynamics with ferromagnetic magnons in a small yttrium-iron-garnet (YIG) sphere at both cryogenic and room temperatures. They observed for the first time a strong coupling of the same cavity mode to both a ferromagnetic-resonance (FMR) mode and a magnetostatic (MS) mode near FMR in the quantum limit. This was achieved at a temperature ~22 mK, where the average microwave photon number in the cavity is less than one. At room temperature, they also observed strong coupling of the cavity mode to the FMR mode in the same YIG sphere and found a slight increase of the damping rate of the FMR mode. These observations reveal the extraordinary robustness of the FMR mode against temperature. The MS mode becomes unobservable at room temperature in their measured transmission spectrum of the microwave cavity containing the YIG sphere. Their numerical simulations showed that this is due to a drastic increase of the damping rate of the MS mode.

This work is supported by the NSAF Grant No. U1330201, the NSFC Grant No. 91421102, and the MOST 973 Program Grant Nos. 2014CB848700 and 2014CB921401.

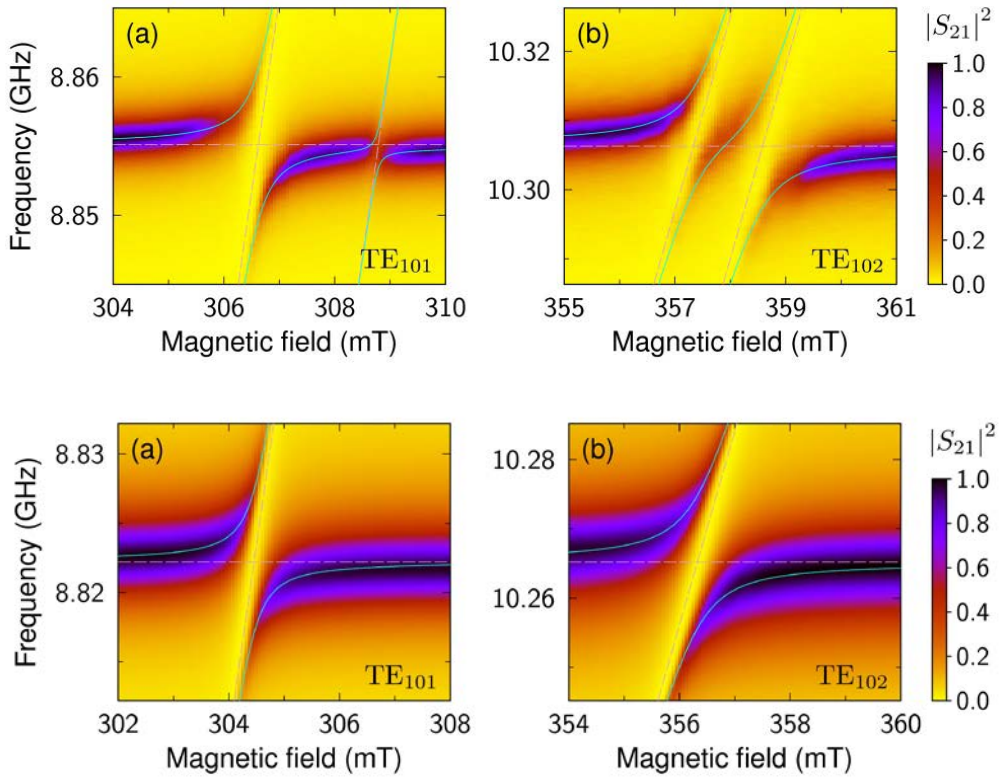

Fig. 1. The transmission spectrum of the 3D cavity with a small YIG sphere is measured as a function of the static magnetic field. Strong magnon–photon coupling achieved at cryogenic temperature (top) and room temperature (below) with different frequencies around (a) TE101 mode and (b) TE102 mode.

For more information, please see the paper: Dengke Zhang, Xin-Ming Wang, Tie-Fu Li, Xiao-Qing Luo, Weidong Wu, Franco Nori and JQ You, "Cavity quantum electrodynamics with ferromagnetic magnons in a small yttrium-iron-garnet sphere", *npj Quantum Information 1*, 15014 (2015). doi: 10.1038/npjqi.2015.14.

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ALLOY ENGINEERING ADDRESSES LONG-STANDING PROBLEM OF SEMICONDUCTOR DEFECTS

The performance of today's semiconductor electronic devices depends critically on how the charge carriers are introduced through doping and how defects in semiconductors affect their transport properties. Therefore, controlling the defect properties in a semiconductor materials is one of the most important issues in semiconductor physics. Despite many extensive studies in the last decades, so far, there is still a lack of effective methods for controlling defects, especially in a two-dimensional (2D) materials, which can have an adverse effects on the semiconductor's potential applications.

In a recent paper published in Physical Review Letters, CSRC physicists Bing Huang and Su-Huai Wei, in collaboration with other scientists at Oak Ridge National Laboratory and University of Utah, have demonstrated that alloy engineering, i.e., the mixing of two semiconductors, can be an effective way in reducing the levels of deep-level defects and their adverse effects without significantly changing the semiconductor's basic electronic structure. In previous strategies to control defects, the electronic structure is inadvertently changed, which leads to additional problems. As the scientists explain, this advantage is surprising, and arises from the fact that some physical properties (the electronic structure of the band edge states) depend on the global concentration of the alloy, whereas other physical properties (defects) depend only on the local concentration of the alloy (Fig. 1).

To demonstrate the new method, the researchers mix two transition metal dichalcogenides (TMDs), $MoSe_2$ and WSe_2, in different concentrations (Fig. 2). The most abundant and harmful defect in TMDs are anion vacancies, which occur in both $MoSe_2$ and WSe_2 as missing Se (selenium) ions. These vacancies can scatter or trap the charge carriers, such as the electrons

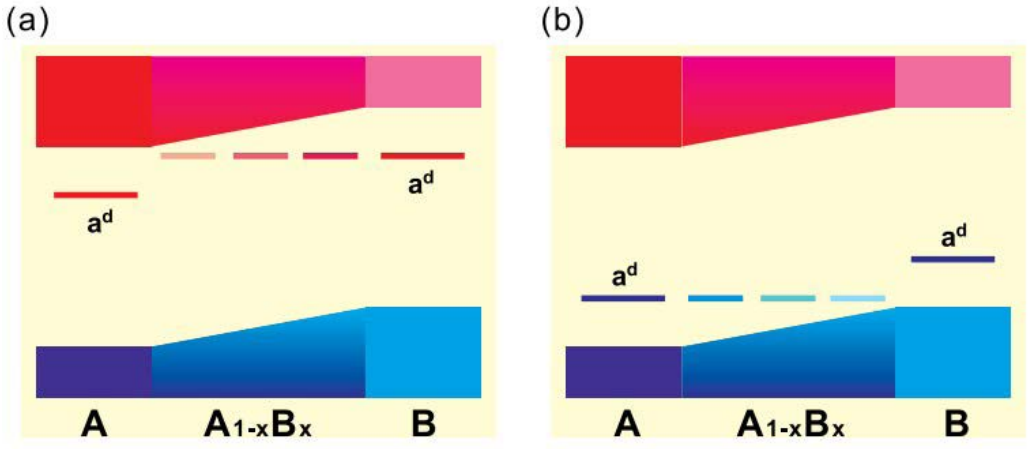

Fig. 1. Schematic plot of the concept for suppressing in-gap deep levels in semiconducting A and B compounds by alloying. Two different situations are considered: (a) the defect levels are closer to the CBM than the VBM, and (b) the defects levels are closer to the VBM than the CBM in A and B.

and holes, which decreases conductivity. Se vacancies also form more easily around W (tungsten) atoms than Mo (molybdenum) atoms, and so are mainly determined by their local environment, not the total W concentration. What the researchers showed here sounds somewhat counterintuitive at first: while the defect levels of the Se vacancies are very deep in both $MoSe_2$ and WSe_2, they become much shallower, and therefore less harmful, when these two TMDs are mixed together at low W concentrations.

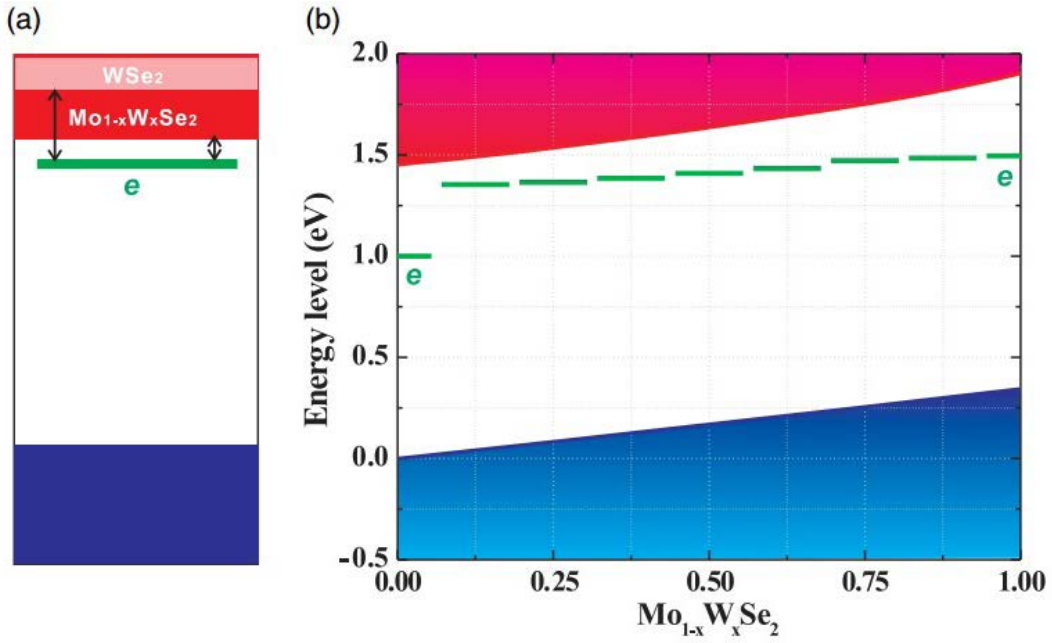

Fig. 2. (a) A schematic drawing of the in-gap e levels of V_{Se} in $M_{o1-x}W_xSe_2$. The in-gap e levels are locally deep in terms of the local WSe_2 environment but globally shallow in terms of the CBM of $M_{o1-x}W_xSe_2$. (b) The calculated average energy positions of in-gap e levels (at the ground state configuration of V_{Se}) in $M_{o1-x}W_xSe_2$ as a function of x.

For more information, please see the paper: ***"Alloy Engineering of Defect Properties in Semiconductors: Suppression of Deep Levels in Transition-Metal Dichalcogenides",*** **Phys. Rev. Lett.** 115, 126806 (2015), (Pub. 18 Sep. 2015). DOI: 10.1002/anie.201406570.

Also see the media report entitled ***"Alloy engineering addresses long-standing problem of semiconductor defects"*** published at phys. Org: http://phys.org/news/2015-09-alloy-long-standing-problem-semiconductor-defects.html

RESEARCHERS REVEAL THE ORIGIN OF THE TI^{3+} IONS RELATED ELECTRONIC STRUCTURE IN TIO_2

As a prototypical metal oxide in solar energy conversion, TiO_2 is easily reduced, forming Ti^{3+} ions, for which a characteristic signature is the presence of a localized state in the band gap at ~ 1 eV below the Fermi level (E_F). There is evidence that d→d transitions from the gap states contribute to the photoabsorption of reduced TiO_2. In addition, due to the band gap narrowing and enhanced photo-absorption associated with the presence of the band gap state, visible light photocatalysis through Ti3+ self-doping has also been observed. While transitions from the band gap state are clearly important, little is known, however, about the character of the electronic excited states that are involved in these transitions, due to the greater difficulty to experimentally access the unoccupied states. A characterization of these states is not only scientifically interesting, but is also important for a better understanding and control of TiO_2 photocatalysis.

A group at CSRC, led by Dr. Li-Min Liu, has worked together with a group at Dalian Institute of Chemical Physics (DICP) to study the electronic structure of the Ti^{3+} related state in TiO_2. Utilizing a combined two-photon photoemission spectroscopy (2PPE) and density functional theory (DFT) calculations, they successfully revealed that the John-Teller distortion-induced splitting of the 3d orbitals of Ti^{3+} ions of at TiO_2(110) surface is the origin of the band gap states (~1 eV below E_F) and excited states (~2.5 eV above E_F) which are of dxy, d_{xz}/d_{yz}/d_{z2} character, respectively. Localized excitation of Ti^{3+} ions through d→d transition from the band gap states and excited states (Fig. 1) extends the photo-absorption into the visible region. They have identified the Ti^{3+} related intrinsic excited state which was thought to be an adsorbate induced feature previously (Science, 2005, **308**, 1154), provided a thorough analysis of the photoabsorption of TiO_2, explained the visible light photocatalysis associated with Ti^{3+} self-doping and also paved the way for the investigation of the electronic structure and photoabsorption of other metal oxides.

For more information, please see the paper "Localized Excitation of Ti^{3+} Ions in the Photoabsorption and Photocatalytic Activity of Reduced Rutile TiO_2", **J. Amer. Chem**. Soc., DOI: 10.1021/jacs.5b04483 (2015).

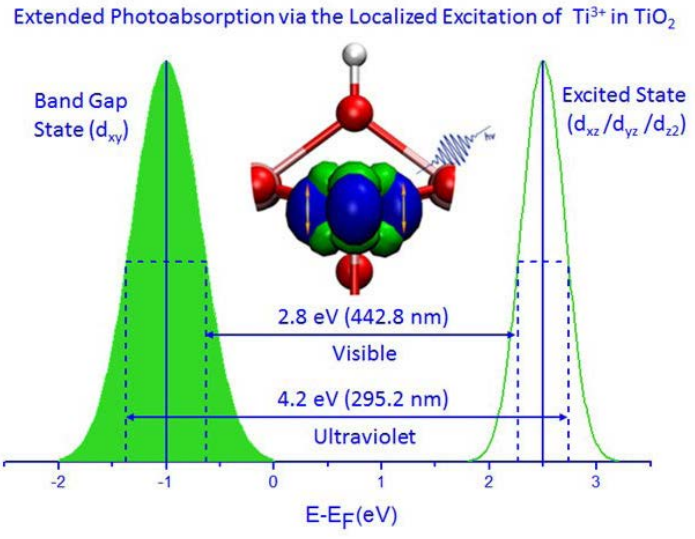

Fig. 1. Ti^{3+} states induced optical transition in TiO_2.

DETERMINE THE WATER EFFECT ON THE CO_2 CAPTURE AND CONVERSION ON TIO_2

It is of great desire to reduce both the emission and accumulation of CO_2 in the atmosphere as it is the main greenhouse and ocean acidification gas. The major source of CO_2 emission is the traditional fossil fuel-fired plants. Apart from the natural photosynthesis, various strategies have been proposed to mitigate CO_2 emission including carbon capture, energy conservation, and energy storage through the chemical approaches. Photo-catalytic reduction of CO_2 is an efficient way to convert CO_2 into synthetic fuels or other useful chemicals by harnessing the renewable solar energy.

Using the first-principles calculations combined with the periodic continuum solvation model (PCSM), a group at CSRC, led by Dr. Li-Min Liu, has explored the adsorption and reactivity of CO_2 on rutile TiO_2(110) surface in the water environment. The results exhibit that both adsorption structures and reactivity of CO_2 are greatly affected by water co-adsorption on rutile TiO_2. In particular, the solvation effect can change the most stable adsorption configuration of CO_2 and H_2O on rutile TiO_2(110) surface. In addition, the detailed conversion mechanism of CO_2 reduction is further explored in the water environment. The results reveal that the solvation effect can not only greatly decrease the energy barrier of CO_2 reduction but also affect the selectivity of the reaction processes. These results show the importance of the aqueous solution, which should be helpful to understand the detailed reaction processes of photo-catalysts.

For more information, please see the paper " CO_2 Capture and Conversion on Rutile TiO_2(110) in the Water Environment: Insight by First-principles Calculations", **J Phys. Chem. Lett**. 6 (13), 2538-2545 (2015).

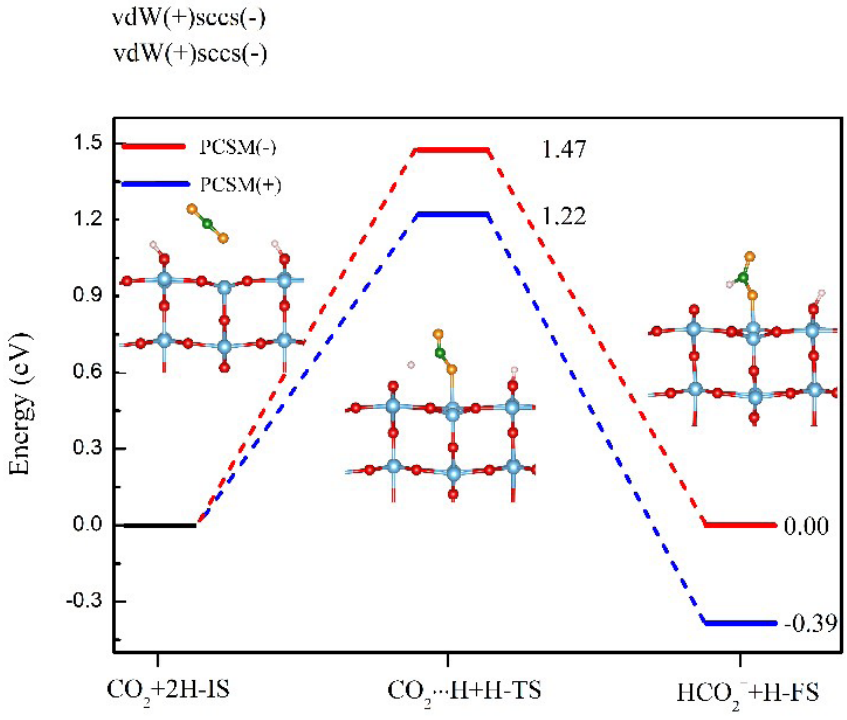

Fig. 1. Adsorption process of CO_2 reduction on TiO_2 (110) surface in the water environment.

VISUALIZING UNDER-COORDINATED SURFACE ATOMS ON 3D NANOPOROUS GOLD CATALYSTS

The underlying mechanisms of gold catalysis towards oxidation reactions have been debated for many years. Recently, free-standing nanoporous gold (NPG) was found to exhibit similar catalytic activities toward oxidation reactions as oxide-supported gold nanoparticles. [1] Moreover, NPG can retain the high catalytic activities at much larger characteristic lengths (>30 nm) in comparison with the critical size of ~5 nm for gold nanoparticles. [2] This unsupported, stable gold catalyst provides a model system to explore the underlying mechanisms of gold catalysis. In line with extensive discussion on catalysis of gold nanoparticles, high-resolution scanning transmission electron microscopy (HR-STEM) observations suggest that the intrinsic catalysis of NPG appears to be associated with the under-coordinated surface atoms. [3] However, the detailed description on the intrinsic correlation between the density of under-coordinated surface atoms and the catalytic activity of NPG remains to be unknown.

Recently, by combining spherical aberration corrected (Cs-corrected) high angle annular dark field (HAADF) STEM with discrete tomography, Pengfei Guan from the CSRC in collaboration with researchers in Tohoku University [4] resolve this debate by reconstructing 3D atomic configurations of NPG ligaments. In this study, the reconstructed 3D atomic configurations of NPG ligaments give the quantitative descriptions of the number fraction and area density of under-coordinated atoms on the surface of gold ligaments of NPG with different sizes (Figure 1). Combining with truncated octahedral gold particles and the density of catalytically active sites for oxidation reactions (Figure 2), the qualitative agreement between the 3D atomic characterization and chemical experiments in the active atomic sites and under-coordinated surface atoms provides an important insight that the surface defects play an important role in the catalysis of NPG.

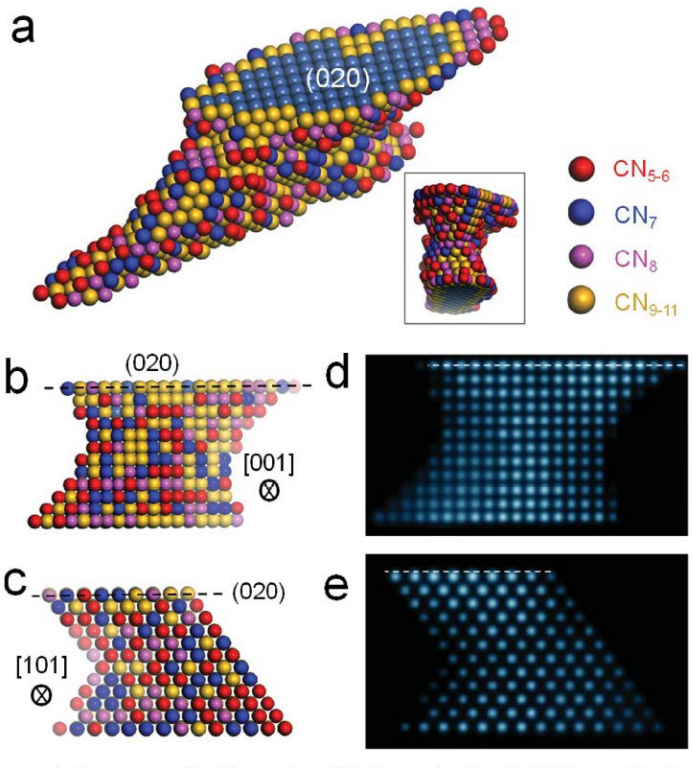

Figure 1. Discrete tomography of nanoporous gold.

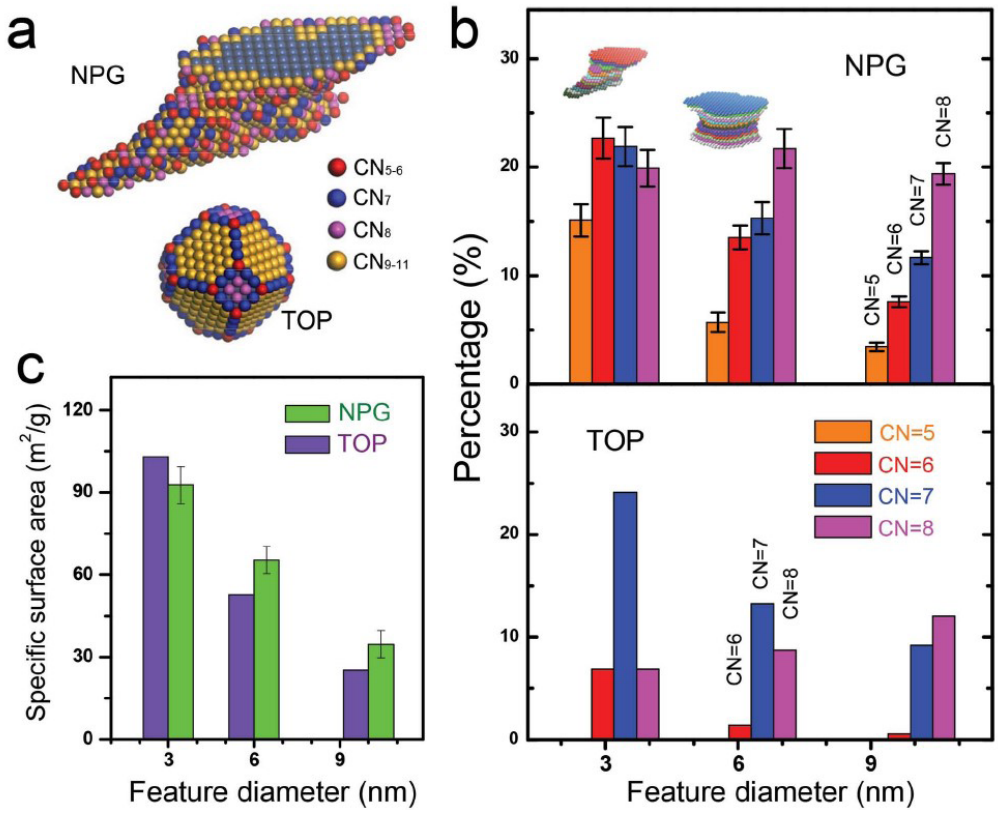

Figure 2. Quantitative measurements of under-coordinated surface atoms on NPG ligaments and truncated octahedral gold particles.

For more information, please see the paper: "Visualizing Under-Coordinated Surface Atoms on 3D Nanoporous Gold Catalysts", *Advanced Materials* ***2015,*** **DOI: 10.1002/adma.201504032**

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MECHANO-CHEMICAL INVESTIGATION REVEALING A JUMP-FROM-CAVITY PRODUCT RELEASE MODEL IN GENE TRANSCRIPTION OF A PROTOTYPICAL RNA POLYMERASE

RNA polymerases (RNAPs) direct gene transcription by synthesizing RNA strand from template DNA. These protein enzymes are usually recognized to work as Brownian ratchet moving along double stranded DNA, with their mechanical movements and chemical reactions loosely coupled. That says, these protein machines move forward and backward without much free energy bias, while their forward movements are favored or backward movements are prevented upon RNA nucleotide incorporation, i.e., the chemical rectification. It is highly interesting to understand the physical basis of these physiologically important machines as they work under non-equilibrium condition, supported by chemical free energy from the enzymatic polymerization cycles ($RNA_i + NTP \Leftrightarrow RNA_{i+1} + PP_i$).

Nevertheless, high-resolution structural studies on bacteriophage T7 RNAP model system had suggested an alternative power stroke mechano-chemical coupling scenario, which requires that the enzymatic reaction product (PPi) release tightly couples with or directly drives the enzyme movements. To resolve the conflicting views in the functional cycle of this prototypical transcription machine, a group of researchers led by Dr Jin Yu (tenure-track assistant professor) at CSRC complex system research division recently conducted intensive atomistic molecular dynamics (MD) simulations to investigate the PPi release mechanism of T7 RNAP [1]. The PPi release can be detected experimentally but happens too fast to be resolved in kinetic or structure dynamical detail.

By running a large number of nanosecond MD simulations, spreading around a wide range of conformational space of ~130,000 atoms of the solvated T7 RNAP, these researchers then constructed the simplified Markov state model (MSM) of the T7 RNAP product release process. In this way, they manage to efficiently organize the high-dimensional data to the physically tractable model, and to extract kinetic information for time scales up to tens of microseconds, which cannot be easily accessible by conventional MD. They found that the PPi release undergoes a jump-from-cavity activation process, unlikely to energetically support the polymerase translocation as being required for the power stroke scenario. In comparison, previous computational studies on multi-subunit RNAPs from higher organisms demonstrated instead charge facilitated hopping mechanisms of the product release.

To explore the essential slow motions during the concerned process, the CSRC researchers further performed a small number of all-atom microsecond long MD simulations on this transcription machine. The PPi release does not appear to be tightly coupled to the rotational opening of an O-helix that is tied to the polymerase translocation. Hence, the study again disfavors the power stroke scenario, but favors the Brownian ratchet mechanism.

Remarkably, these researchers discovered a key residue Lys472 that is able to closely assist PPi to jump out of the cavity in T7 RNAP. The mechanism can apply general to many polymerases sharing conserved structural features with T7 RNAP, including viral or human mitochondria RNAPs, as well as a group of DNA polymerases that direct gene replication. Surprisingly, the lysine or arginine residue closely assisting the PPi release appears to be a universal module not only to the relatively simple single-subunit polymerases, but also to the much more complex multi-subunit RNAPs, even though the overall structural features and the full product release mechanisms vary significantly in the multi-subunit RNAPs.

In summary, this work has resolved unprecedented detail for structural dynamics of an essential process of a prototypical transcription machine. These researchers are continuing with similar computational efforts to further explore the translocation mechanisms of T7 RNAP, that combined would provide physical basis for the mechanochemistry of this prototype transcription machine.

This research has been supported by NSFC #11275022

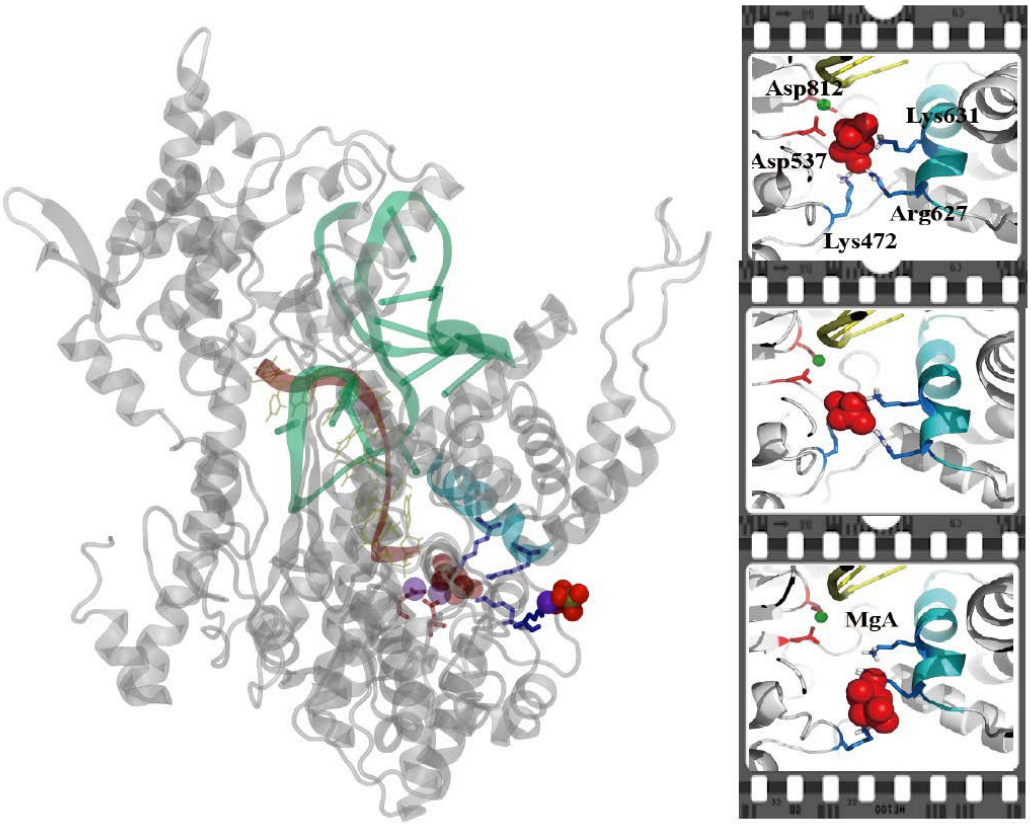

Fig 1. The product PPi release in T7 RNA polymerase transcription elongation. *Left:* The protein/DNA/RNA is shown in white/green/brown (O-helix in cyan). PPi in spheres (oxygen/phosphorus for red/brown). The key amino acids are shown with blue/red for positive/negative charged. In particular, Lys472 (blue) side chain swivels from the inside to the outside to assist the PPi release. *Right:* The simplified Markov state model with three states, showing PPi released from the inside cavity (*top*) to the outside protein surface (*bottom*).

Ref.: Lin-Tai Da, Chao E, Baogen Duan, Chuanbiao Zhang, Xin Zhou, and Jin Yu*. "A Jump-from-Cavity Pyrophosphate Ion Release Assisted by a Key Lysine Residue in T7 RNA Polymerase Transcription Elongation", PLoS Computational Biology, 11 (11) e1004624 (2015). doi:10.1371/journal.pcbi.1004624

STEADY QUANTUM COHERENCE IN NONEQUILIBRIUM ENVIRONMENT

Isolated quantum systems evolve unitarily according to the Schrödinger equation, while an open quantum system, which is inevitably coupled to a heat bath, usually quickly loses all its quantum coherence. That is, all the off-diagonal terms of the density matrix of the system (in the energy representation) will decay to zero when the open system approaches the steady state. This phenomenon is called decoherence, and it is also believed that this is why our world appears as a classical one and no macroscopic superposition can exist stably in usual cases. It has been reported that if some non-vanishing steady quantum coherence exists in certain special environment, even with a quite small amount, it can lead to some novel physics, such as lasing without inversion, or extracting work from a single heat bath.

Recently, S. W. Li in CSRC, and his collaborators C.Y. Cai and C.P. Sun, studied the steady state of a three-level system in a non-equilibrium environment, which consists of two heat baths with different temperatures. They found that for the Λ-type and V-type systems, the interference between transitions can give rise to non-vanishing steady quantum coherence, if the two transitions couple to the two heat baths with different proportions of coupling strengths. The amount of the steady quantum coherence increases with the temperature difference of the two heat baths. If the two heat baths have the same temperature, all the quantum coherence vanishes and returns to the equilibrium case. These transition structures are quite common in natural and artificial quantum systems. The non-equilibrium environment can be implemented via current noises with different effective temperatures in quantum circuits, or electron leads with different chemical potentials.

The interference between transitions plays an essential role in the steady quantum coherence. But it was often omitted by secular approximation in previous literatures. They showed that indeed the secular approximation is consistent in the case of equilibrium environment, but for non-equilibrium environments, that would lead to the neglect of the steady quantum coherence.

They also showed that the quantum coherence has a clear physical meaning, i.e., it exactly reflects the internal non-equilibrium flux inside a composite system, which is an important characterization of non-equilibrium systems.

Ref: Sheng-Wen Li, C.Y. Cai, C.P. Sun, "Steady quantum coherence in non-equilibrium environment", Annals of Physics 360 (2015) 19–32 (Available online 11 May 2015).

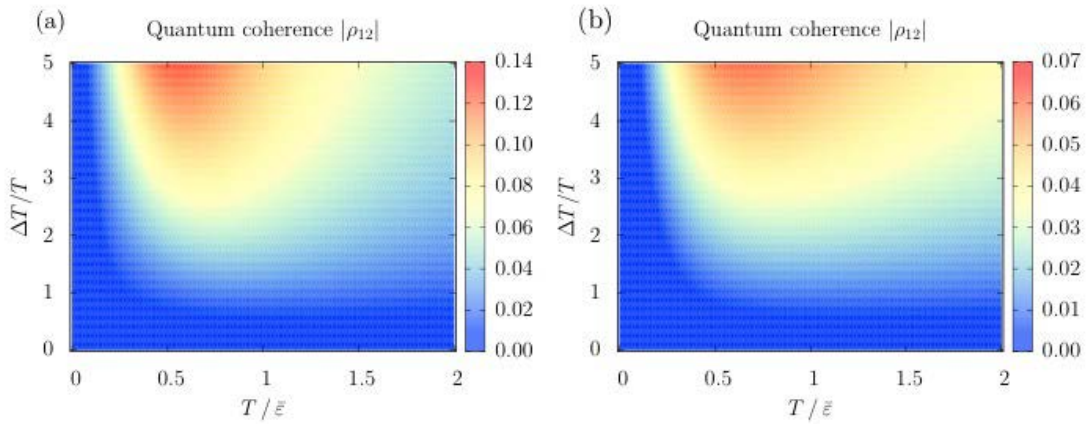

Fig.1. Numerical result for $|\rho_{12}|$ in the non-equilibrium steady state of (a) Λ-type and (b) V-type system.

MODELING ACTIVE MATTER SYSTEMS WITH APPLICATIONS TO CELL DYNAMICS

Active matter is a class of materials that are driven out of equilibrium by energy input at the microscopic scale via biochemical or catalytic activities. As a result, emergent dynamical structures may emerge such as long-range order, anomalous fluctuations, dynamical spatial-temporal structures and patterns, and dynamical phase transitions [1,2]. When coupled with regulatory signaling pathways, active matter systems are seen in living systems such as the cortical layer or the microtubule ensemble in the cytoskeleton of live cells and bacteria colonies [1,2].

Active particles in the active matter are generally anisotropic and can form ordered states at a sufficiently high concentration. The nature of the ordered state depends on both the configuration of the individual particles and the interactions among the particles. A class of active matter of these features is also known as the active liquid crystal, which may form liquid crystalline phases at sufficiently high particle concentrations or under strong particle-particle interaction.

A useful theoretical framework for describing the collective behavior of active matter systems is a continuum model that generalizes liquid crystal hydrodynamics to include new activities due to the microscopic energy input. We have developed a general framework for deriving models for complex fluids based on the generalized Onsager's principle [4]. This approach has been extended to include models for active matter.

Using the continuum hydrodynamic models, we have investigated systematically hydrodynamics of a polar active liquid crystal system and identified important roles played by the active viscosity and self-propelling speed on hydrodynamics of the active matter system. This study leads to the discovery of a rich set of emergent dynamical patterns in 2-D channel and cavity flows, including traveling waves as well as irregular oscillatory patterns (see Fig 1).

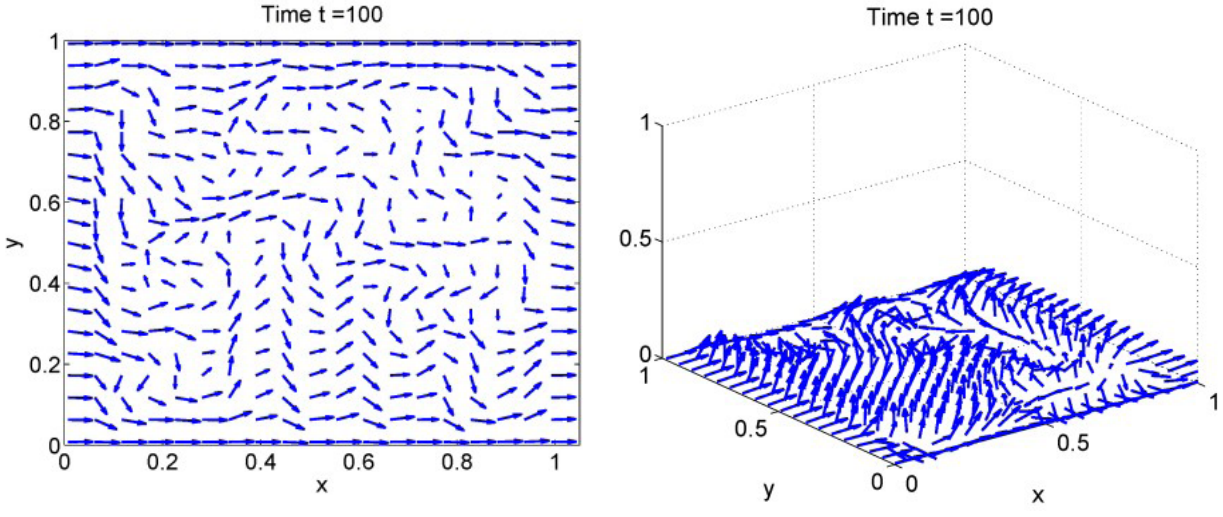

Fig 1. Irregular pattern (a)(left) and out-of-plan travel wave (b)(right).

In cells, two types of active matter systems coexist. One is the F-actin coupled with myosin motors and the other is the microtubule coupled with myosin motors. In a region adjacent to the cell membrane, known as the cell cortical layer, F-actin+myosins form the cytoskeleton to provide the mechanical support for the membrane and to regulate cell motion. In order to develop a whole cell model at the continuum level, active matter model is an ideal choice.

As a major application of the active matter modeling, we have developed a set of multiphase field models to describe cell motion on a substratum as well as cell mitosis, especially, cytokinesis. The basic ingredient in the multiphase models is depicted in Fig 2.

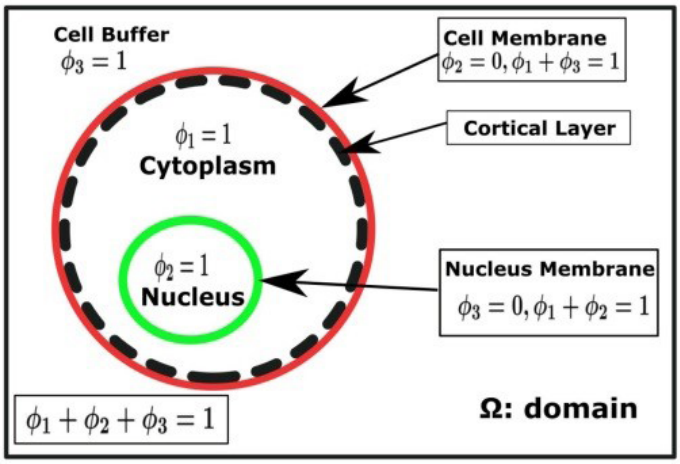

Fig 2. Portrait of a simple 3-phase cell model, where the cortical layer is modeled as an active liquid crystal phase.

Using this model, we can simulate cytokinesis of an eukaryotic cell with a very good precision. Fig 3a depicts the 3-D simulation and Fig 3b shows a comparison with the experiment on the radius of the neck. This model has been extended to study cell migration on substrate, cell oscillation and cell rounding.

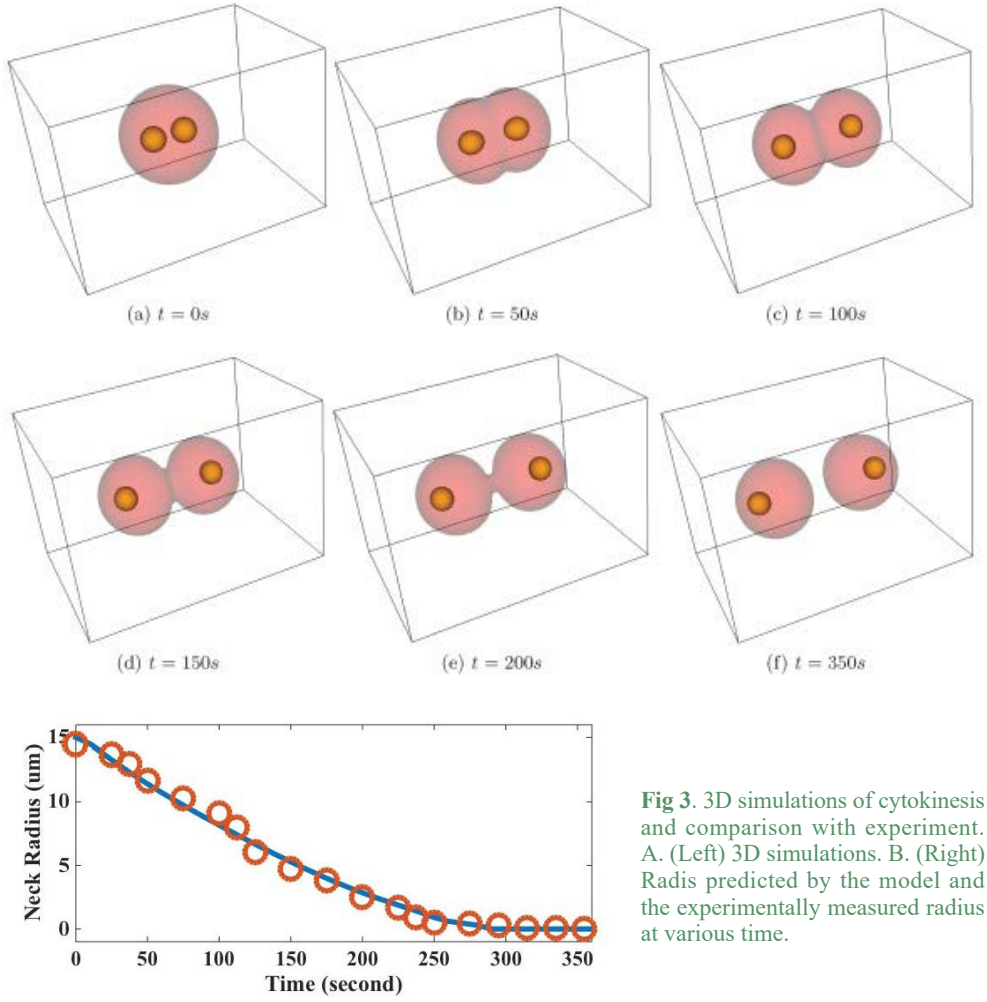

Fig 3. 3D simulations of cytokinesis and comparison with experiment. A. (Left) 3D simulations. B. (Right) Radis predicted by the model and the experimentally measured radius at various time.

Cell modeling using active matter models is a promising direction with a great potential to produce accurate and versatile models to study various mecho-chemical mechanisms inherent in cells and explain various transporting phenomena including signaling through mechanical sensing.

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4.Xiaogang Yang and Qi Wang, Structures and basic patterns in cavity flows of active liquid crystals: **Computers and Fluids**, 2015.

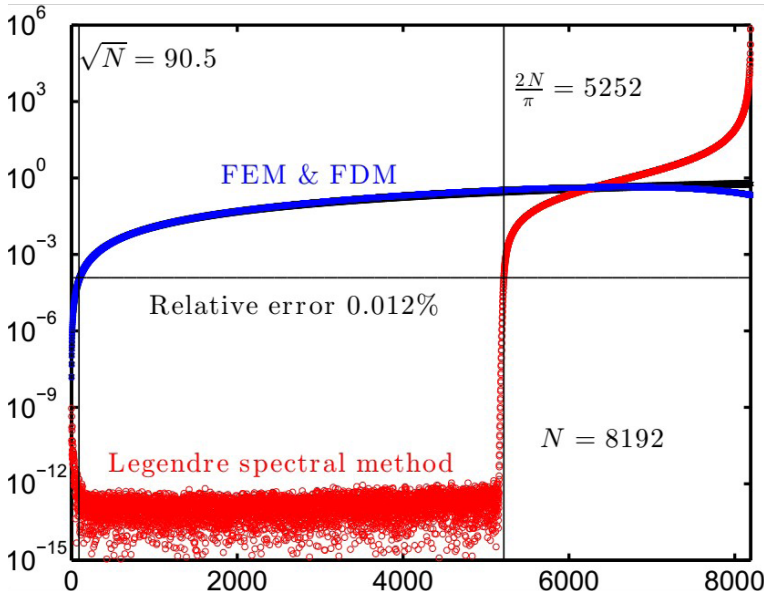
HOW MANY PDE NUMERICAL EIGENVALUES CAN WE TRUST, AND HOW TO GET MORE OUT OF IT?

When approximating PDE eigenvalue problems by numerical methods such as finite difference and finite element, it is common knowledge that only a small portion of numerical eigenvalues are reliable. However, this knowledge is only qualitative rather than quantitative in the literature. We will investigate the number of trusted eigenvalues by the finite element approximation of order elliptic PDE eigenvalue problems.

Suppose that we solve a 2*m*-order elliptic equation on a domain $\Omega \subset \mathrm{R}^{\mathrm{d}}$ by the finite element method (conforming or non-conforming) of polynomial degree $k-1$ under a shape regular and quasi-uniform mesh with mesh-parameter *h*. Then there are about $j_N = N^{(k-m-\alpha/2)/(k-m)}(k-1)^{-d(k-m-\alpha/2)/(k-m)}$ reliable numerical eigenvalues with relative error of λ_{j_N} converges at rate h^{α} for $\alpha \in (0, 2(k-m)]$. Here N is the total degrees of freedom.

Numerical test for one dimensional problems:

Model problem: $-u'' = \lambda u$ on $(-1,1)$, $u(-1) = 0 = u(1)$.



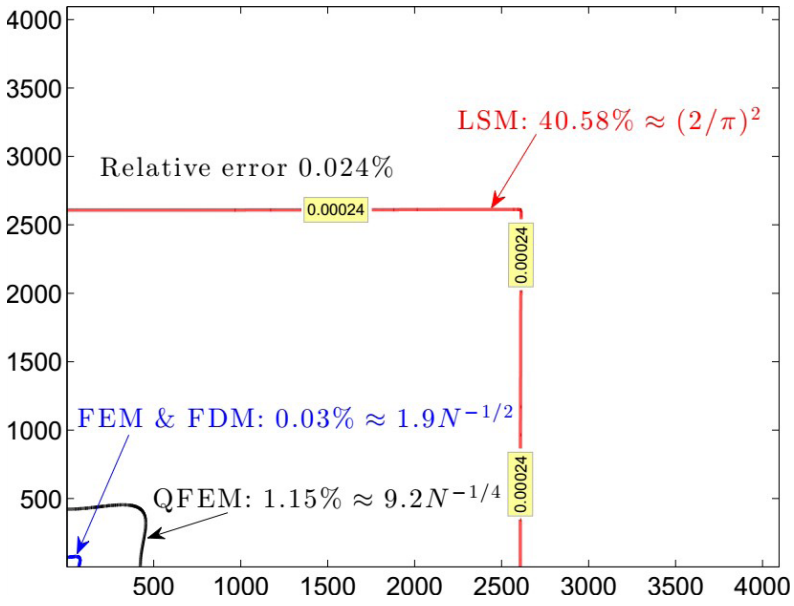
Comparing with linear finite element method (FEM) and finite difference method(FDM) with the same degrees of freedom (8192 elements).

Spectral: About $\frac{2}{\pi}N \approx 5252$ numerical eigenvalues reach 0.01% relative error:

FEM and FDM: About $\sqrt{N} \approx 91$ numerical eigenvalues reach 0.01% relative error.

Numerical test for two dimensional problems:

Model problem: $-\Delta u = \lambda u$ on $\Omega = (-1, 1) \times (-1, 1)$, $u = 0$ on $\partial\Omega$.



Comparing with linear finite element method (LFEM) and quadratic finite element method (QFEM) with the same degrees of freedom ($N = 40962$), number of numerical eigenvalues reach 0.01% relative error:

Spectral: About $\left(\frac{2}{\pi}\right)^2 N$, i.e., about 40.43% ;

LFEM: About $0.5N^{1/2}$, which is about $\frac{0.5N^{1/2}}{N} = 0.5N^{-1/2} \approx 0.01\%$;

QFEM: About $2N^{2/3}$, which is about $\frac{2N^{2/3}}{N} = 2N^{-1/3} \approx 0.74\%$.

Based on the model problems (the Laplace operators), we figure out roughly how many reliable eigenvalues can be obtained from numerical approximation under a pre-determined convergence rate, by using a solid knowledge regarding magnitudes of eigenvalues available in the literature and a priori error estimates of the finite element method. One effective way to have more reliable eigenvalues is to use recovery technique. Towards this direction, the Polynomial Preserving Recovery (PPR) has been applied to achieve higher accuracy in eigenvalue approximations, especially for non self-adjoint problems.

For more information, please see the paper: "How many numerical eigenvalues can we trust? " Z.Zhang, Journal of Scientific Computing 65-2 (2015), 455-466.

This work was supported in part by the National Natural Science Foundation of China under grants 11471031 and 91430216, and the US National Science Foundation through grant DMS-1419040.

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A SHARP INTERFACE METHOD FOR SPH

Many numerical methods have been developed to deal with the interface of multiphase flows. Volume of fluid (VOF)[1], level set method (LSM) [2], front tracking (FT) [3], and phase field (PF) [4] are famous numerical methods which have achieved great success in handling multiphase flows. These methods can be divided into two types: sharp interface method and diffuse interface method (DIM). SIM has sharp representation of interface and the material discontinuity is kept sharply. Geometrical calculations can be more accurate than DIM. Also, it is more convenient to deal with tangential force in SIM. In DIM, the interface is represented by a band of region with a few of numerical cells. The material discontinuity is smeared in this region. It is more convenient for DIM to simulate the interface coalescence or breakup.

Smoothed particle hydrodynamics (SPH) is a full Lagrangian meshless method [5]. The fluid is represented by a set of SPH particles. The flow variables are stored in these SPH particles. SPH has been developed to simulate fluid flows for more than twenty years. But accuracy is always a problem in SPH simulations.

In this work, a sharp interface method for SPH is developed to deal with the free interface, material discontinuity and physical jump conditions across the interface in two-phase flows. LSM is used to track the interface, and the interface is reconstructed explicitly based on it. The level set function is initially set to be the signed distance to the interface, and then evolves according to the level set equation. The ghost fluid method (GFM) is introduced to handle the discontinuity. The interface states are calculated by using of the jump conditions and are extended to the ghost fluid particles. The ghost fluid method helps to get smooth and stable calculation near the interface. All jump conditions in the normal and tangential directions are satisfied so that it can reflect the real physics better.

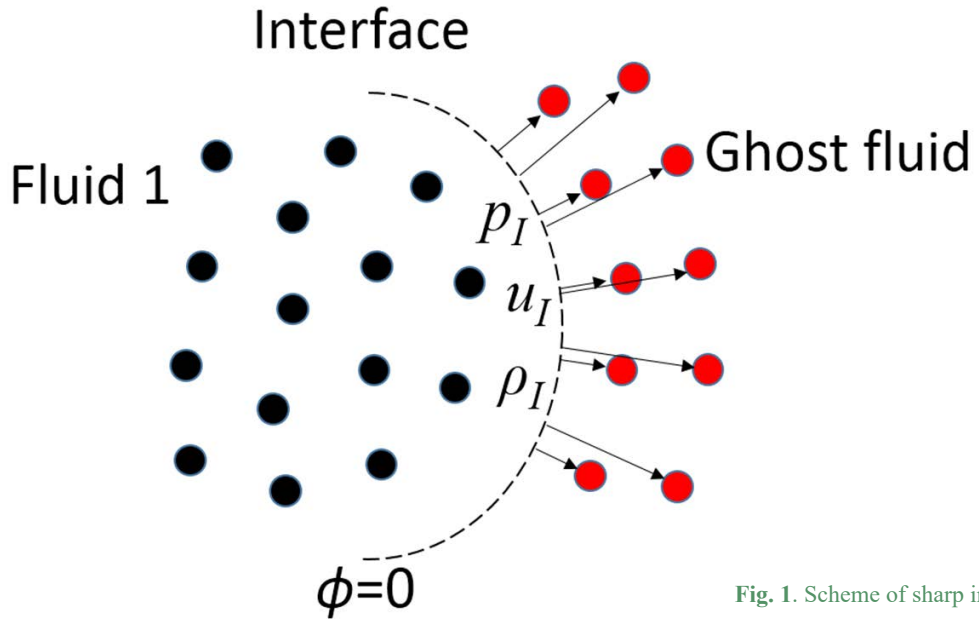
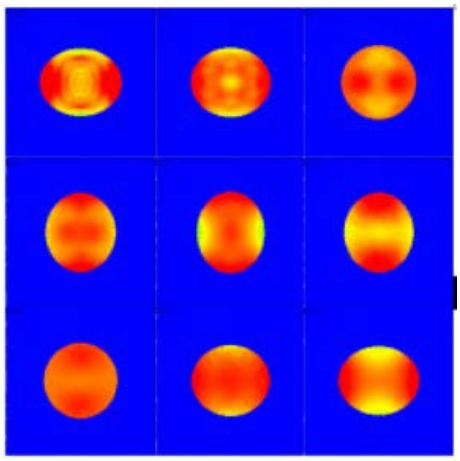
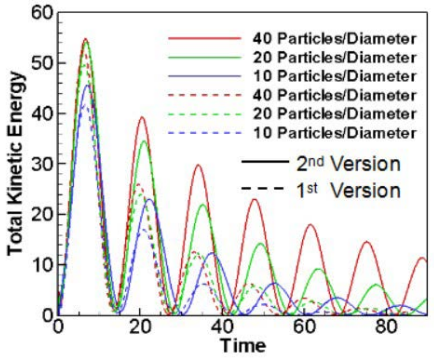


Fig. 1. Scheme of sharp interface method for SPH.

Numerical tests show the accuracy and stability of our method. An oscillating cylinder test case is shown in Fig. 2. The 1st version is the one published in JCP. The 2nd version is the improved one with interface calculated via geometrical information of the SPH particles, which is more robust and gives better simulation results than the 1st version.





D/dx	40	20	10
Error(1st Version)	0.0094	0.026	0.072
Error(2nd Version)	0.0047	0.037	0.12

Fig. 2. The contour (left) and periodic analysis (right) of the liquid cylinder oscillation case. The period shows good convergence when the SPH particle number increases, and the 2nd version shows better performance than the 1st version.

For more information on the 1st version, please see the paper: "*A sharp interface method for SPH*", **J. of Comput. Phys**. 302 (2015). DOI: 10.1016/j.jcp.2015.09.015. The paper for the 2nd version is in preparation.

This research is supported by NSFC (Grant Nos. 91230203, 11202020).

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SELECTIVE PARTICLE CAPTURE BY ASYNCHRONOUSLY BEATING CILIA

The separation and filtration of particles in a fluid medium are essential to many technological and biological processes. Technological applications include controlling indoor and outdoor air quality, manufacturing pharmaceuticals and powders, and sorting cells in microfluidic "lab-on-chip" devices [1]. The health of aquatic ecosystems is largely impacted by filter feeding animals, which provide attractive biological paradigms for particle filtration. Filter feeders remove particulate food from the surrounding water by passing the water over specialized filtering structures. One of the capture strategies is to use the same cilia to generate feeding currents and to intercept particles when the particles are on the downstream side of the cilia [2]. Previous analysis provides valuable insights into the geometric effect but does not elucidate the hydrodynamic mechanisms underlying cilia-particle interactions.

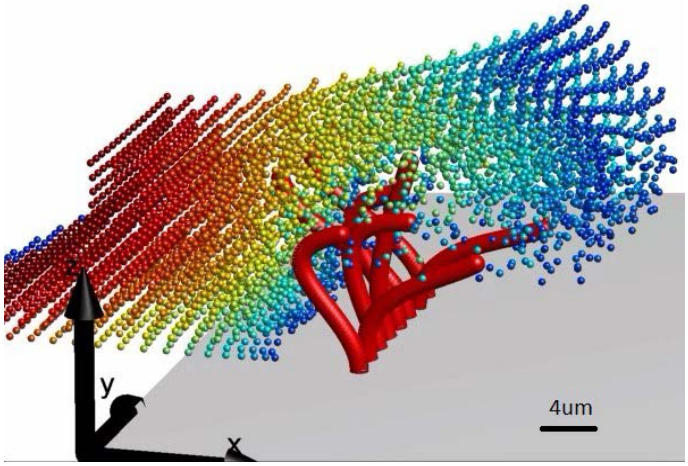

Fig. 1. Particle motion in cilia-generated flows. Particle color represents the initial particle position in the x direction.

Recently, a research team from CSRC and University of Southern California shed some light on the capture process. In their study, a 3D computational model of ciliary bands interacting with flow suspended particles was developed and particle trajectories for a range of particle sizes were calculated. Consistent with experimental observations, they found optimal particle sizes that maximize capture rate. The optimal size depends nonlinearly on cilia spacing and cilia coordination, synchronous vs. asynchronous. These parameters affect the cilia-generated flow field, which in turn affects particle trajectories. The low capture rate of smaller particles is due to the particles' inability to cross the flow streamlines of neighboring cilia. Meanwhile, large particles have difficulty entering the sub-ciliary region once advected downstream, also resulting in low capture rates. The optimal range of particle sizes is enhanced when cilia beat asynchronously. These findings have potentially important implications on the design and use of biomimetic cilia in processes such as particle sorting in microfluidic devices.

For more information, please see the paper: "Selective particle capture by asynchronously beating cilia", Y. Ding and E. Kanso, *Physics of Fluids* 27, 121902 (2015).

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MULTISCALE MODELING OF PLASMONIC PHOTOVOLTAIC DEVICES

The field of plasmonics is developing rapidly and has emerged as a new area for materials and device research. Surface plasmons refer to the collective excitations of conduction electrons at the interface between a metal and a dielectric, resulting in strong field localization. By proper engineering of these nanostructures, light can be concentrated and scattered into the photoactive layer, thereby enhancing the optical absorption of solar cells. The metallic nanostructures can act as an antenna that converts incident energy from sunlight to localized surface plasmon modes. Experimentally, enhanced PCEs have been demonstrated for organic solar cells doped with silver nanoparticles due to associated plasmonic near-field effects. This unique optical property of nanometallic structures can be exploited to confine light at subwavelength scales. The excellent light trapping is critical to improve light absorption efficiency in nanoscale photovoltaic devices. [1]

We apply a multiscale quantum mechanics/electromagnetics (QM/EM) method to model the current-voltage characteristics and optical properties of plasmonic nanowire-based solar cells.[2-3] The QM/EM method features a combination of first-principles quantum mechanical treatment of the photoactive component and classical description of electromagnetic environment. The coupled optical-electrical QM/EM simulations demonstrate a dramatic enhancement for power conversion efficiency of nanowire solar cells due to the surface plasmon effect of nanometallic structures. The improvement is attributed to the enhanced scattering of light into the photoactive layer. We further investigate the optimal configuration of the nanostructured solar cell. Our QM/EM simulation result demonstrates that a further increase of internal quantum efficiency can be achieved by scattering light into the n-doped region of the device.

For more information, please see the paper: "*Multiscale Modeling of Plasmon-Enhanced Power Conversion Efficiency in Nanostructured Solar Cells*", **J. Phys. Chem. Lett. 6**, 4410 (2015).

This research was supported by NSFC and National Basic Research Program of China.

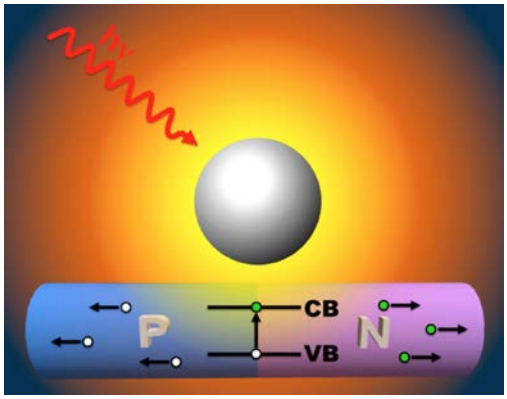

Fig. 1. Schematic diagram of a plasmonic photovoltaic device for a coupled optical-electrical QM/EM simulation. The system contains a silver nanosphere and is placed above a silicon nanowire.

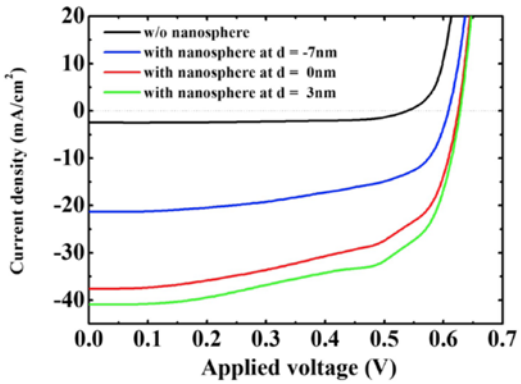

Fig. 2. J-V characteristics of SiNW solar cell illuminated by the monochromatic light of frequency 3.4 eV. Black line: without nanosphere. Red
line: with nanosphere at d = 0 nm. Blue
line: with nanosphere and d = −7 nm. Green line: with nanosphere at d = 3 nm.

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MERCURY UNDER PRESSURE ACTS AS A TRANSITION METAL: CALCULATED FROM FIRST PRINCIPLES

The prediction of compounds whose elements are found in high oxidation states beyond the naturally occurring forms is a very exciting topic in theoretical condensed matter. Group IIB elements, including Zn, Cd, and Hg, are usually defined as post-transition metals because they are commonly oxidized only to the +2 state. However, it is possible that Hg could be stable in higher oxidation states owing to the large relativistic effects that perturb the position of the 5d energies.

Metastable, gas-phase planar molecules containing Hg-IV have been predicted by quantum chemistry calculations. The previous studies predicted that HgF4 molecules could resist dissociation to HgF2 and F2 molecules.[1-3] HgF4 molecules has also been detected using matrix-isolation infrared (IR) spectroscopy. [4] Regarding Hg-III, it has been reported experimentally in a short-lived compound.[5] A Hg-III fluoride in molecular form has been recently studied by quantum chemistry calculations.[6] All these results clearly reveal the propensity of Hg to act as a transition metal while reacting with strong oxidizing agents, such as fluorine. However, Hg in a thermodynamically stable high-oxidation state, such as in HgF4, has not been achieved.

Recently, a group of CSRC researchers has found that high-pressure techniques are a viable method to stabilize both Hg-IV and Hg-III oxidation states.[7] Using an advanced structure search algorithm based on Particle Swarm Optimization algorithm [8] and first principles electronic structure calculations, they found that under high pressure Hg in Hg-F compounds transfers charge from their d-orbitals to the F, thus behaving as a transition metal. Oxidizing Hg to +4 and +3 yielded the thermodynamically stable compounds HgF4 and HgF3. The former consists of HgF4 planar molecules, a typical geometry for d8 metal centers. HgF3 is metallic and ferromagnetic owing to the d9 configuration of Hg, with a large

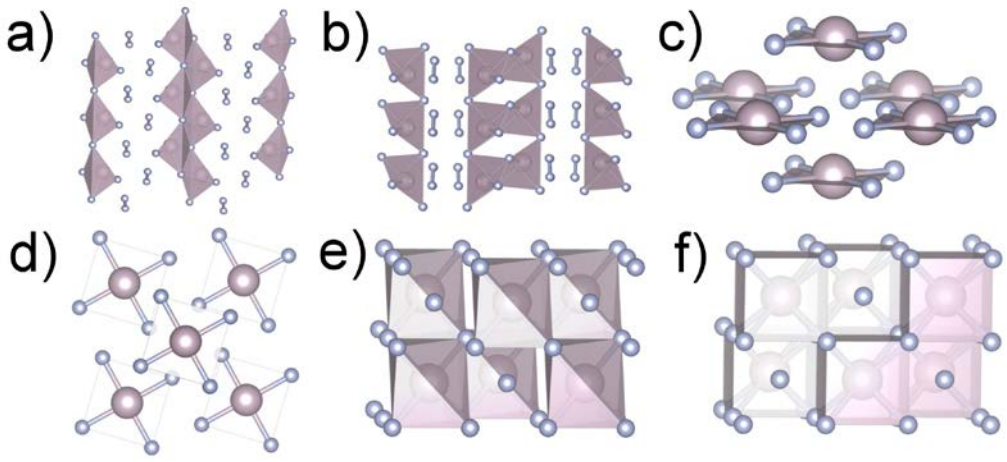

Fig. 1. Real-space configuration of the crystalline structures: For HgF4, a) side view and b) top views of the thermodynamically unstable Pca21 low-pressure structure and (c) and (d) are the same views for the stable high-pressure structure I4m. For HgF3: e) is the low-pressure C2m and f) is Fm-3m.

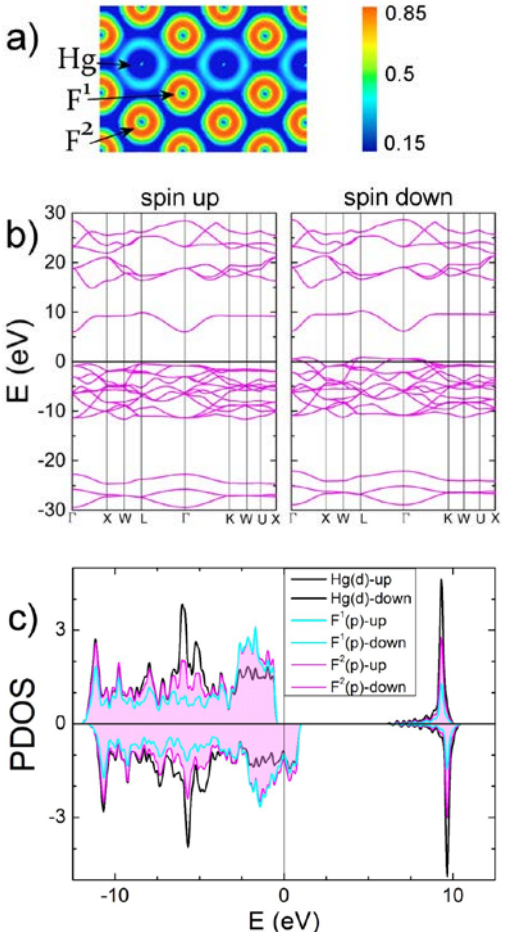

Fig.2. (a) Plot of the ELF of the HgF_3 structure. ELF ranges from 0.15 (blue) to 0.85 (red); (b) Plot of the band structure of HgF_3 at 200 GPa, separated for the majority (spin up) and minority (spin down) electrons; (c) Projected DOS of HgF_3 at 200 GPa, where sign indicate majority-minority electrons. The black and cyan lines and the magenta line with shaded area show the PDOS of Hg 5d, F^1 2p and F^2 2p states. respectively.

gap between its partially occupied and unoccupied bands under high pressure, which suggests properties analogous to a transparent conductor.

For more information, please see the paper: "***Mercury under Pressure acts as a Transition Metal: Calculated from First Principles***", **Angew. Chem. Int. Ed**. 54, 9280 (2015), (Pub. 3 Jul. 2015). DOI: 10.1002/anie.201505500.

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MAGIC CLUSTER IN GRAPHENE CHEMICAL VAPOR DEPOSITION (CVD) GROWTH

CVD is the most promising way to achieve high-quality graphene with macroscopic area at a reasonable price. The nucleation is the most important stage to CVD as it determines both the density of nuclei and the concentration of grain boundaries in the final product. Recently, a type of ultra-stable C clusters were observed on Ru(0001) and Rh(111) surfaces by three astonishing experimental observations [1-3]. Graphene may be achieved by the coarsening of these identical-size ultra-stable C clusters as nuclei. However, due to the high curvature of the cluster and the influence of metal surfaces, STM was unable to disclose the precise atomic structure of the magic cluster. Therefore, the atomic structure of this C cluster was under highly debate [1-4].

Recently, the debate may be finally resolved by J.-F. Gao and Prof. F. Ding [5], a group of CSRC researchers. As shown in Fig. 1, via first-principles calculations, they disclosed a novel branched C cluster, named C21-3C, which has the core of the aforementioned C21 [4] and three dangling C atoms attached to the three pentagons. C21-3C is exceptional stable and corresponds a local energetic minimum in the size range of 20-30 atoms. Compared with core-shell C21 and other C clusters near its size, the high stability of C21-3C is attributed to both the stable core and appropriate passivation of dangling C atoms by metal surface. Besides, the relative height and simulated STM images of C21-3C agree the experimental observations well. With many compelling evidences, we confirm C21-3C is the most promising candidate for the observations.

Further, the relative population of C_{21}-3C is calculated on three metal surfaces, Ru(0001), Rh(111) and Ir(111). Among all C clusters in the size range of 20-30 atoms, the ratio of C_{21}-3C can be as high as 89.1%~99.5% on Ru(0001) and Rh(111) surfaces, while on Ir(111) surface, the ratio of C_{21}-3C is always less than 48.4%, see Fig. 2.

That is, C_{21}-3C can be the dominating on Ru(0001) and Rh(111) surfaces under suitable conditions, but it can't on Ir(111)-like surfaces. That is why the identical-size ultra-stable C cluster can be only observed on Ru(0001) and Rh(111) surfaces in experiments.

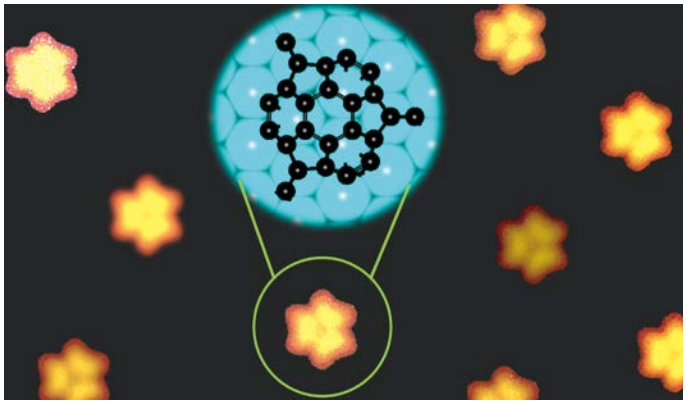

Fig. 1. The structure and STM of C_{21}-3C, which is exceptionally stable during the growth of graphene on Ru(0001) and Rh(111) surfaces by CVD.

For more information, please see the paper: *"The Structure and Stability of Magic Carbon Clusters Observed in Graphene Chemical Vapor Deposition Growth on Ru(0001) and Rh(111) Surfaces"*, **Angew. Chem. Int. Ed**. 53, 14031 (2014), (Pub. 15 Oct. 2014). DOI: 10.1002/anie.201406570.

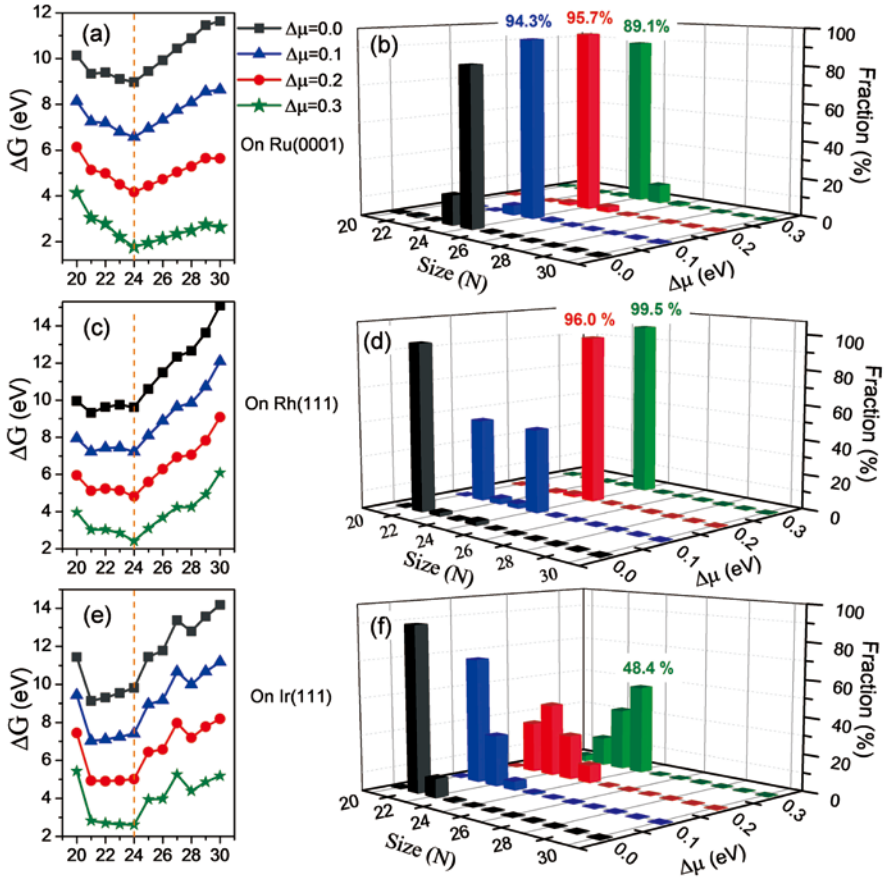

Fig. 2. The free-energies and populations of C_N (N=20~30) clusters under different condition of graphene growth (denoted by the chemical potential difference between feedstock and graphene, Δμ = 0.0, 0.1, 0.2, and 0.3 eV) on a,b) Ru(0001). c,d) Rh(111), and e,f) Ir(111) surfaces, respectively.

This research was also supported by Development Fund of CAEP and NSFC.

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VACANCY INTER-LAYER MIGRATION IN MULTI-LAYERED GRAPHENE

Defects have significant impacts on the properties of graphene. The engineering of graphene by introducing or eliminating defects is important for achieving the properties required for these various applications. Previous theoretical calculations assumed vacancy migration between layers was prohibited due to the very high migration barrier.[1] However, for years, experimental observations have frequently shown that irradiation of MLG or MWCNTs initially creates vacancies in all graphene layers or MWCNT walls, and then leads to the formation of a vacancy hole in only one layer or wall.[2, 3] These observations implied that the vacancies created in various graphene layers can be collected into one layer, and the inter-layer migration of vacancies is thus unavoidable. Meanwhile, an understanding of the vacancy migration between layers is still awaited.

Motivated by the experimental observations and their divergence from previous theoretical predictions, Prof. F. Ding, Dr. L. L. Liu, Dr. J. F. Gao at Beijing Computational Science Research Center, Dr. X. Zhang at Hong Kong Polytechnic University, and Prof. T. Yan at Nankai University preformed an long time quantum mechanics molecular dynamics on the defective two layers graphene. They reported a new inter-layer migration mechanism of vacancies between two adjacent massive defective layers. Via this mechanism, carbon atoms can jumped from one layer to another one, as a result, one massive defective graphene layer was greatly healed, leaving larger hole in the other one by vacancies gathering. Further transition state searching based on DFT found interaction between vacancies or vacancy holes in neighboring graphene layers can greatly reduce the barrier of inter-layer migration, to ~3 eV or less, expediting the migration process.

The study explains theoretically the puzzling experimental observation of vacancy inter-layer migration and reveals a new mechanism for graphene healing. This insight into the mechanism of defect inter-layer migration may lead to the engineering of graphitic nanomaterials by electron or ion irradiation.

This research was also supported by Hong Kong GRF research grant and NSFC.

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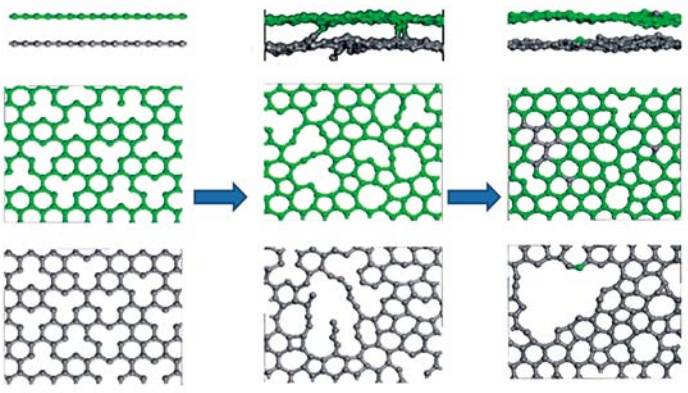


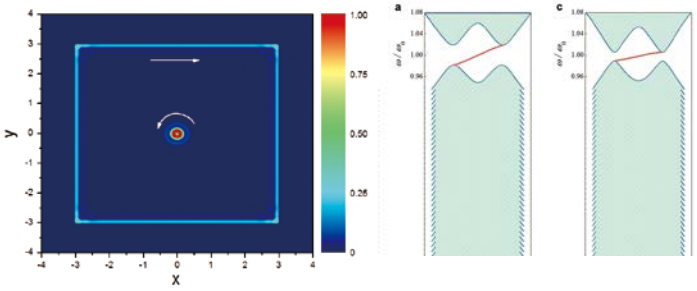
Fig. 1 A new mechanism for graphene self-healing by inter-layer migration of vacancies. The initial structures of two layers defective graphene (left panel), there are massive monovacancies in both two neighboring graphene layers in the beginning; with a short time molecular dynamic simulations, monovacancies aggregated to double vacancies and large holes, most important, inter-layer bonds formed at some defective holes (middle panel); after 27 ps annealing, one layer of graphene was greatly repaired by inter-layer atom migration, leaving more large holes in the other layer. The molecular dynamic simulations were performed by DFTB+ software package at 2500 K and it can be reproduced both by DFT method and classical Brenner potential at 2500 K.

PHOTONIC SIMULATION OF TOPOLOGICAL SUPERCONDUCTOR EDGE STATE AND ZERO-ENERGY MODE AT A VORTEX

The recent discovery of topological insulators has promoted research and development of studying topological phases in condensed matter physics. Interestingly, due to the inherent similarity of wave nature between electrons and photons, researchers are inspired to design and realize photonic topological states in classical-wave systems. In general, there are two basic schemes: (i) photonic band structures with Dirac cones in periodically arranged hexagonal arrays or with crossing point in square lattices; (ii) photonic hopping model with complex hopping amplitude. In all these works, the topological phases were characterized by non-zero Chern number and manifested by one-way edge states.

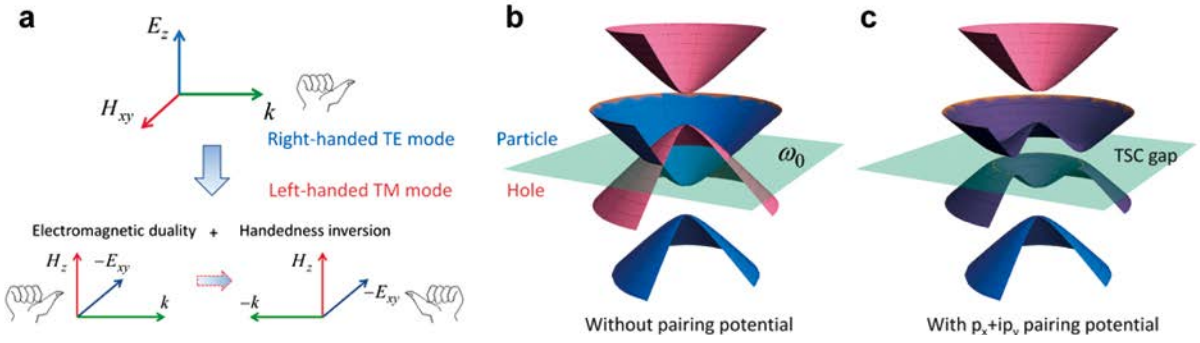
Recently, a group of CSRC researchers, W. Tan, L. Chen, and H. Q. Lin with collaborator X. Ji from AMSS demonstrated the photonic analogue of another type of topological states in topological superconductors (TSC), which has a pairing gap in the bulk and gapless bound states at the edge. Two essential characteristics of TSC, particle-hole symmetry and p_x+ip_y pairing, were well emulated in a suitably designed electromagnetic medium: (i) a combination of electromagnetic duality and handedness inversion of photons was proposed to mimic particle-hole transformation for electrons; (ii) the analogous p_x+ip_y pairing potentials were achieved by introducing complex off-diagonal elements in permittivity and permeability tensors. Finally, a 2×2 effective Hamiltonian were established possessing the identical mathematical structure of the TSC Hamiltonian, and well-defined edge state and zero-energy mode at a vortex were illustrated. This study bridges the fields of superconductor and photonics, which may not only provide a good platform for simulating wave behaviors in superconductor physics at room temperature, but also inspire researchers to explore more fruitful topological excitations in photonic systems.

This research was also supported by NSFC and 973 Program.



Ref.: Tan, W., Chen, L., Ji, X. & Lin, H.-Q. Photonic simulation of topological superconductor edge state and zero-energy mode at a vortex. Sci. Rep. 4, 7381; DOI:10.1038/srep07381 (2014).

Fig. 1 Photonic analogue of TSC band structures.



ELECTRON SPIN DECOHERENCE IN SILICON CARBIDE NUCLEAR SPIN BATH

Investigations of nitrogen-vacancy (NV) centers in diamond for quantum computing and sensing have achieved significant progress in the last decade. Similar defect centers in silicon carbide (SiC) are also of great interest due to their outstanding properties.

Recently, a theoretical group in CSRC, Professor Nan Zhao and Dr. Li-Ping Yang, together with their collaborators in Stuttgart University, studied the electron spin decoherence of single defects in SiC nuclear spin bath with a microscopic model [1]. They theoretically discovered that the defect centers in SiC can have very long electron spin coherence time, which makes defect in SiC a very promising physical system for quantum information processing. They found that, although the natural abundance of 29Si nuclear spin is about 4 times larger than that of 13C, the electron spin coherence time of defect centers in SiC nuclear spin bath in strong magnetic field (B > 300 Gauss) exceeds ~ 1 ms (see the figure), almost twice as long as the NV centers in 13C nuclear spin bath in diamond. Through numerical calculations, they attributed this counter-intuitive effect to the suppression of heteronuclear-spin flip-flop process in finite magnetic field.

The theoretical prediction in this work agrees with experiment observations very well. Very recently, two of the world-pioneering groups in this field, the Stuttgart group lead by Professor J. Wrachtrup and the Chicago group lead by D. Awschalom, were able to coherently control the electron spin of single defect in SiC, and their measured coherence times strongly support the conclusion in Ref. [1]. More details about the experimental progress can be found in Refs. [2] & [3].

This research was also supported by NKBRP (973 Program) and NSFC.

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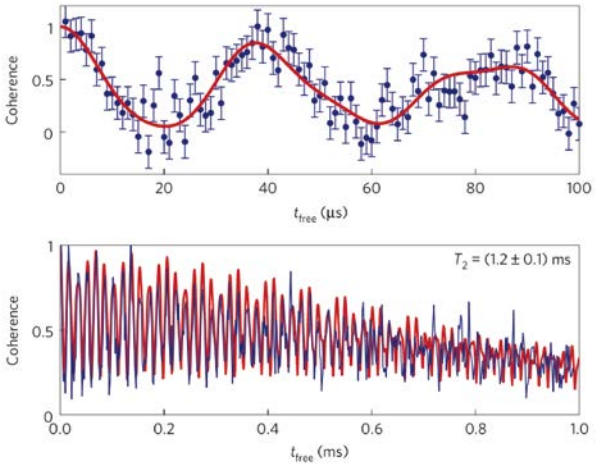


Fig 2: Experimental observation of electron spin coherence in SiC (from Ref. [3]). The measured date confirms that the coherence time T_2 > 1 ms, which agrees the theoretical prediction in Ref. [1].

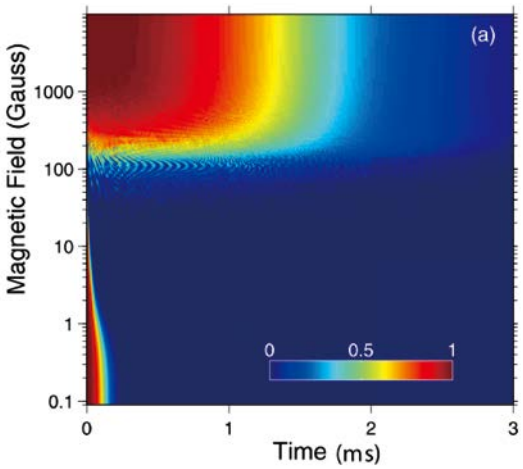


Fig 1: Calculated electron spin coherence of defect centers in SiC as a function of total evolution time and applied magnetic field.

WAVEGUIDE QUANTUM ELECTRODYNAMICS: CONTROLLABLE CHANNEL FROM QUANTUM INTERFERENCE

In a fully quantum network based on single-photon carriers to process quantum information, the essential task is to coherently control photon propagation by a local quantum node. To this end, a hybrid system consisting of a one-dimensional (1D) waveguide coupled to a two-level system (TLS) has been extensively studied for physical implementation of the quantum node acting as a quantum switch or a single-photon transistor. This functional hybrid system can be realized in circuit-QED systems. Inspired by its potential application in quantum computation and quantum information processing, the waveguide-QED system has been studied intensively. The working principle of the quantum devices mentioned is based on the following observation: a single photon propagating in a 1D waveguide will be completely reflected if it is resonant with the transition frequency of the TLS (this is the Fano resonance phenomenon).

CP Sun's group study a waveguide QED system with a rectangular waveguide and a two-level system inside, where the transverse magnetic TMmn modes define the quantum channels of guided photons. In our approach, both the real dispersion relation and multichannel effects are exactly taken into account. As for the multichannel-induced loss, we find that there exists a unique controllable channel (CC) defined by a particular superposition of the transverse magnetic TMmn modes, in which the guided photons are lossless and thus well controlled by the TLS, since the complementary channels orthogonal to the CC are all decoupled from the TLS. A dark state emerges when the photon is incident from one of the scattering-free channels orthogonal to the CC. The CC and all SFCs make up the whole single-excitation Hilbert space of the waveguide-QED system. For a single photon confined in the CC, the Fano interference between the incident wave and the re-emitted wave makes it totally reflected on resonance and well transmitted off resonance. Therefore, in a realistic waveguide the TLS can also work well, provided we use the CC to guide photons.

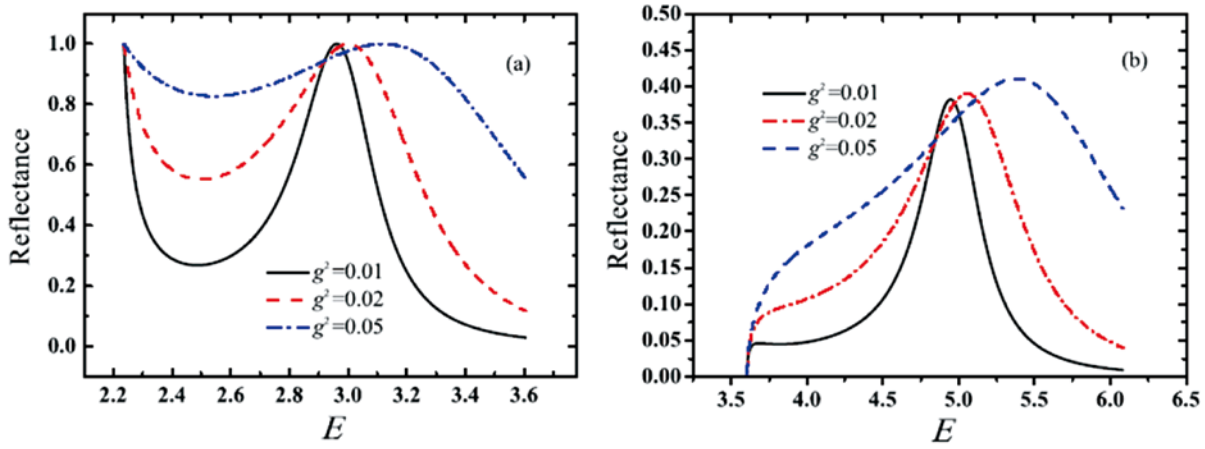


FIG. 1: Reflectance spectrum for a single photon incident in the TM11 mode. (a) $E \in (\Omega_1,\Omega_2)$; $\omega_a=(\Omega_1+\Omega_2)/2$. (b) $E \in (\Omega_2,\Omega_3)$; $\omega_a=(\Omega_2+\Omega_3)/2$.

This research was also supported by National 973 program and NSFC.

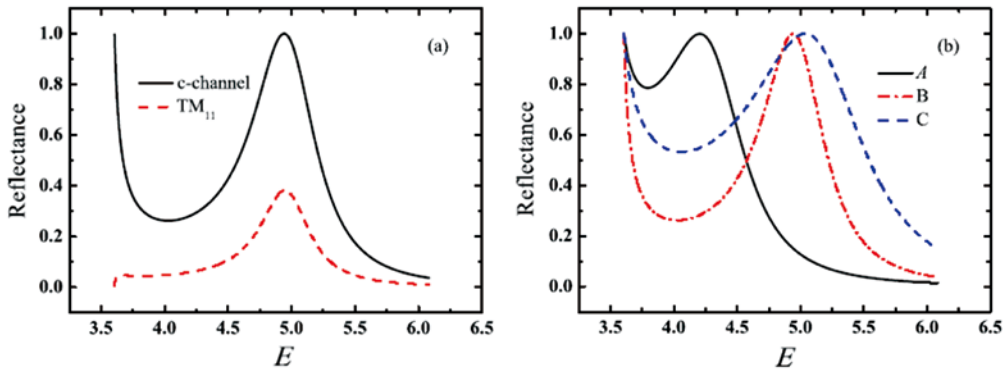


FIG. 2: (a) Reflectance spectrum with $E \in (\Omega_2,\Omega_3)$. A single photon is input in TM11 [dashed (red) line] or input in the CC (solid black line). g2=0.01; ωa=$(\Omega_2 + \Omega_3)/2$. (b) Reflectance spectrum with $E \in (\Omega_2,\Omega_3)$ for a single photon input in the CC. (A) $\omega_a=0.8\Omega_2+0.2\Omega_3$, $g^2 = 0.01$; (B) $\omega_a=0.5(\Omega_2 + \Omega_3)$, $g^2=0.01$; (C) $\omega_a =0.5(\Omega_2 + \Omega_3)$, $g^2=0.02$.

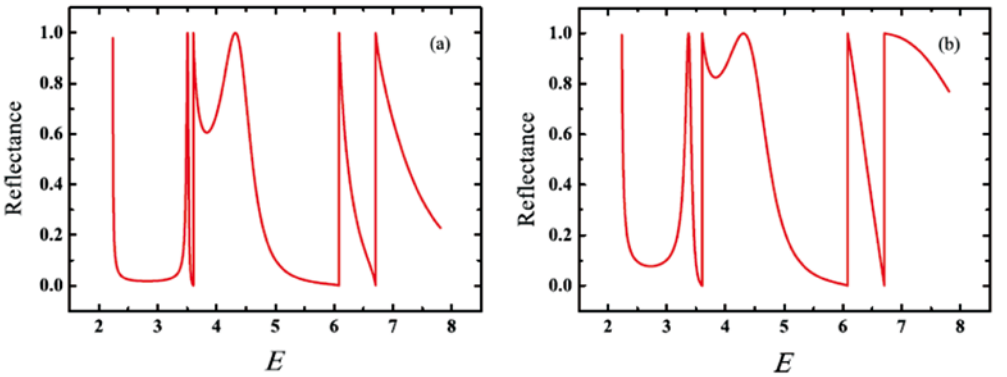


FIG. 3: Reflectance spectrum with $E \in (\Omega_1,\Omega_5)$ for a single photon input in the CC. (a) $g^2=0.01$; $\omega_a=(\Omega_1 + \Omega_5)/2$. (b) $g^2=0.0$; $\omega_a=(\Omega_1 + \Omega_5)/2$.

Ref.: Qiong Li, Lan Zhou and C. P. Sun, "Waveguide quantum electrodynamics: Controllable channel from quantum interference", PHYSICAL REVIEW A 89, 063810 (2014), (Pub 13 June 2014), DOI: 10.1103/PhysRevA.89.063810

PREDICTION OF A DIAMOND NV− LIKE COLOR CENTER IN CUBIC BORON NITRIDE

A successful transition from a transistor-based computing paradigm to quantum computing requires identifying systems with desired properties such as having a long quantum coherence time and being scalable. In this regard, the negatively charged nitrogen-vacancy (NV−) center in diamond, with its unique spin and optical properties, has emerged as a promising solid system for studying spin-related phenomena and quantum computing. The exciting potentials of the NV− center has fostered the search for similar, possibly low-cost, defect systems. Cubic boron nitride (c-BN), with its extreme hardness (second only to diamond), chemical and thermal stabilities (superior to diamond), has traditionally been used in high temperature applications as well as in hard protective coatings and abrasives. Unlike diamond, which can only be p-doped, c-BN can be doped with both pand n-types; and larger sizes c-BN can be produced by annealing c-BN powders. Recently, there are very encouraging developments in the synthesis and annealing techniques, thereby prompting renewed interest in this material. Since c-BN shares many of the interesting properties with diamond, it is likely the best system to host an NV−-like isoelectronic defect center.

Recently, a group of CSRC associate member P. Zhang, and CSRC researcher X. Gao, predicted a defect, an oxygen-on-nitrogen, boron vacancy complex (ON−VB) (shown in Fig. 1) in c-BN, based on first-principles electronic structure calculations, which has much of the characteristics of the GC-2 center often observed in c-BN. More interestingly, we find that the electronic structure of the ON−VB center resembles that of the NV− center in diamond (shown in Fig. 2), thus providing a potentially low-cost alternative to the NV− center. Similar to the NV− center, we find that the ON−VB center is optically accessible with a zero-phonon-line (ZPL) of about 1.6 eV, to be compared with 1.95 eV for the NV− center. In addition we identify the experimental GC-2 center with this defect complex. Vibronic coupling associated with the luminescence process of ON−VB is analyzed using a projection scheme within the Franck-Condon principle. The estimated vibronic coupling peaks at about 55 meV, which agrees well with the observed characteristic phonon frequency (56 meV) of the GC-2 center in c-BN.

This research was also supported by NSFC of China and DOE, NSF of USA.

Ref.: Tesfaye A. Abtew, Weiwei Gao, Xiang Gao, Y. Y. Sun, S. B. Zhang, and Peihong Zhang, “Theory of Oxygen-Boron Vacancy Defect in Cubic Boron Nitride: A Diamond NV− Isoelectronic Center”, Phys. Rev. Lett. 113, 136401 (2014), (pub. 23 September 2014). DOI: 10.1103/PhysRevLett.113.136401 (2014).

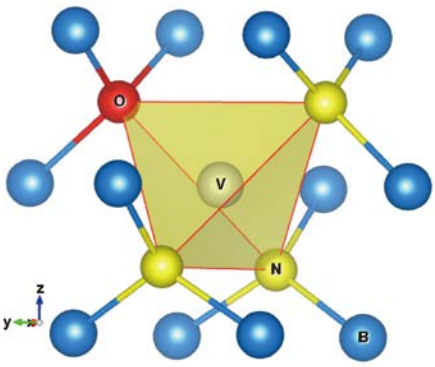


Fig.1: Structure of an O_N–V_B center in c-BN. Nitrogen atoms are shown in yellow (light color), boron in blue, and oxygen in red (dark). The boron vacancy (V_B) at the center of the tetrahedron is also shown.

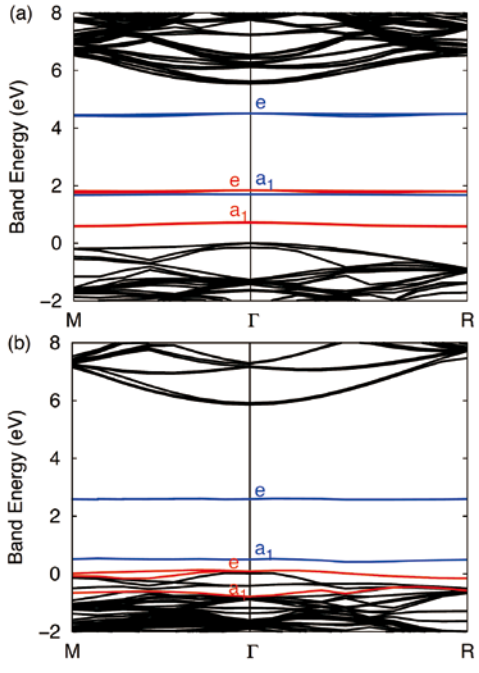
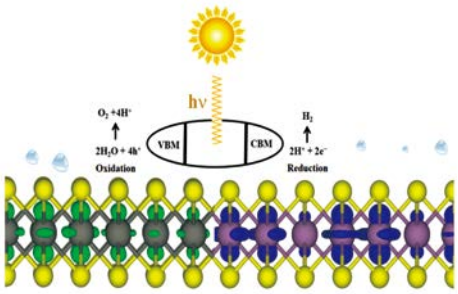
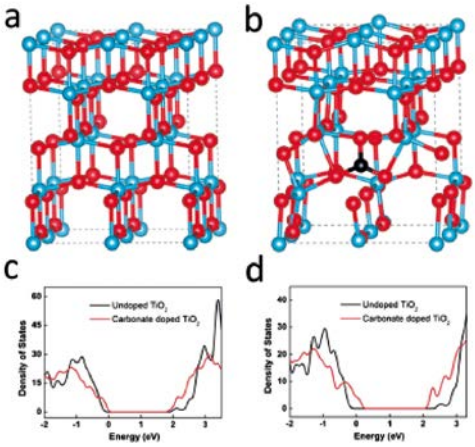


Fig.2: Band structures of (a) NV^- center in diamond, and (b) O_N–V_B center in c-BN calculated using a 216-atom supercell and the HSE functional. The spin resolved defect states are shown in red and blue lines for the majority and minority spins, respectively.

DESIGN OF HIGH EFFICIENT PHOTOCATALYSTS BY FIRST-PRINCIPLES CALCULATIONS

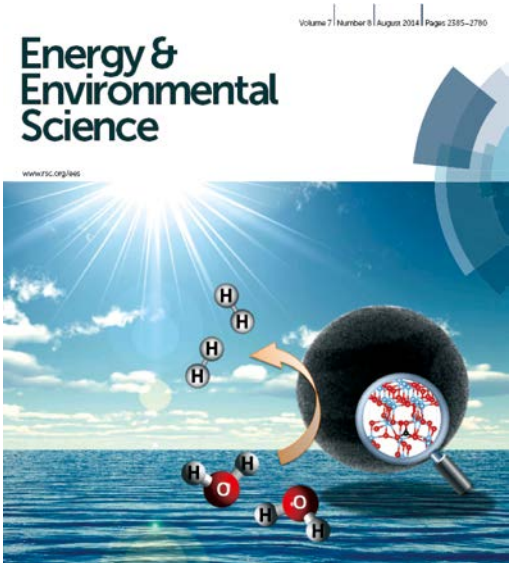




Solar energy is an ideal source of energy and converting sunlight into chemical fuels has been widely regarded as a promising green and sustainable approach to overcome the traditional supply of fossil fuels and their associated environmental issues. The key area for solar-to fuel conversion is to design the stable and high efficient photocatalysts. In order to improve the efficiency of photocatalysts, the morphology, size, and the electronic structure of the photocatalysts are explored.

Recently, a group of CSRC, led by Dr. Li-Min Liu, carried out first-principles calculations to design the novel photocatalysts, along with the collaboration with the experimental groups. Firstly, they examined the structural and electronic properties of 81 single layer structures for the 27 zinc-blende (ZB) materials with the constitutional formula, and the results shows that the stable single-layer ZB structures exhibit versatile electronic properties, such as tunable band gaps, strong optical absorption in the solar spectrum and suitable band edge positions. Following this, they reveals that although GaN and AlN monolayers retain the indirect band gap of bulk, MoS_2–AlN and MoS_2–GaN heterostructures have suitable direct gaps, excellent electron–hole separation and fascinating visible light adsorption, which is promising for solar energy applications. Thirdly, they explored the doping effect on the TiO_2, and they suggest that doping TiO_2 with carbonate can effectively reduce the bandgap of TiO_2, thus making TiO_2 photoactive in the visible region of the solar spectrum.

This research was also supported by NSFC.



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2. Chuan-Jia Tong, Hui Zhang, Yan-Ning Zhang, Hao Liu and Li-Min Liu*, New manifold two-dimensional single-layer structures of zinc-blende compounds, **J. Mater. Chem. A**, 2014, 2, 17971.
3. Bin Liu,‡ Li-Min Liu,‡ Xiu-Feng Lang, Hsin-Yi Wang, Xiong Wen (David) Lou and Eray S. Aydil, Doping high-surface-area mesoporous TiO2 microspheres with carbonate for visible light hydrogen production, **Energy Environ. Sci**., 2014, 7, 2592 (‡ equal contribution).

FIRST-PASSAGE TIME DISTRIBUTION IN A DISORDERED MEDIUM

The diffusive motion of macromolecules controls the speed of great many cellular processes such as signalling, assembly of protein complexes and molecular machines, and exit of mRNAs from the cell nucleus. Recent in vivo measurements have generally indicated a subdiffusive behavior of fluorescently tagged particles in the cytoplasm and nucleoplasm, as well as on the plasma membrane. The origin of the observed anomalous diffusion is still much debated. For example, one theory invokes the viscoelasticity of the intracellular medium which includes cytoskeletons and other organelles. A particle moving in such a medium would experience greater resistance to motion at shorter times, leading to a negative auto-correlation in displacement. Such a scenario would lead to a model known as the fractal Brownian motion (FBM). Another theory assumes power-law distribution of trapping times due to existence of sites with strong binding affinities (see Fig. 1). A renormalization group analysis proposed by Machta in 1985 suggests that, for space dimensions greater than $d_c = 2$, diffusion in a medium with quenched disorder has the same behavior as its annealed version, the continuous time random walk (CTRW) model of Montroll and Weiss. The CTRW model at $\mu < 1$ has been widely used in the interpretation of anomalous intracellular diffusion, despite the fact that organelles in the cell generally move much slower than the diffusing molecules such as proteins.

We re-examined this correspondence both numerically and through analytic calculations for diffusion in three dimensions. For quenched disorder, we found that the mean first-passage time (FPT) to the system boundary exhibits strong sample-to-sample fluctuations. Although in both cases, the FPT is dominated by the strongest trap on the path when $\mu < 1$, difference between the quenched and annealed cumulative FPT distributions arises from fluctuations in the number and spatial arrangement of deep traps in a given sample. Numerical simulations with power-law dwell times confirm our analytical predictions (see Fig. 2). We are now collaborating with several experimental groups in the Beijing area performing high-resolution single-cell imaging studies. The analysis tools we have developed will help the experimentalists to analyze the particle trajectories and to identify the correct physical mechanisms for anomalous diffusion in the cell.

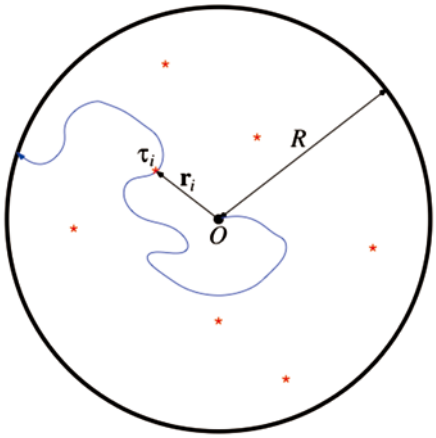

Fig. 1: The random walk of a particle in a medium with randomly distributed traps whose dwell times τi satisfy a power-law distribution $P(\tau) \sim \tau^{-\mu-1}$ with a fat tail. The process is terminated when the particle reaches the surface of a sphere centered at the starting point of the walker.

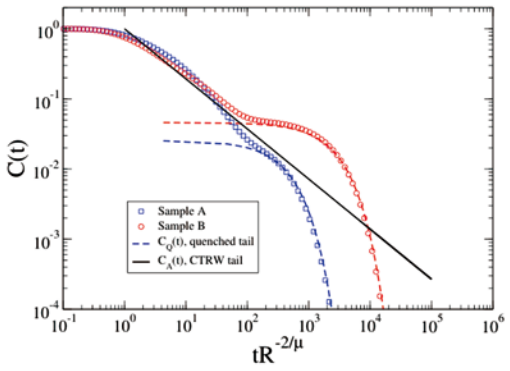

Fig. 2: Cumulative distributions of the first passage time for individual samples (symbols) as compared to the behavior of the CTRW (solid line) for diffusion in a disordered medium in three dimensions. Here $\mu = 0.71$.

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A CRITICAL RESIDUE SELECTIVELY RECRUITS NUCLEOTIDES FOR T7 RNA POLYMERASE TRANSCRIPTION FIDELITY CONTROL

Gene transcription is a fundamental process in molecular biology. The essential enzymes that direct the processes are RNA polymerases (RNAPs). The RNAP copies information from template DNA to a newly synthesized RNA strand, largely based on Watson-Crick base pairing between the template nucleotide and the incoming nucleotide. In the absence of the polymerase, the polymerization happens slow and is error-prone. The polymerase tremendously accelerates the polymerization and improves the fidelity.

In this work, a group of CSRC researchers at Complex System Research division implemented intensive MD simulations at atomistic level to investigate how nucleotide selection is assisted by a critical residue Tyr639 in T7 RNAP transcription (see Fig 1). The nucleotide selection is essential for the fidelity control in gene replication and transcription. The first author of this work is Dr Baogen Duan, a postdoctoral fellow in the center. The corresponding author and the principle investigator of this project is Dr Jin Yu, a tenure-track assistant professor in the center.

Recent work on T7 RNA polymerase suggested that a small post-translocation free energy bias stabilizes Tyr639 in the active site to aid nucleotide selection. However, it was not clear exactly how Tyr639 assists the selection. Here we report a molecular dynamics simulation study revealing atomistic detail of this critical selectivity. The study shows first that Tyr639 blocks the active site at post-translocation by marginally stacking to the end base pair of the DNA-RNA hybrid. The study then demonstrates that at the nucleotide pre-insertion state, a cognate RNA nucleotide does not affect the local Tyr639 stabilization, whereas a non-cognate nucleotide substantially stabilizes Tyr639 so that Tyr639 keeps blocking the active site (see Fig 2). As a result, further nucleotide insertion into the active site, which requires moving Tyr639 out of the site, would be hindered for the non-cognate nucleotide, but not for the cognate nucleotide. In particular, we note that water molecules assist the ribose recognition in the RNA nucleotide pre-insertion, and help Tyr639 stacking to the end base pair in the case of a DNA nucleotide. It was also seen that a base-mismatched nucleotide at pre-insertion directly grabs Tyr639 for the active site stabilization. We also find that in a mutant polymerase Y639F the strong stabilization of residue 639 in the active site cannot establish upon the DNA nucleotide pre-insertion. The finding explains the reduced differentiation between ribo- and deoxyribonucleotides that has been recorded experimentally for the mutant polymerase.

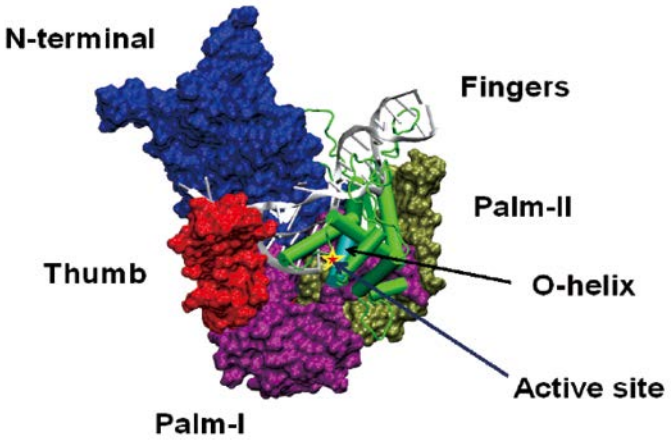


Fig 1 The molecular structure of T7 RNAP elongation complex

This research was also supported by NSFC #11275022.

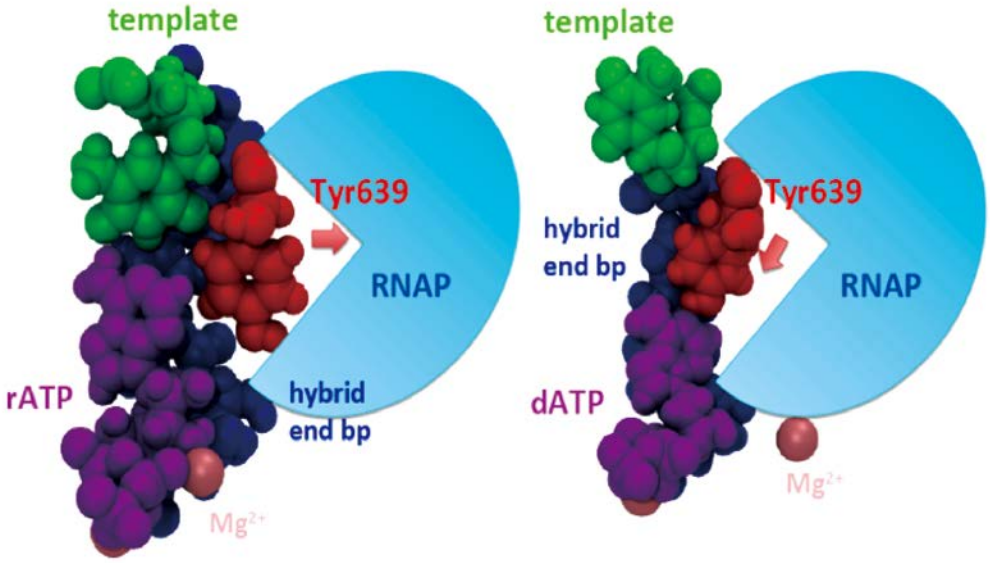


Fig 2 A critical residue Tyr639 serves for nucleotide selection in T7 RNAP. Both a right/cognate rATP (left) and a wrong/non-cognate dATP(right) are shown.

Ref.: Baogen Duan, Shaogui Wu, Lin-Tai Da, and Jin Yu. "A critical residue selectively recruits nucleotides for T7 polymerase transcription fidelity control", Biophysical Journal, 107 (2014), (pub. November 2014). doi:10.1016/j.bpj.2014.09.038

SUPERCONVERGENCE OF DISCONTINUOUS GALERKIN METHOD FOR LINEAR HYPERBOLIC EQUATIONS

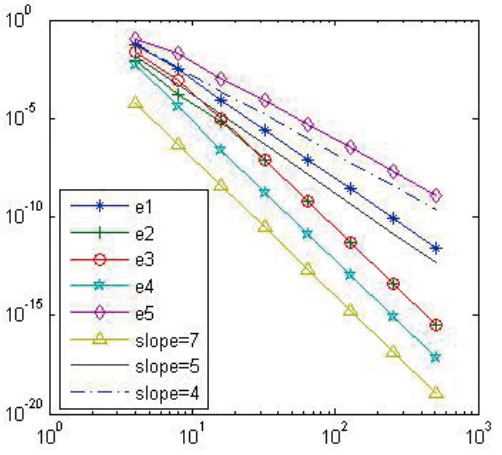
Discontinuous Galerkin (DG) methods, originally developed for neutron transport problems, are a class of finite element methods using discontinuous piecewise polynomial space. Due to its flexibility for arbitrarily unstructured meshes, the efficiency in parallel implementation, the ability to easily handle complex geometries or interfaces and accommodate arbitrary h-p adaptivity, the DG method gains more popularity in solving various differential equations and attracts intensive theoretical studies.

In the past several decades, there has been considerable interest in studying superconvergence properties of DG methods. Very recently, Yang and Shu studied superconvergence properties of a DG method for linear hyperbolic equations when upwind fluxes were used. They proved a k+2th superconvergence rate of the DG approximation at the right Radau points and for the cell average under suitable initial discretization. They also presented numerically, for k=1,2, a 2k+1th superconvergence rate of the DG solution at the downwind points and for the cell average.

In fact, numerical 2k+1th convergence rate was observed by many researchers more than a decade ago. However, a theoretical proof of this remarkable property remains open. Indeed, the 2k+1th superconvergence rate is one of the unsolved mysteries of the DG method for hyperbolic equations.

The main result of our work is to uncover this mystery by offering a rigorous mathematical proof for the 2k+1th superconvergence rate at downwind points and for the domain average. As by-products, we provide a simplified proof for the point-wise k+2th superconvergence rate at the right Radau points, a fact established before in a weaker sense by a different approach; we also prove a point-wise k+1th derivative superconvergence rate at the left Radau points, a fact not reportd before. By doing so, we present a full picture for superconvergence properties of the DG method for liner hyperbolic equations in one spatial dimension.

Some Review Comments
“thanks to the originality of the analysis and the pertinence of the results", “The finding about the derivative error in the left Radau points is novel". “this paper can be really considered as a major breakthrough concerning the analysis of superconvergence properties of DG schemes for linear conservation laws."



Convergence rates for k=3: error at right radau points k+2; derivative error at left radau points k+1; errors at downwind points, cell and domain averages 2k+1.

Waixiang Cao, Zhimin Zhang, and Qingsong Zou, Superconvergence of Discontinuous Galerkin method for linear hyperbolic equations, SIAM Journal on Numerical Analysis 52-5 (2014), 2555-2573.

UNIFORMLY ACCURATE EXPONENTIAL-WAVE-INTEGRATOR METHOD FOR HIGHLY OSCILLATORY NONLINEAR SCHRÖDINGER EQUATION WITH WAVE OPERATOR

The nonlinear Schrödinger equation with wave operator (NLSW) is the nonlinear Schrödinger equation (NLS) perturbed by the wave operator with strength described by a dimensionless parameter $\varepsilon \in (0,1]$, reading as

$$\begin{cases} i\partial_t u^\varepsilon(\mathrm{x},\mathrm{t}) - \varepsilon^2 \partial_{tt} u^\varepsilon(\mathrm{x},\mathrm{t}) + \nabla^2 u^\varepsilon(\mathrm{x},\mathrm{t}) + \mathrm{f}(|u^\varepsilon|^2) u^\varepsilon(\mathrm{x},\mathrm{t}) = 0, & \mathrm{x} \in \mathrm{R}^d, \quad \mathrm{t} > 0, \\ u^\varepsilon(\mathrm{x},0) = u_0(\mathrm{x}), \qquad \partial_t u^\varepsilon(\mathrm{x},0) = u_1^{\ \varepsilon}(\mathrm{x}), & \mathrm{x} \in \mathrm{R}^d. \end{cases}$$

NLSW has wide applications in physics, such as the Klein-Gordon equation in the nonrelativistic limit, Langmuir envelope approximation in plasma and modeling light bullets from sine-Gordon equation. Theoretical analysis and numerical evidence show that the solution of NLSW is highly oscillatory in time for small ε .In detail, as $\varepsilon \to 0$, NLSW converges to NLS and for the small perturbation, i.e. $0 < \varepsilon << 1$, the solution of the NLSW differs from that of the NLS with a function oscillating in time with $O(\varepsilon^2)$ wavelength at $O(\varepsilon^2)$ and $O(\varepsilon^4)$ amplitudes for ill-prepared and well-prepared initial data, respectively. This rapid oscillation in time brings significant difficulties in designing and analyzing numerical methods with uniform error bounds in ε .

Recently, CSRC researcher Yongyong Cai and associate member Weizhu Bao developed an exponential-wave-integrator sine pseudospectral (EWI-SP) method for NLSW, carried out rigorous numerical analysis of the EWI-SP method and obtained uniform and/or optimal error estimates for the method [1]. The main result can be summarized as

Theorem 1. Let $u_{h,\tau}^n$ be the numerical approximation of the solution $u^\varepsilon(\mathrm{x},t_n)$of the NLSW by the EWI-SP method under mesh size h and time step τ. Under proper assumptions on the solution of the NLSW and the function *f*, there exist constants $0 < \tau_0, \frac{h_0}{\pi} \le 1$independent of $0 \le \varepsilon \le 1$, such that if $0 < h \le h_0$ and $0 < \tau \le \tau_0$, for well-prepared initial data, we have the following uniform and optimal error bound

$$\left\| u^\varepsilon(\mathrm{x},t_n) - u_{h,\tau}^n \right\|_{L^2} \le C\left(h^m + \tau^2\right) \quad \text{and} \quad \left\| \nabla(u^\varepsilon(\mathrm{x},t_n) - u_{h,\tau}^n) \right\|_{L^2} \le C\left(h^{m-1} + \tau^2\right),$$

where *C* is a constant and m depends on the regularity of the solution.

For ill-prepared initial data, we can establish similar uniform error bound for the EWI-SP method. In fact, the EWI-SP method possesses the optimal uniform error bounds at $O(\tau^2)$ and $O(\tau)$ in τ (time step) for well-prepared initial data and ill-prepared initial data, respectively, and spectral accuracy in *h*(mesh size) if the solution is smooth for the both cases, in the L^2 and H^1 norms. This result significantly improves the error bounds of the finite difference methods for the NLSW. The key step is to use sine spectral discretization for NLSW in space, and the resulting ODE system is then integrated by the exponential-wave-integrator method. Numerical examples were reported to confirm the error bounds are sharp.

This work is not only useful for simulating NLSW, but also important for designing uniformly and/or optimal convergent numerical methods for highly oscillatory nonlinear dispersive partial differential equations, such as the Klein-Gordon equation in the nonrelativistic limit regime [2], the Klein-Gordon-Zakharov system [3], the Dirac equation in the nonrelativistic limit regime, the Zakharov system in the subsonic limit regime, the Klein-Gordon-Schrödinger equations etc.

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AN EFFICIENT SPECTRAL METHOD FOR COMPUTING DYNAMICS OF ROTATING TWO-COMPONENT BOSE–EINSTEIN CONDENSATES VIA COORDINATE TRANSFORMATION

The Bose–Einstein condensation (BEC) affords an astonishing glimpse into the macroscopic quantum world and has been extensively studied since its first realization in 1995. Later, with the observation of quantized vortices in BECs, attention has been broaden to explore vortex states and their dynamics associated with superfluidity. Recently, rotating BECs which are known to exhibit highly regular vortex lattices have been heavily studied both experimentally and theoretically. On the other hand, multi-component BECs admit numerous interesting phenomena absent from single-component condensates, for example, domain walls, vortons, square vortex lattices and so on. As the simplest cases, two-component BECs provide a good opportunity to investigate the properties of multi-component condensation.

The first experiment of two-component BECs was carried out in $|F=2, m_f=2>$ and $|F=2, m_f=-1>$ hyperfine states of ^{87}Rb. At temperatures T much smaller than the critical temperature T_c , a rotating two-component BEC with an external driving field (or an internal Josephson junction) can be well described by two self-consistent nonlinear Schrödinger equations (NLSEs), also known as the coupled Gross–Pitaevskii equations (CGPEs).

Many numerical methods have been proposed to study the dynamics of non-rotating single/multi-component BECs, i.e. when $\Omega = 0$, with/without external driving field. Among them, the time-splitting pseudo-spectral method proposed by W. Bao, Y. Zhan in 2004 is one of the most successful methods. It has spectral-order accuracy in space and can be easily implemented, i.e. it can achieve both the accuracy and efficiency. However, the appearance of the angular momentum rotational term hinders the direct application of those methods to study the rotating two-component BECs. Recently, several numerical methods were proposed for simulating the dynamics of rotating single/multi-component BECs. For example, a pseudo-spectral type method was proposed by reformulating the problem in two-dimensional polar coordinates or three-dimensional cylindrical coordinates. Another example is the time-splitting alternating direction implicit (TSADI) method, where the angular momentum rotation term is solved in x- and y-directions separately. Later, a generalized Laguerre–Fourier–Hermite pseudo-spectral method was proposed. These methods have higher spatial accuracy compared to those finite difference/element methods. However, the pseudo-spectral type method has only the second- or fourth-order accuracy in the radial direction, while the implementation of the TSADI methods could be quite involved. One possible approach to overcome those limitations is to relax the constrain of the rotational term, which is the main aim of our work. For this purpose, we propose a simple and efficient numerical method to solve the CGPEs. The main merits of our method are: (i) Using a rotating Lagrangian coordinate transform, we reformulate the original CGPEs to one without angular momentum rotation term. Then, the time-splitting pseudo-spectral method designed for the non-rotating BECs, which are of spectral order accuracy in space and easy to implemented, can be directly applied to solve the CGPEs in new coordinates. Moreover, (ii) our method solves the CGPEs in two splitting steps instead of three steps in the proposed pseudo-spectral type method and thus it is more efficient. In addition, the temporal accuracy of our method can be easily increased to higher order.

Ref: Ju Ming, Qinglin Tang, Yanzhi Zhang, "An efficient spectral method for computing dynamics of rotating two-component Bose–Einstein condensates via coordinate transformation," J. CAMPUT. PHYS., 258(2014) 538-554.

QUANTUM MECHANICAL SIMULATIONS OF NANOSCALE PHOTOVOLTAIC DEVICES

The increasing demand of renewable energy supply has motivated the search for high efficiency photovoltaic devices. Semiconductor nanostructured photovoltaic devices have emerged as a new generation of devices due to their potential applications in low cost devices with high power conversion efficiencies (PCEs). Recent studies found that the nanowire-based solar cell is able to achieve high PCE, which breaks the traditional limit. Due to the different temporal and spatial scales involved, it remains a great challenge to model the processes in photovoltaic energy conversion. Conventionally, two major approaches for optoelectronic device simulations are the continuum equation model and the discrete dynamic Monte Carlo (DMC) method, which are both based on classical models relying on empirical parameters.

Recently we developed a quantum mechanical simulation method to model directly the photo-induced current of photovoltaic structure. The method adopts a DFTB description of the electronic structure, non-equilibrium Green's function (NEGF) formalism to model the quantum transport and many-body theory for electron-photon interaction. Our work presents a full quantum mechanical simulation of photovoltaic devices, with all processes included simultaneously. Our method captures quantum mechanically all the electronic and optical properties of a photovoltaic device under the radiation of an external electromagnetic source. All the photovoltaic process, such as photon absorption, electron-hole generation and recombination, and subsequent electron-hole separation and charge transport, are treated on the equal footing. It presents an important step towards the prediction of the properties of photovoltaic devices and the ultimate design of these devices from first-principles.

A full quantum mechanical study of a silicon nanowire-based photovoltaic device of the order of ten thousand atoms was carried out. In Fig. 1 the local density of states (LDOS) is plotted in the two-dimensional space of energy and coordinate. The LDOS forms the band-like structures in real space. The contribution from individual dopants can be clearly seen. In Fig. 1a, the bending of the band structure across the PN junction is clearly observed, from which a built-in potential is formed. Upon the photo-excitation, an electron is excited to the conduction band and a hole is created simultaneously in the valence band. The electron moves to the right and the hole moves to the left, producing the photo-induced current. As the forward bias voltage is increased to the open-circuit voltage, the directions of the electron and hole movements are reversed (Fig. 1b). Based on the analysis of the LDOS and the underlying dynamic processes, our method provides detailed insights into the fundamental processes such as photo-absorption, electron-hole separation/recombination and charge transport in photovoltaic devices. Fig. 2 plots the current-voltage characteristics of a silicon nanowire. The black and red lines are dark currents and illuminated currents, respectively. A monochromatic light illumination with photon energy 2.5 eV was applied to the system. The calculated short-circuit currents is 2.3 3mA/cm2 and the open circuit voltages is 0.62 V.

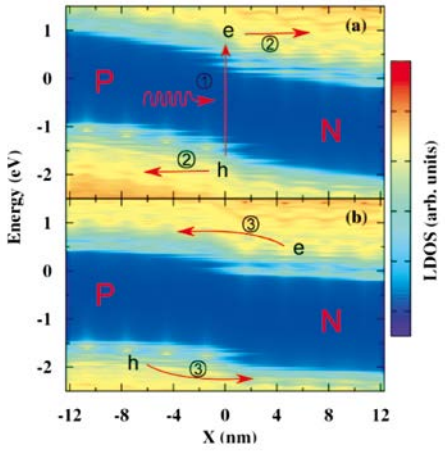

Fig.1 Local density of states of the silicon nanowire with forward bias voltage (a) 0 and (b) 0.6V.

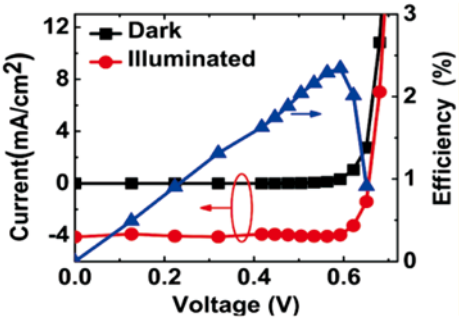

Fig.2 Current-Voltage characteristics of a silicon nanowire with/without light illumination.

Ref.: Yu Zhang, Lingyi Meng, ChiYung Yam, GuanHua Chen, "Quantum-Mechanical Prediction of Nanoscale Photovoltaics", J. Phys. Chem. Lett., 5, 1272-1277 (2014).

WILSON RATIO OF FERMI GASES IN ONE DIMENSION

Wilson ratio, defined as the ratio of the magnetic susceptibility χ to specific heat *C*v divided by temperature T

$$R_W = \frac{4}{3}\left(\frac{\pi k_B}{\mu_B g}\right)^2 \frac{\chi}{c_v/T},$$

is a constant at the renormalization fixed point of these systems. For example, RW = 1 for noninteracting or weakly correlated electrons in metals [1], and RW = 2 in the Kondo regime for the impurity problem [2]. The dimensionless Wilson ratio quantifies the interaction effect and spin fluctuations and thus presents a characteristic of strongly correlated Fermi liquids [1]. RW > 1 in strongly correlated systems where the spin fluctuations are enhanced while charge fluctuations are suppressed.

Motivated by the experimental results for the spin ladder and some optical systems, several physicists, including Prof. H. Q. Lin at the Beijing Computational Science Research Center and Prof. X. W. Guan at Wuhan Institute of Physics and Mathematics, considered the Wilson ratio [3] in the context of the spin-1/2 delta-function interacting Fermi gas [4,5]. The quantum liquids exhibited by this model include the paradigm of a spin-charge separated Tomonaga-Luttinger liquid (TLL) in the repulsive regime and a two-component TLL of pairs and single fermions in the attractive regime. They addressed the issue that whether the Wilson ratio can capture a similar Fermi liquid nature of such a particular pairing phase, and found that

$$R_W = \frac{4}{(v_N^b + 4v_N^M)\left(\frac{1}{v_s^b} + \frac{1}{v_s^M}\right)}$$

which holds throughout the two-component TLL phase.

This result is in terms of the density stiffness vNb;u and sound velocity vNb;u for pairs b and excess single fermions u. These parameters can be calculated from the ground state energy. Figure 1 shows that at finite temperatures, the contour plot of RW can map out not only the two component TLL phase but also the quantum criticality of the attractive Fermi gas. The Wilson ratio thus gives a simple testable parameter to quantify interaction effects and the competing order between pairing and depairing.

The Wilson ratio of 1D Fermi gases can in principle be measured in experiments. The Wilson ratio of the 1D attractive Fermi gases which they have obtained thus provides a measurable parameter to quantify different phases of quantum liquids in 1D interacting fermions with polarization. At low temperatures, the Fermi liquid nature is retained in 1D many-body systems of interacting fermions. Their analysis can be adapted to different systems, such as interacting fermions, bosons, and mixtures composed of cold atoms with higher spin symmetry.

This research was also supported by MOST and NSFC.

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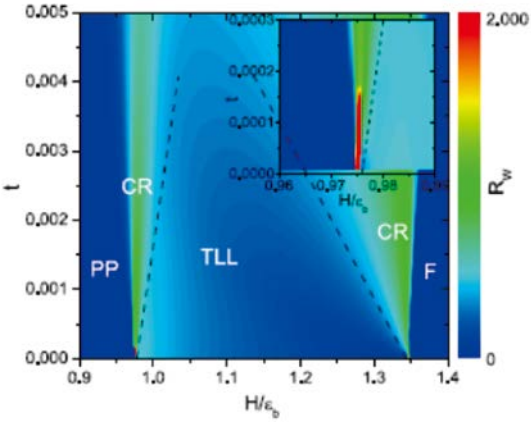

Fig.1: Contour plot of the Wilson ratio RW [Eq. (1)] of the attractive Fermi gas for dimensionless interaction | γ | = 10 as a function of the reduced temperature $t = T/\varepsilon_b$ and magnetic field. ε_b is the binding energy. The result [Eq. (2)] provides a criterion for the two-component TLL phase in the region below the dashed lines, where RW is temperature independent. The dashed lines indicate the crossover temperature $T^*H - H_c$ | separating the relativistic liquid from the nonrelativistic liquid. RW = 0 for both the TLL of pairs (PP) and the TLL of excess fermions (F). In the critical regimes (CR), RW gives a temperature-dependent scaling. However, near the two critical points, the ratio reveals anomalous enhancement, discussed further in the paper. The inset shows the enhancement at the lower critical point.

QUANTUM CONFINEMENT INDUCED OSCILLATORY ELECTRIC FIELD ON A STEPPED PB(111) FILM AND ITS INFLUENCE ON SURFACE REACTIVITY

Manipulating and controlling the surface chemical reactivity on metal thin films is an interesting topic in physics and chemistry, since metal surfaces play an important role in catalysis, molecular self-organization, and corrosion processes. Recent experiments indicate that the quantum size effects (QSE) can cause selective adsorption and enhancement of chemical process on the terraces of wedge-shaped thin Pb(111) films formed on stepped Si(111) substrate. Nevertheless, the microscopic mechanisms that relate the QSE to the experimentally observed selective chemical reaction are still not well understood, although some correlations between the surface reactivity and electronic properties (e.g., work function, density of states at Fermi level) have been discussed.

Recently, a group of physicists including Xiaojie Liu and H. Q. Lin at CSRC, investigated how QSE can control the selective adsorption and chemical processes on stepped or wedge-shaped Pb(111) films [1]. Unlike all the previous theoretical studies which have focused on the properties of separate uniform height islands, they investigated the situation when several Pb thin strips with different thicknesses are brought into contact to form a stepped or wedge-shaped thin film. Using first-principles calculations, they showed that QSE will induce a modulated oscillatory electrostatic potential on the surface of stepped or wedge-shaped Pb(111) films. This modulated electrostatic potential will cause an alternating electric field across the strips of different thickness on the wedge and influence the growth morphology and reactivity on the flat top of the wedge-shaped Pb(111) films as observed experimentally. Such a QSE induced electric field modulation mechanism would be used to design metal film geometries for desirable controlling of nanostructure morphologies and selective chemical reactions.

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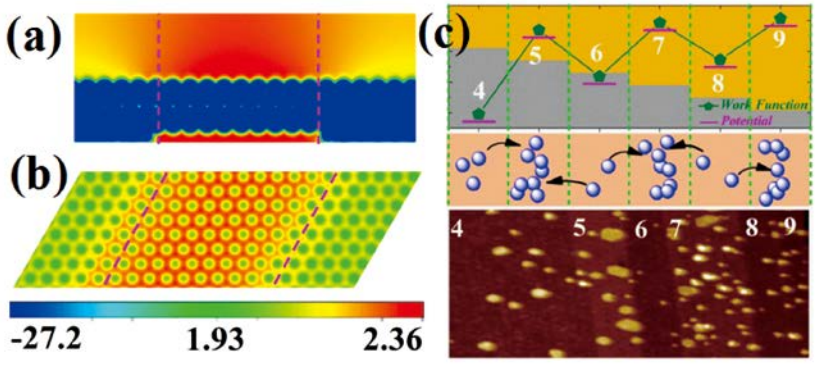

Fig. 5 Quantum size effects induce oscillatory electrostatic potential and thus alternating electric field on the surface of the wedge-shaped Pb(111) films, leading to selective even or odd layer adsorption preference depending on the charge state of the adatoms. The electrostatic potential are shown in Fig. 5(a) (side view) and (b) (side view).

THEORETICAL STUDIES ON THE NOVEL QUANTUM SCATTERING AND FRACTIONAL QUANTUM HALL EFFECT OF DIRAC FERMIONS ON THE SURFACE OF A TOPOLOGICAL INSULATOR

The recent theoretical prediction and experimental discovery of topological insulators (TI) has attracted considerable interest in the condensed matter physics community. One topic of fundamental importance in topological surface states is the defect- or impurity-induced strong modifications on the local electronic properties, which can be detected by scanning tunneling microscopy (STM). Because of the Dirac spectrum, the spin-orbit coupling (SOC) induced fermionic chirality, and the strong warping effect in topological surface states, the impurity scattering effect in TIs is naturally expected to display novel behavior that should be absent from the conventional semiconductor or metal-surface twodimensional electron gases. The characterizations of the fractional quantum Hall effect (FQHE) of Dirac fermions on the TI surface in the presence of a magnetic field is another interesting topic. Especially, owing to the unique spin chirality of Dirac fermions induced by intrinsic strong SOC in TI materials, the effect of tilted magnetic field, the Zeeman effect, and the warping effect on the FQHE on TI surface should remarkably differ from that in conventional 2DEG. However, the novel properties of the FQHE of Dirac fermions on TI surface is still missing in the literature,

Recently, a group of physicists including CSRC researchers, Zhen-Guo Fu and H. Q. Lin, and associate member P. Zhang, performed systematic theoretical studies on i) the quantum scattering effect of Dirac fermions induced by impurities and steps on TI surface[1-3], and ii) the FQHE of Dirac fermions on TI surface [4-6].

In order to study the quantum scattering effect of Dirac fermions, the topological surface states are described by a Dirac wave equation with an additional locking between momentum and spin of the surface Dirac electrons, and the strong warping effect is also taken into account. They theoretically developd a partial-wave method to study multiple scattering of massive/massless Dirac fermions on the surface of TI with strong warping effect, and demonstrated that with increasing the Fermi energy, the power-law decay of local density of states (LDOS) induced by impurities is modified due to the warping effect of the Fermi surface. In symmetric double-step barriers on TI surface,

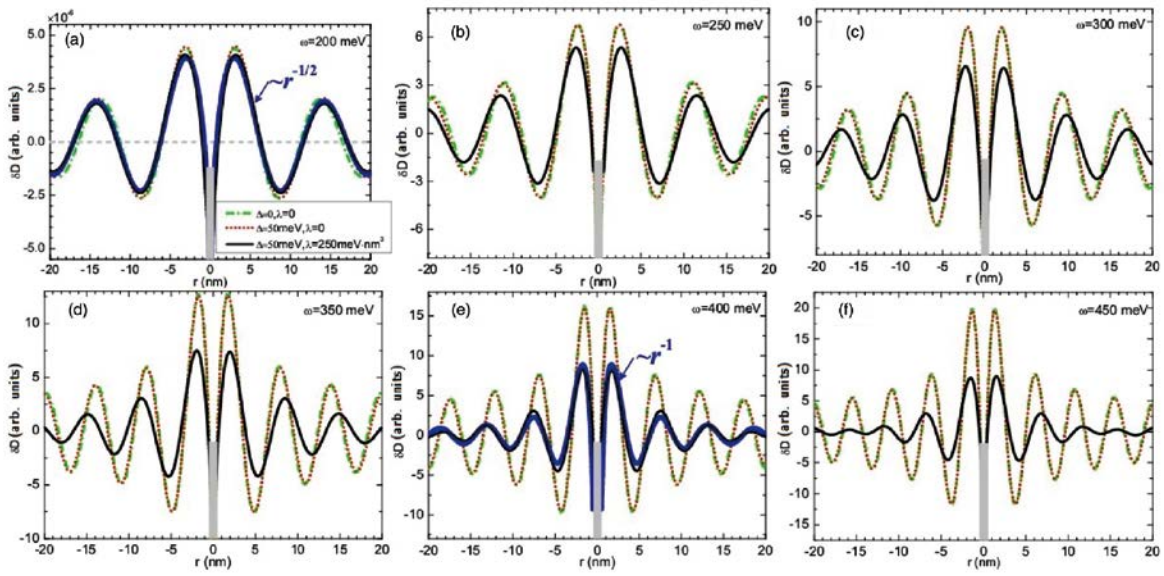

Fig.1: LDOS as a function of x (Γ-K direction) with y = 0 for a single magnetic impurity located at r=(0,0) with a radius of α = 0.5 nm.

their results showed that the remarkable warping effect may result in anisotropic Fabry-Perot-like resonance states confined in the step-well running along Γ-M direction and Γ-K direction. Cooperating with the STM experimental group of Prof. Q. K. Xue in Tsinghua University, they also studied the quantum confinement of Dirac fermions in triangular quantum corrals on TI Bi2Te3 surface, and the theoretical simulations are consistent with the experimetal observations very well.

Furthermore, taken into account the electron-electron interactions and an external tilted magnetic field, they theoretically found that by increasing the in-plane component of the tilted magnetic field as well as the warping strength of the Fermi surface, the FQHE state at n=0 Landau level (LL) becomes more stable, while the stabilities of n=±1 LLs become weaker. Moreover, their results showed that the excitation gaps of the ν=1/m FQHE states increase with increasing the tilt angle. Taken into account the Zeeman effet, the effective pseudopotentials of the Coulomb interaction are reformed and are quite different from those in graphene. They showed that the ground state energies and the excitation gaps at ν=1/3 FQHE between the n=±1 LLs render asymmetry, and the

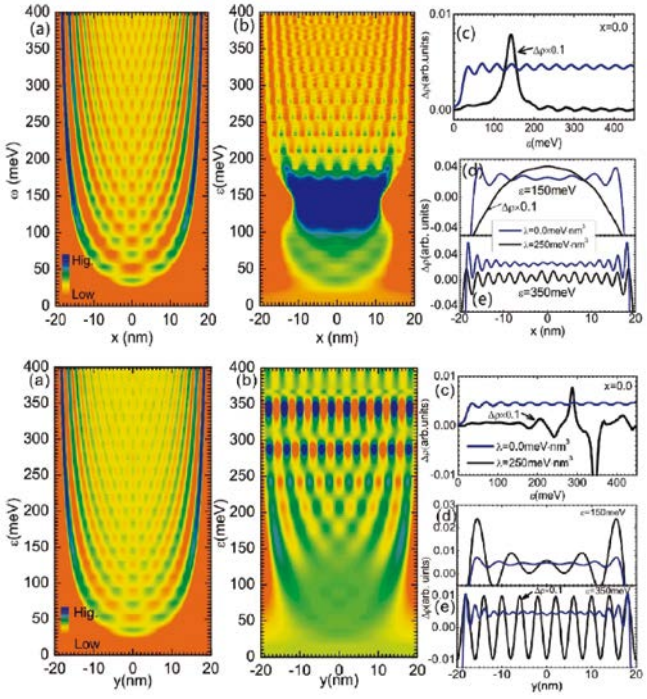

Fig.2: The change in the LDOS of Dirac electrons confined in the double symmetric barriers along Γ-M direction (Left)and Γ-K direction (right).

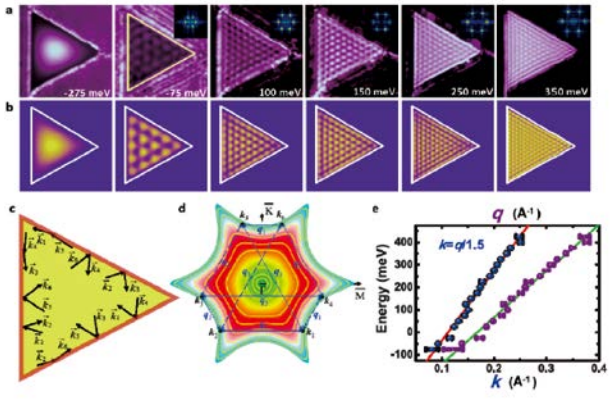

Fig.3: Quantum confinement of Dirac fermions on the surface of TI Bi2Te3.

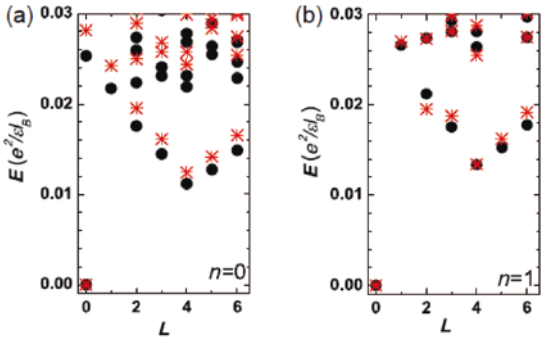

Fig.4: Exact energies versus the angular momentum L for N = 7 electrons at the 1/3 TIFQH state. The warping strength is chosen as 0 (circles) and 0.2 (stars).

FQHE state at the n=+1 LL is more robust than that at n=−1 LL since the excitation gap at n=+1 LL is larger than that at n=−1 LL. Their works are not only useful for understanding the novel properties of Dirac fermions in TIs, but also encouraging for the experimental research of STM and FQHE in TIs.

This research was also supported by NSFC and NBRPC.

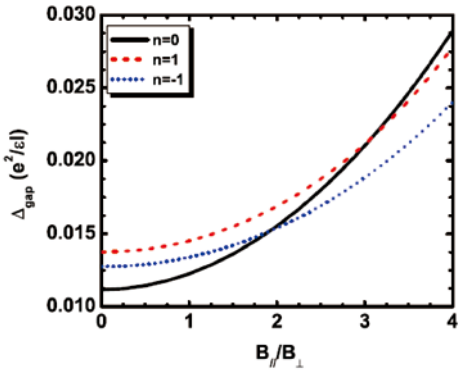

Fig.5: The gap width between the ground state and the first excited state at 1/3 FQHE states for LLs n=0 and ±1.

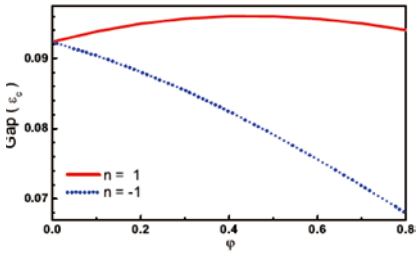

Fig.6: Excited energy gap versus Zeeman parameter for N=6 electrons at1/3 FQHE state.

Ref.:
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CONTROLLING A NANOWIRE SPIN-ORBIT QUBIT VIA ELECTRIC-DIPOLE SPIN RESONANCE

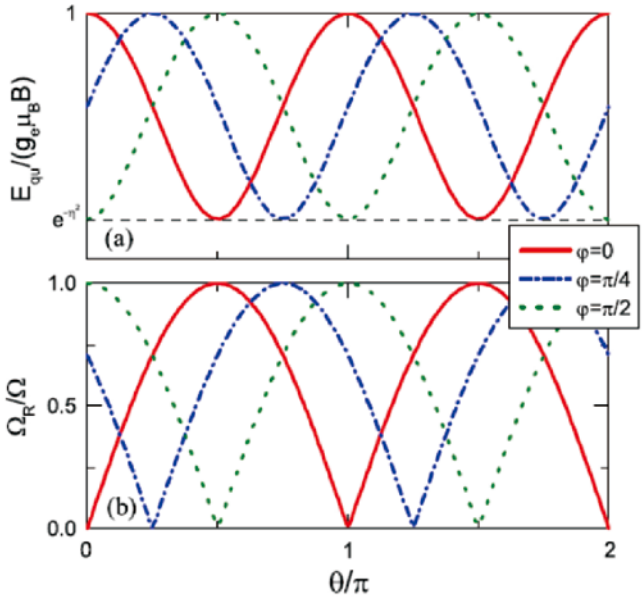
How to achieve a simple and efficient way to manipulate a qubit is of basic importance in quantum information processing. For the conventional spin qubit, its manipulation can be accomplished by using the electron spin resonance technique. The spin-orbit qubit, unlike the conventional spin qubit, contains both the orbital and the spin degrees of freedom of an electron, owing to the spin-orbit coupling (SOC). The spin-orbit qubit has an additional advantage of being manipulable via an external a.c. electric field, an interesting phenomenon called the electric-dipole spin resonance (EDSR). With respect to generating a local a.c. magnetic field for manipulating a spin qubit, it is much easier to produce a local a.c. electric field with current experimental techniques.

Semiconductor quantum wires with strong SOC, e.g., InSb nanowires, are of current interest. These have been suggested as a potential platform for demonstrating Majorana quasiparticles, and these can also be used to produce a quantum dot for achieving a spin-orbit qubit. The coherent electric manipulation and the spectroscopy of a nanowire spin-orbit qubit were investigated, and a strong Rabi frequency of 100 MHz was also reported recently. Interestingly, the frequency of the driving a.c. electric field depends on the direction of the applied static magnetic field. As shown in a recent PRL paper by J.Q. You's group, this dependence is actually a signature of the strong SOC in the nanowire.

In this PRL paper, J.Q. You and his collaborators provided an explicit theoretical explanation for the EDSR effect in a nanowire quantum dot with strong SOC. In comparison with previous theories, where the SOC was regarded as a perturbation, they considered a strong SOC in this work. With their theory applicable in the strong SOC regime, it reveals that the Rabi frequency induced by an external a.c. electric field has a maximum value at an optimal SOC strength, instead of the Rabi frequency that is linearly proportional to the SOC strength. As their theory shows, this linear dependence is only valid in the weak SOC regime. Also, their theory shows that the SOC can be probed by monitoring both the spectrum and the EDSR responses of the spin-orbit qubit to the direction of the external static magnetic field. Therefore, it can provide a useful method to determine both Rashba and Dresselhaus SOCs in the nanowire.

This research was supported by the National Natural Science Foundation of China and the National Basic Research Program of China (973 Program).

Ref: Rui Li, J. Q. You, C. P. Sun, and Franco Nori, "Controlling a nanowire spin-orbit qubit via electric-dipole spin resonance", Phys. Rev. Lett. 111, 086805 (2013). (published 23 August 2013; DOI: 10.1103/PhysRevLett.111.086805).



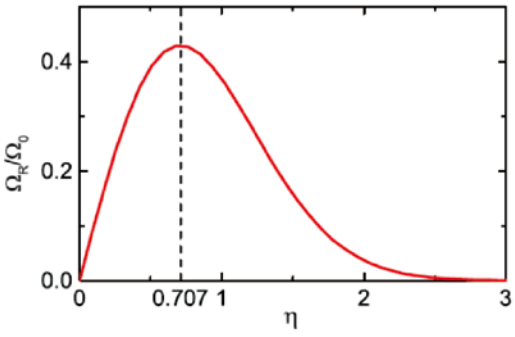


Figure 1: Electric-field-induced Rabi frequency of the nanowire spin-orbit qubit versus the strength of the spin-orbit coupling.

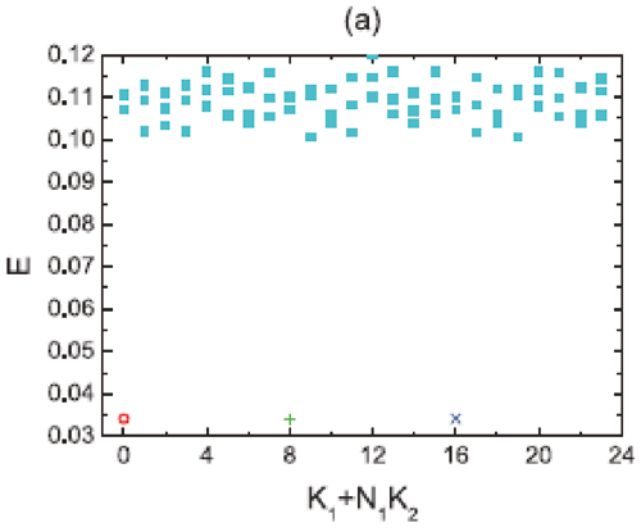
Figure 2: Periodic response of (a) the level spacing and (b) the Rabi frequency of the nanowire spin-orbit qubit on the direction of the external static magnetic field.

NUMERICAL STUDIES ON FRACTIONAL CHERN INSULATORS

Fractional Chern insulator (FCI) is a new type of topological phase of matter that was first proposed in 2011. It is a collective phenomenon of strongly interacting particles occurring in nearly flat Bloch band with nonzero Chern number . Compared with usual fractional quantum Hall (FQH) states, FCIs do not need external magnetic fields and can potentially be realized in room temperature, therefore providing a more promising platform for the study of topological order and relevant physics.

Recently, Z. Liu in CSRC, with his collaborators in Europe and China, did several theoretical studies on fractional Chern insulators by numerical algorithms, such as exact diagonalzation and density matrix renormalization group (DMRG). They first established the adiabatic continuity between FCIs in Bloch bands and FQH states in Landau levels (LLs), thus confirmed these two different types of states are in the same topological phase [1]. Then they studied FCIs in Bloch bands on cylinders by DMRG, and found the excitation energy spectra on the edge and the space-cut entanglement spectra of the bulk ground states have the same counting structure, so the bulk-edge correspondence of FCIs was established [2]. They also discovered several FCIs beyond simple Laughlin-like states, such as the hierarchy states (the counterparts in LL are composite-fermion states) [3] and the non-Abelian states stabilized by long-range interactions [4]. Finally, they generalized the usual Hofstadter model by inducing long-range hopping and found much richer Bloch band topology, which can harbor various FCIs [5]. Because of these works, Z. Liu and one of his collaborators were invited to write a review paper on the progress of the field of fractional Chern insulators [6].

Z. Liu was also supported by China Postdoctoral Science Foundation Grant



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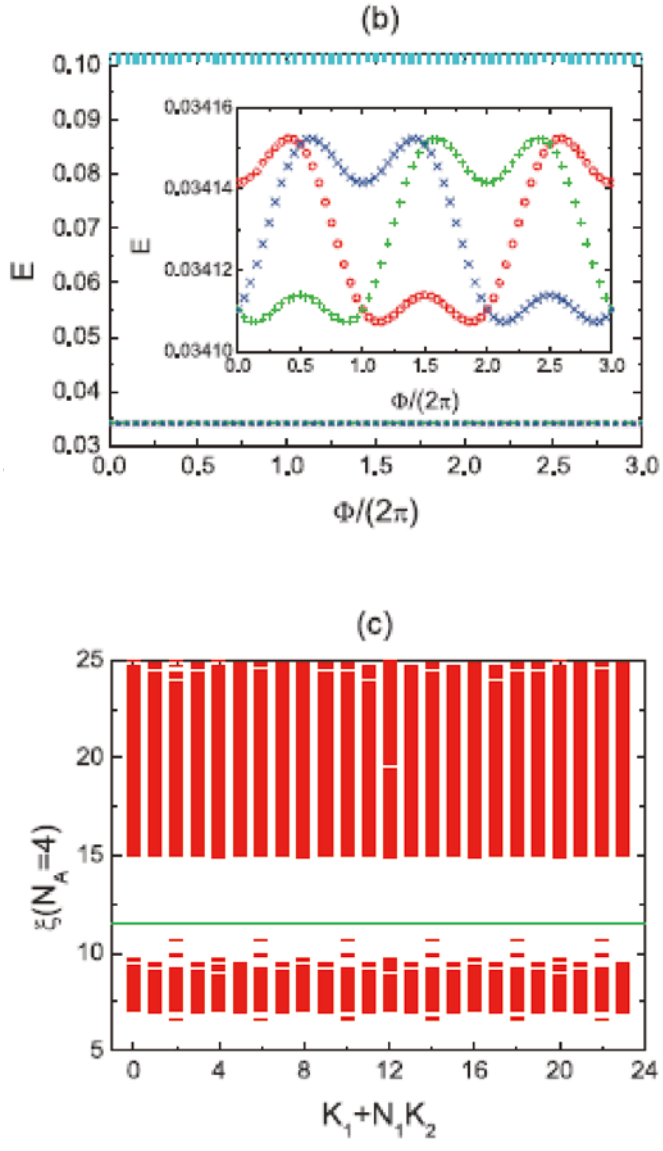
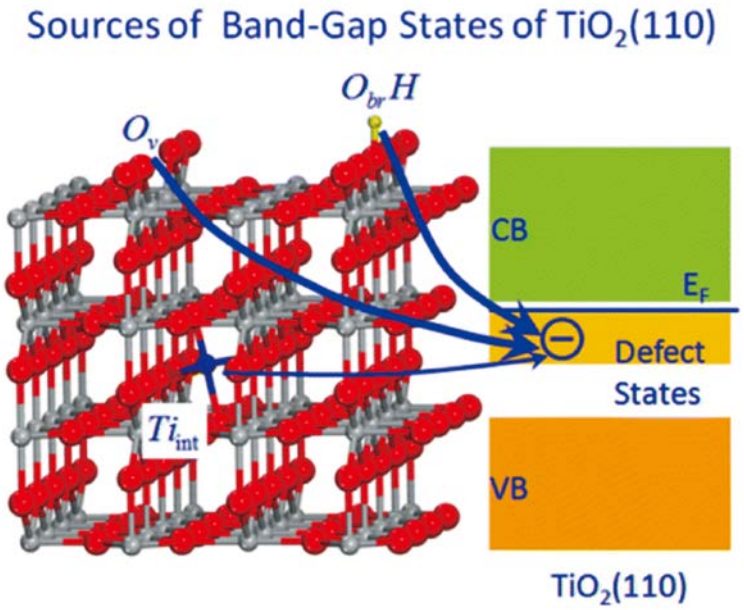


Fig.:Numerical observation of a FCI at $\nu = 1/3$ in a $|c| = 1$ band. (a) Shows the low lying energies with periodic boundary conditions in each (center-of-mass) momentum sector. There are three nearly degenerate ground states. (b) Shows the spectral flow under flux insertion. The three nearly degenerate ground states evolve into each other. (c) The ground-state particle-cut entanglement spectrum with a clear entanglement gap. The total number of levels below the gap is the same as the corresponding quasihole excitation counting of the $\nu = 1/3$ FQH Laughlin state.

BAND-GAP STATES OF TIO2(110): MAJOR CONTRIBUTION FROM SURFACE DEFECTS

Titanium dioxide (TiO2) has attracted particular attention because of its wide range of applications in physics, chemistry and materials. Rutile (110), partly due to its stability, has become a prototypical system of metal oxide, and there are two kinds of typical point defects on rutile TiO2(110), i.e., surface Obr vacancies and subsurface Ti interstitials (Tiint). Once upon the existance of defect, the Fermi level (EF) is pinned to the bottom of conduction band (CBM), and defect states appear at about 0.8 eV below the EF. Many physical and chemical processes on TiO2 surface are linked to the excess electrons originated from band gap states. However, the sources (surface and/or subsurface defects) of these states are still rather controversial.

Recently, L.M Liu in CSRC with his collaborators performed density functional theory (DFT) calculations in combination of ultraviolet photoelectron spectroscopy (UPS) measurements on the band gap states of TiO2(110). Their results clearly suggest both surface and subsurface defects contribute to the band gap states, whereas the contribution of subsurface defects corresponds to that of only 1.9% monolayer ObrH at the current bulk reduction level. As the surface defect concentration is usually much larger than 1.9% monolayer in real studies and applications, such results clearly demonstrates the importance of surface defects in changing the electronic structure of TiO2, which dictates the surface chemistry.



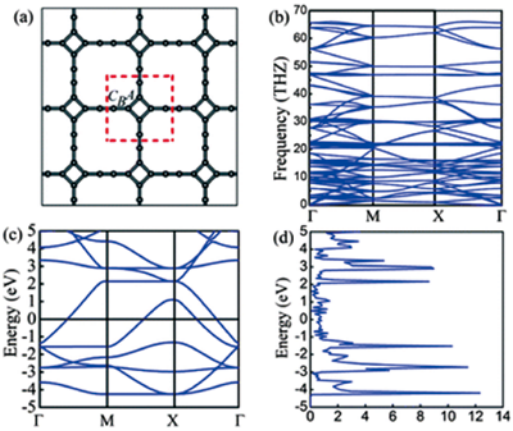
See:
Xinchun Mao, Xiufeng Lang, Zhiqiang Wang, Qunqing Hao, Bo Wen, Zefeng Ren, Dongxu Dai, Chuanyao Zhou, Li-Min Liu, and Xueming Yang, "Band-Gap States of TiO2(110): Major Contribution from Surface Defects", J. Phys. Chem. Lett., 2013, 4 (22), pp 3839–3844, DOI:10.1021/jz402053p

R-GRAPHYNE: A NEW TWO-DIMENSIONAL CARBON ALLOTROPE WITH VERSATILE DIRAC-LIKE POINT IN NANORIBBONS

Among the abundant allotropes, graphene is one of the most recently research hot topic due to the two-dimensional (2D) sp2 bond structure with unique electronic properties. The cause of the amazing electronic properties of graphene is attributed to its peculiar band structure featuring so-called Dirac points. In the vicinity of the Dirac point, the valence and conduction band meet at the Fermi level with zero band gap semiconductor forming a double cone, which appear in a linear relationship. Thereby, it considered as a revolutionary material for the future generation of high-speed nano-electronics. As a matter of fact, the potential application of graphene in future nano-electronic devices calls for controllable manipulation of its atomic and electronic properties. The general way is to introduce the defect or the functional groups.

Recently, L.M. Liu and L. Lau in CSRC with their collaborators proposed a novel two-dimensional carbon allotrope, rectangular graphyne (R-graphyne) with tetra-rings and acetylenic linkages, based on first-principles calculations. They found that although the bulk R-graphyne exhibits metallic property, the nanoribbons of R-graphyne show distinct electronic structures from the bulk. The most intriguing feature is that band gaps of R-graphyne nanoribbons oscillate between semiconductor and metallic states as a function of width. Particularly, the zigzag edge nanoribbons with half-integer repeating unit cell exhibit unexpected Dirac-like fermions in the band structures. The Dirac-like fermions of the R-graphyne nanoribbons originate from the central symmetry and two sub-lattices. The extraordinary properties of R-graphyne nanoribbons greatly expand our understanding of the origin of Dirac-like points. Such findings uncover a novel fascinating property of nanoribbons, which may have broad potential applications for carbon-based nanoscale electronic devices.

This work is highlighted in Nature China with the title of "Nanomaterials: A cute above".



See:
Wen-Jin Yin, Yue-E. Xie, Li-Min Liu, Ru-Zhi Wang, Xiao-Lin Wei, Leo Lau, Jian-Xin Zhong and Yuan- Ping Chen, "R-graphyne: a new two-dimensional carbon allotrope with versatile Dirac-like point in nanoribbons", Journal of Materials Chemistry A, 2013, 1(17): 5341-5346

STATISTICAL MECHANICAL STUDY OF ADAPTATION AND MOTOR SWITCHING KINETICS IN THE E. COLI CHEMOTAXIS SYSTEM

The chemotaxis pathway of the bacterium E. coli has been a model system for the study of active chemical sensing by a living cell. Its receptor domain exhibits very high signal sensitivity and can adapt to a broad range of ligand concentrations. Recently, Ganhui Lan et al. have shown that such a functional behavior can only exist in a nonequilibrium system supported by energy flow. Through an explicit but approximate model calculation, they obtained a quantitative relation between energy dissipation and adaptation accuracy, which they suggested to be general. We have analyzed a discrete-state model in detail and obtained exact solution for the adaptation accuracy, energy dissipation rate, and the frequency-resolved linear response of the circuit to a sinusoidal perturbation in the ligand concentration. A nonequilibrium "phase transition"-like behavior exists in this network when the number of methylation sites extends to infinity. The exact analysis clarifies the energy-speed-accuracy tradeoff relation proposed by Lan et al. This work was mostly done by a first year graduate student Wang Shouwen in the group.

Furthermore, Dr. Chai Yan in the group has continued his study on the kinetics of E. coli flagellar motor switching. The bacterial flagellar motor is a nanometer-scale machine whose rotational direction stochastically switches between clockwise and counterclockwise. Duration of the motor in each rotary state is regulated by the concentration of the chemotaxis signaling protein CheY-P which binds to the rotor ring. We have studied the kinetic properties of the motor switching in an equilibrium conformational spread model both analytically and numerically. Exact expression for the 2D free energy landscape of the model is obtained, as shown in Fig. 1. The dwell time distributions and transition time distribution are computed numerically. Characteristics of these distributions as a function of the kinetic rates for individual rotor switching and CheY-P binding are analyzed. The results are summarized in terms of the dynamic response of the motor switching under a varying CheY-P signal.

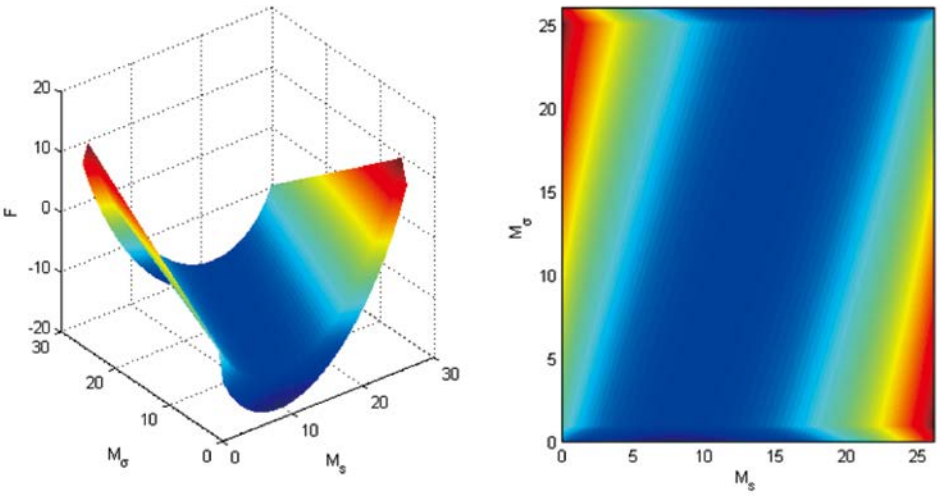
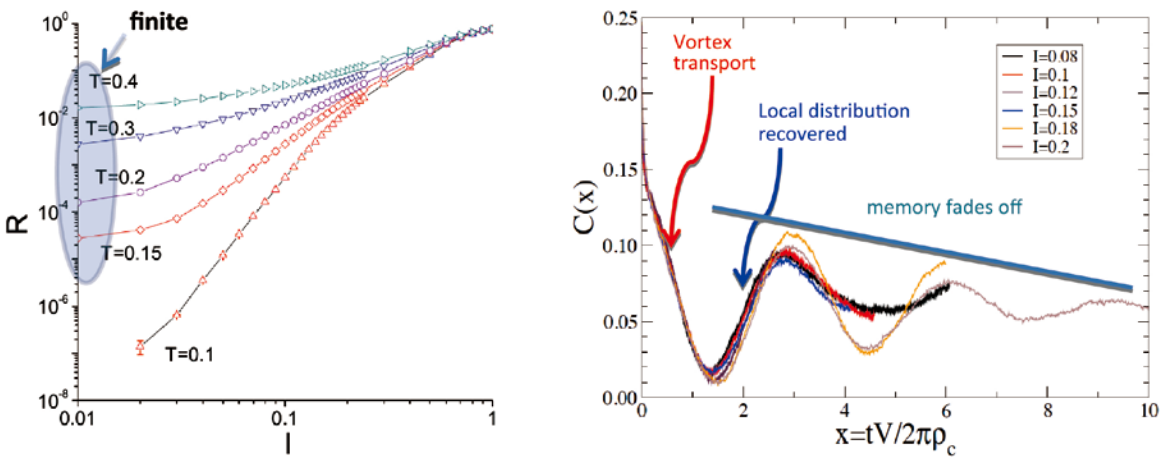


Fig. 1 Free energy landscape of the conformational spread model for flagellar motor that controls switching between two metastable states.

DRIVEN VORTEX MOTION AND ARRHENIUS RESISTIVITY IN 2D GAUGE GLASS

The two-dimensional gauge glass model has been proposed to study transport properties of granular superconducting films and disordered Josephson-junction (JJ) arrays in a magnetic field. Detailed analytical and numerical studies have shown that the low temperature equilibrium behavior of the system is controlled by a T=0 critical point with a finite density of states for gapless vortex excitations. However, due to the random potential created by the disorder and the ground state vortex configuration, vortex transport under a weak external current I is complex and has not been analyzed in detail. In fact, previous numerical work suggested a change of behavior from Ohmic to power-law I-V at around T/J~0.22, where J is the Josephson coupling constant between neighboring superconducting grains. We have carried out extensive simulations of the gauge glass model under the resistively-shunted-junction (RSJ) dynamics at weak applied currents and low temperatures. Ohmic behavior is observed down to T=0.1 for arrays of size up to 512x128. Simulations also indicate that the vortex configuration is insensitive to the temperature and a weak external current, suggesting that most of the dissipation is due to isolated vortices that traverse in a random potential. We investigated the auto-correlation of the spin chirality. A damped oscillatory auto-correlation is observed, from which information about the local transport and the birth and death of excess vortices can be extracted. The finite lifetime of the excess vortices results in the finite transport distance which does not depend sensitively on temperature and the driven current. Based on this observation, we relate the transport properties of the disordered JJ array to the individual vortex motion. Furthermore, the Arrhenius relation between voltage drop and temperature is explained by an exactly solvable single vortex model.



Josephson-Junction array with disorder. Its zero-current value decreases with temperature following the Arrhenius law. (b) The auto-correlation of a chirality parameter showing the finite lifetime of excited vortices as indicated by the scaled variable x.

QUANTUM ROUTING OF SINGLE PHOTONS WITH A CYCLIC THREE-LEVEL SYSTEM

Many theoretical proposals and experimental demonstrations of a quantum router have been carried out in various systems, i.e., cavity QED system, circuit QED system, optomechanical system, and even a pure linear optical system. The essence lying at the core is the realization of the coupling between a two-(or few-) level system and quantum channels. Except for the experiment implemented with linear optical devices, the quantum router demonstrated in most experiments and theoretical proposals has only one output terminal. Thus the ideal quantum router with multi-access channels deserves more exploration.

Recently, Y. Li and C. P. Sun in CSRC, with their collaborators, theoretically proposed a scheme for quantum routing of single photons with two output channels, which are composed of two coupled-resonator waveguides (CRWs). The quantum node is realized by a three-level system with three transitions forming a cyclic (Δ-type) structure: Two different transitions of the Δ atom are coupled to the photonic modes of the two channels respectively and the other is used to connect the two channels with a classical field. It is shown that the quantum node indeed works as a multi-channel quantum router. Here, the Δ atom functions as a single-photon switch within the incident channel: When the classical field is applied to dress the atom, single photons can be routed from one channel to the other. Actually, there have been numerous theoretical studies focusing on the von Neumann–Wigner conjecture: whether or not there exist (quasi-) bound states when discrete energy levels are coupled to a continuum. Now, this hybrid system provides a platform to probe this kind of bound states.

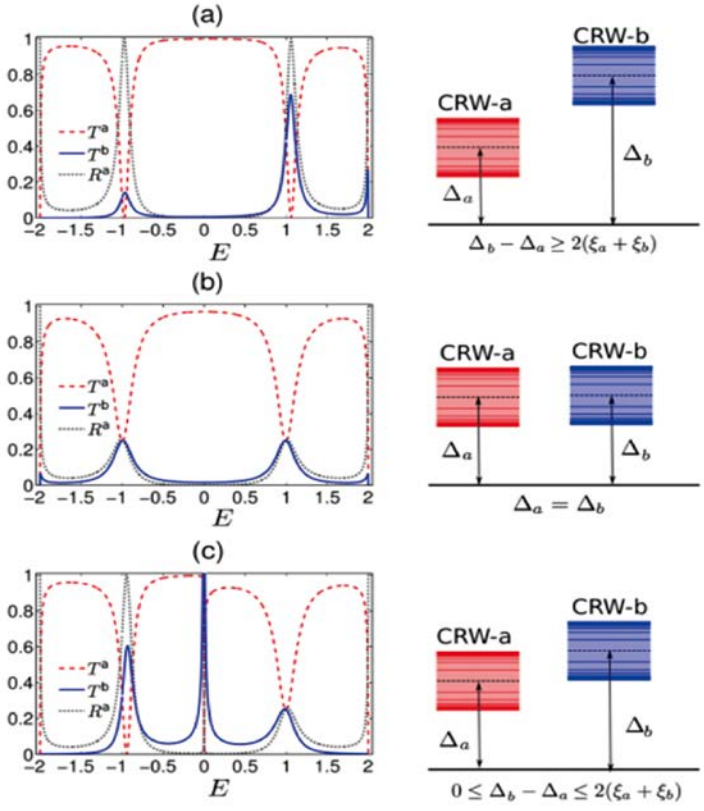


FIG.1 (color online). The scattering process described by transmittance $T^a(E)$ (dashed red line), reflectance $R^a(E)$ (dotted gray line), and transfer rate $T^b(E)$ (solid blue line) with different configurations of the two bands of the vacant CRWs, (a) $\Delta_b = 4.5$, thus $\Delta_b - \Delta_a > 2(\xi_a + \xi_b)$. For convenience, all the parameters are in units of ξ_a and we always set $\xi_b = \xi_a = 1$, $\Delta_a = 0$, $\Omega = 1$, and $g_a = g_b = 0.5$.

The promising candidates for experimental implementations of the above quantum routing system are the following: The circuit QED system where two coplanar linear resonators are coupled to a cyclic Δ-atom using three Josephson junctions and microwaves serve as the classical controlling field; The defect cavities in photonic crystal coupled to a silicon-based quantum dot. It is hopeful that the quantum routing function predicted in this work can be observed in some experiments.

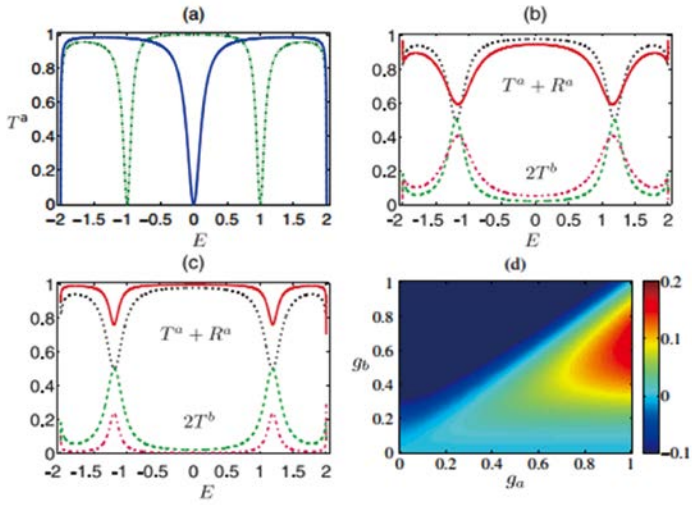


FIG.2 (color online). (a) The transmission T^a as a function of the incident cenergy E with $g_a = 0.5$ and $\Omega = 0$ (solid blue line), or with $g_a = 0.5$, $g_b = 0$ and $\Omega = 0$ (dotted-dashed green line); (b),(c) The coefficients $T^a + R^a$ (solid ren lines and dotted black lines), $2T^b$ (dshed green lines and sotted-dashed pink lines) as functions of the incident energy E with g_a =0.5 and $\Omega = 1.2$, g_b =0.5 for the dotted black and dashed green lines, or g_b =0.8[0.2] for the solid red and dotted-dashed pink lines. (d) Transmittance difference (T^b - T^a) at the condition $|E| = \Omega$ vs g_a and g_b. Here, we take $\Delta_a = \Delta_b$ =0, and $\xi_a = \xi_b$ =1.

See:
"Quantum Routing of Single Photons with a Cyclic Three-Level System"
Zhou, Lan; Yang, Li-Ping; Li, Yong; Sun, C. P.
Phys. Rev. Lett. 111, 103604 (2013).

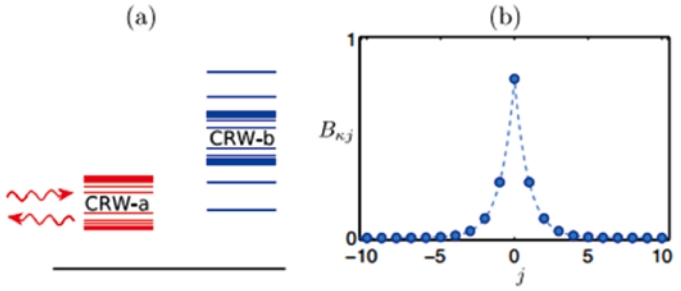


FIG.3 (color online). (a) The CRW-*b* plus the Δ atom have two bound states both above and blow the continuum band. The incident photon gets perfectly reflected when its energy matches the bound states within CRW-*b*; (b) Wave function of the bound state within CRW-*b* with $n_b = 0$.

QUANTUM ZENO AND ANTI-ZENO EFFECT WITHOUT INTRODUCING WAVE-PACKET COLLAPSE: THEORY AND EXPERIMENT

The explanation for quantum Zeno effect evoked many arguments on whether the postulate "wave-packet collapse (WPC)" is necessary. To illustrate this problem, CP Sun's group presented a dispersive-coupling-based interpretation for the quantum Zeno effect (QZE) where measurements are dynamically treated as dispersive couplings of the measured system to the apparatus rather than the von Neumann's projections [1]. It is found that the explicit dependence of the survival probability on the decoherence time quantitatively distinguishes this dynamic QZE from the usual one based on projection measurements. By revisiting the cavity-QED experiment of the QZE [J. Bernu et al., Phys. Rev. Lett. 101, 180402 (2008)], CP Sun's group suggests an alternative scheme [1] to verify their theoretical consideration that frequent measurements slow down the increase of photon number inside a microcavity due to the non-demolition couplings with the atoms in large detuning.

CP Sun's group also cooperated with an NMR experiment group to experimentally demonstrate a dynamic fashion of quantum Zeno effect [2]. The frequent measurements are implemented through quantum entanglement between the target qubit(s) and the measuring qubit, which dynamically results from the unitary evolution of duration τ_m due to dispersive coupling. Experimental results testify to the presence of "the critical measurement time effect", that is, the quantum Zeno effect does not occur when τ_m takes some critical values, even if the measurements are frequent enough. Moreover, they provide an experimental demonstration of an entanglement preservation mechanism based on such a dynamic quantum Zeno effect.

CP Sun's group also studied the quantum anti-Zeno effect without evoking the projection measurements [3]. They investigated the measurement-induced enhancement of the spontaneous decay for a two-level subsystem, where measurements are treated as couplings between the excited state and an auxiliary state rather than the von Neumann's wave function reduction. The photon radiated in a fast decay of the atom, from the auxiliary state to the excited state, triggers a quasi-measurement, as opposed to a projection measurement. Such frequent quasi-measurements result in an exponential decay of the survival probability of atomic initial state with a photon emission following each quasi-measurement. Their calculations show that the effective decay rate is of the same form as the one based on projection measurements. The survival probability of the atomic initial state obtained by tracing over all the photon states is equivalent to that of the atomic initial state with a photon emission following each quasi-measurement.

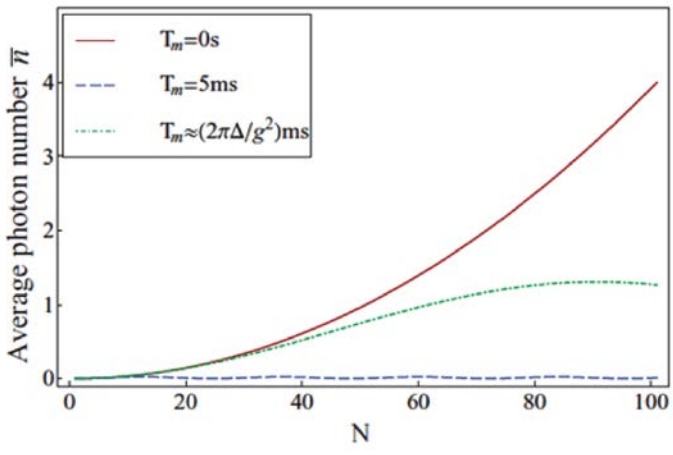


Fig. 1. Average photon number as a function of the pulse number N. Without the QND probe, the average photon number grows quadratically with N (red solid line). The QZE emerges as the average photon number is frozen at zero with τm = 5 ms (blue dashed line). If the measurement time is chosen specifically at τm, the average photon number increases obviously (green dash-dotted line) which is not explained in terms of the WPC interpretation. See Ref. [1].

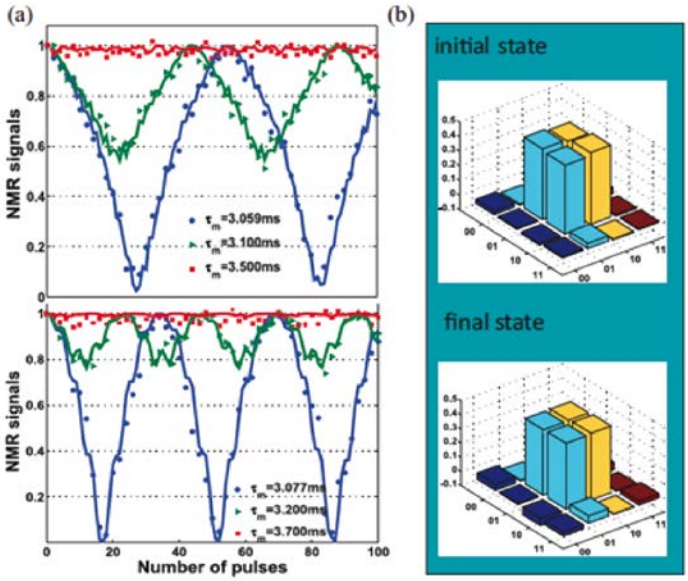


Fig. 2. (a) Experimental QZE with entanglement based measurement on two-qubit system for a product state (top plots) and an entangled state (bottom plots). (b) Real part of the reconstructed density matrix of the initial and final states for preserving the entangled state via QZE. See Ref. [2].

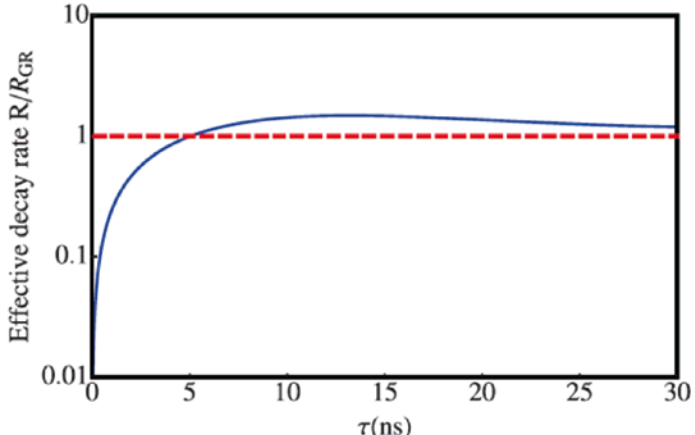


Fig. 3. The effective decay rate κ(t) versus the quasi-measurement interval for a Lorentzian interacting spectrum. The red dashed line displays the golden-rule decay rate. See Ref. [3].

References:

[1] Dispersive-coupling-based quantum Zeno effect in a cavity-QED system
D. Z. Xu, Qing Ai, and C. P. Sun, Phys. Rev. A 83, 022107 (2011).

[2] Experimental demonstration of the quantum Zeno effect in NMR with entanglement-based measurements,
Wenqiang Zheng, D. Z. Xu, Xinhua Peng, Xianyi Zhou, Jiangfeng Du, and C. P. Sun,
Phys. Rev. A 87, 032112 (2013).

[3] Quantum anti-Zeno effect without wave function reduction
Qing Ai, D. Z. Xu, Su Yi, A. G. Kofman, C. P. Sun and Franco Nori, Scientific Reports 3, 1752 (2013).

OPTICAL DIODE MADE FROM A MOVING PHOTONIC CRYSTAL

Optical diodes controlling the flow of light are of principal significance for optical information processing. They transmit light from an input to an output, but not in the reverse direction. This breaking of time reversal symmetry is conventionally achieved via Faraday or nonlinear effects. For applications in a quantum network, features such as the abilities of all-optical control, on-chip integration, and single-photon operation are important. Here we propose an all-optical optical diode which requires neither magnetic field nor strong input field. It is based on a ‘‘moving’’ photonic crystal generated, see Fig. 1, in a three-level electromagnetically induced transparency medium in which the refractive index of a weak probe is modulated by the moving periodic intensity of a strong standing coupling field with two detuned counter-propagating components. Because of the Doppler effect, the frequency range of the crystal’s band gap for the probe copropagating with the moving crystal is shifted from that for the counter-propagating probe (see Fig. 1). This mechanism is experimentally demonstrated in a room temperature Cs vapor cell, see Fig. 2.

This work was supported by National Basic Research Program of China (Grants No. 2012CB921603, No. 2011CB922203, and No. 2010CB923102), National Natural Science Foundation of China (Grants No. 11174026 and No. 11274210), and CUHK Focused Investments Scheme.

See:
“Optical Diode Made from a Moving Photonic Crystal”, Wang, Da-Wei; Zhou, Hai-Tao; Guo, Miao-Jun; Zhang, Jun-Xiang; Evers, Joerg; Zhu,Shi-Yao, Phys. Rev. Lett. 110.093901(2013)

Flying photonic crystal (Doppler Effect)

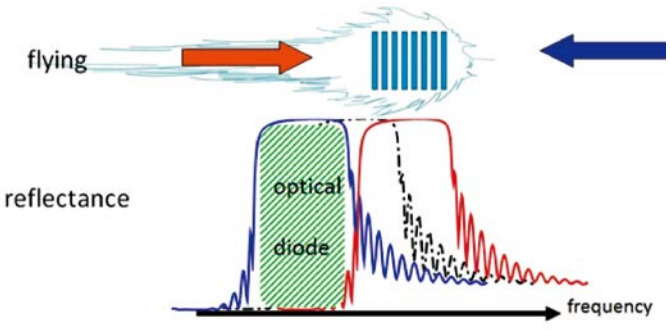


Fig. 1, Working principle of the optical diodes

Experimental Result of the optical diodes

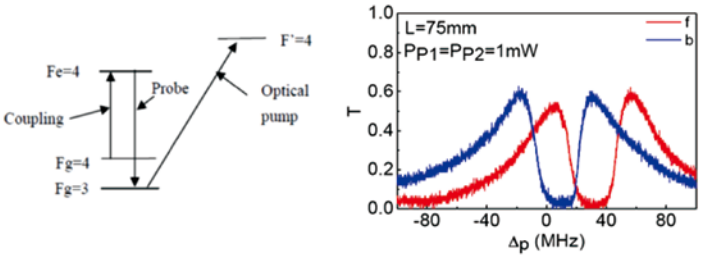
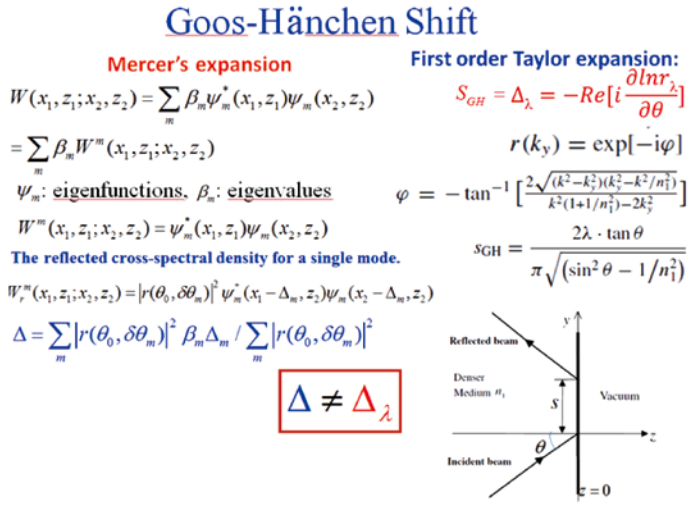


Fig. 2, Experimental result of the optical diodes. With coupling: 40mW, probe: 80 W, T =28°C

GOOS-HÄNCHEN SHIFTS OF PARTIALLY COHERENT LIGHT FIELDS

The Goos-Hänchen (GH) shift refers to a lateral displacement (from the path expected from geometrical optics) along an interface in totally internal reflection. This phenomenon results from a coherence effect. In previous works, the first order Taylor expansion was used, which is not accurate for partial coherent beams. In order to bring to light the role of coherence, the reflection of partially coherent light fields was investigated within the framework of the coherence-theory. A formal expression for the GH shifts of partially coherent light fields is obtained in terms of eigenfunction expansion of the Mercer's method, which is much more accurate than the traditional first order Taylar expansion, see Fig. 1. It is shown that both the spatial coherence and the beam width have an important effect on the GH shift, especially near the critical angles (such as totally reflection angle), see Fig. 2. For incident angle smaller than the critical angle, the GH shift is still finite. These results are important to observe the GH shifts of the beams with imperfect coherence, like x-ray and matter-wave beams.

This research is supported by NPRP Grant No. 4-346-1-061 by the Qatar National Research Fund (QNRF) and a grant from King Abdulaziz City for Science and Technology (KACST). This work is also supported by NSFC Grants (No. 61078021, No. 11174026, and No. 11274275), and by the National Basic Research Program of China (Grants No. 2012CB921602, 3 and No. 2011CB922203).



See:
"Goos-Ha¨nchen Shifts of Partially Coherent Light Fields", Li-Gang Wang, Shi-Yao Zhu, and M. Suhail Zubairy, Phys. Rev. Lett. 111.223901(2013)

Fig. 1, The difference of this work with previous works

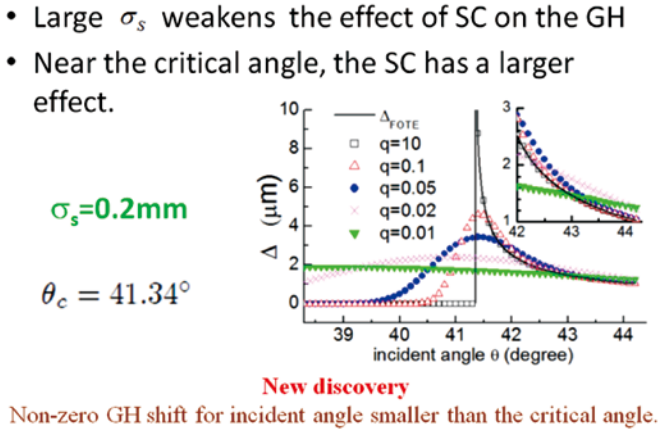


Fig. 2, The main result

QUANTUM PHASE DIAGRAM OF THE FRUSTRATED SPIN LADDER WITH NEXT-NEAREST-NEIGHBOR INTERACTIONS

Due to spin frustration, materials that possess the frustrated spin-ladder structure could present rich quantum states, and some of them are not fully understood, such as the controversial intermediated columnar dimer (CD) state in the anti-ferromagnetic frustrated case. The introduction of the in-chain next-nearest-neighbor (NNN) interaction further increases frustration among spins and may cause new interesting quantum phases. An in-chain NNN interaction is found in natural material BiCu2PO6, recently. Therefore, it is necessary and interesting to research the quantum phase diagram of the frustrated spin ladder with the in-chain NNN interaction.

This motivated Dr. Yan-Chao Li and Prof. Hai-Qing Lin at the Beijing Computational Science Research Center (CSRC) to study the phase diagram of the model. They provided a comprehensive picture on the influence of the in-chain NNN interaction on the quantum phase transitions of the system, not only for the anti-ferromagnetic frustrated (AFF) case but also for the ferromagnetic frustrated (FF) case. The quantum phase diagrams for the two cases are presented. Their results show that the controversial CD phase at J2=0 does exist in the AFF case, and an interesting tetramer phase with spontaneously broken symmetry is found in the FF case.

The phase diagrams should be helpful for the understanding of the micromechanism of natural materials possessing such kind of structures and may have theoretical implications for preparations of specific functional materials.

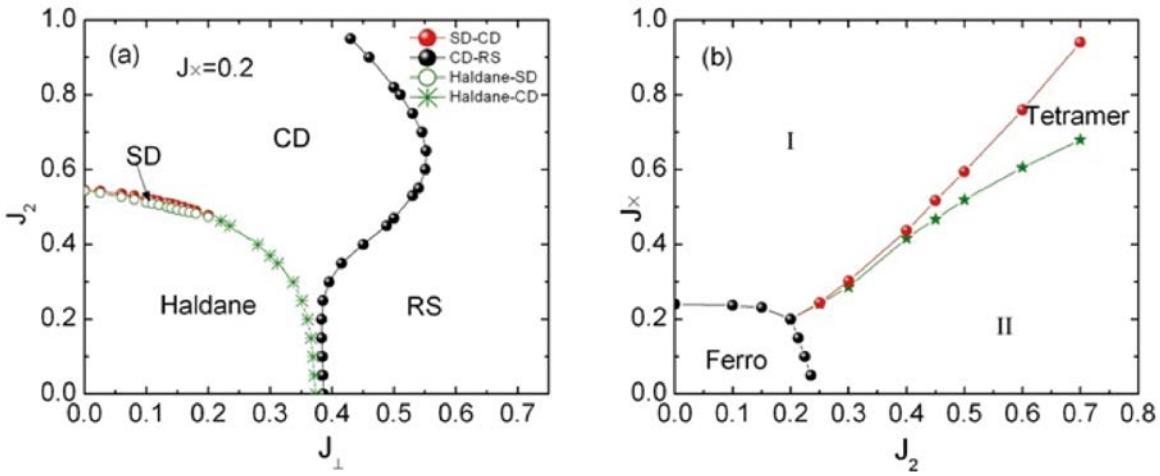


Figure. Ground-state phase diagrams for (a) the AFF case at $J_{\times}$=0.2 and (b) the FF case at $J_{\perp}$=-0.5.

See:
Yan-Chao Li and Hai-Qing Lin, "Quantum phase diagram of the frustrated spin ladder with next-nearest-neighbor interactions", New Journal of Physics, 14 063019 (2012) (pub. 15 June 2012).
Link to the publication: http://iopscience.iop.org/1367-2630/14/063019

DYNAMICS OF CORRELATIONS AND SCALING BEHAVIORS IN SPIN-CHAIN ENVIRONMENTS

Quantum discord (QD) has been shown to be more effective than entanglement for cases such as quantum correlations detecting under separable mixed states and quantum phase transition detecting under finite temperatures. Therefore, it is expected that the QD may be an ideal measurement of correlation in quantum information processing and quantum computation. Because any quantum process or computation is a dynamic progress which interacts with a certain environment, it is very important to understand the dynamic behaviors of QD under specific environments in order to realize the potential applications of QD.

Recently, CSRC researchers, Dr. Yan-Chao Li and Prof. Hai-Qing Lin, together with collaborators from Zhejiang University, studied the dynamics of QD for a two-qubit system coupled in different ways with real spin-chain environments. They found that the QD shows the sudden transition behavior---the QD does not decay for a finite time interval, and they supplied a method to prolong the transition time by controlling the two-qubit using a train of band-band pulses. Meanwhile, they found that the QD shows different sudden change behaviors for different coupling cases and strong dependence of the environmental parameters. The initial QD can be even increased and a finite-value QD can be maintained after a long-time evolution due to indirect interactions through the spin chain in one case. Moreover, an interesting scaling behavior for the QD was given under the weak-coupling condition. They also studied the strong-coupling limit and found that the QD oscillates with time rapidly, but represents regular distributions under a specific time interval. The long time invariant QD under a specific time interval might supply a potential application in quantum information processing.

See:
1.Yan-Chao Li, Hai-Qing Lin, and Jing-Bo Xu, “Dynamics of correlations and scaling behaviors in a spin-chain environment”, Europhys Lett. 100, 20002 (2012), (pub. 31 Oct. 2012).
Link to the publication: http://iopscience.iop.org/0295-5075/100/20002

MAGNETIC AND PARI BINDING PROPERTIES OF AROMATIC HYDROCARBON SUPERCONDUCTORS

The recent discovery of superconductivity in the solid state of various alkali-metal-doped polycyclic aromatic hydrocarbons (PAHs), including picene, coronene, phenanthrene, and 1, 2 : 8, 9-dibenzopentacene, has attracted considerable interest in the condensed matter physics community. One of the most intriguing properties of these new organic superconductors is that the superconducting transition temperature Tc increases dramatically with increasing the number of benzene rings, reaching up to 33.1K as reported in alkali- metal-doped 1,2 : 8,9-dibenzopentacene, comparable to that of alkali-metal-doped C60. This behavior suggests that PAHs with longer chains of benzene rings may exhibit higher Tc. Another interesting experimental finding is that the magnetic susceptibility in the normal state of superconducting compounds is considerably large, and shows the Curie-Weiss behavior as a function of temperature, evidencing that there exist local spins in the charge doped systems. However, the physical origin of local spins and the superconducting mechanism remain unclear.

Recently, a group of CSRC researchers, H. Q. Lin, C. Zhang, and associate member Z. B. Huang, performed a systematic numerical study on the magnetic and pair binding properties in these PAH superconductors. To account for electron-electron interaction, the π-electrons on the carbon atoms of a single molecule are modeled by the one-orbital Hubbard model, and the energy difference ε between carbon atoms with and without hydrogen bonds is taken into account. They demonstrated that the spin polarized ground state is realized for charged molecules in the physical parameter regions, which provides a reasonable explanation of local spins observed in PAHs. In alkali-metal-doped dibenzopentacene, their results showed that electron correlation may produce an effective attraction between electrons through charge disproportionation in different C30H18 molecules. Their work is not only useful for understanding the superconducting mechanism in alkali-metal-doped dibenzopentacene, but also encouraging for the search of higher Tc PAH superconductors with longer chains of benzene rings.

This research was also supported by MOST and NSFC.

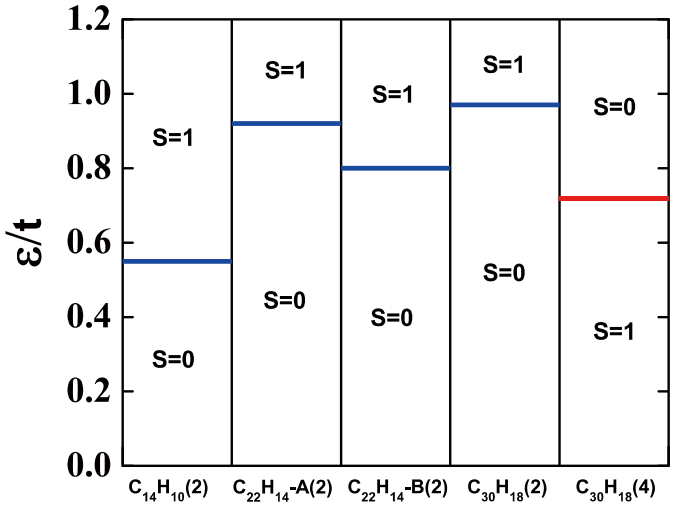


Fig.1: Spin phase diagram for charged hydrocarbon molecules at U=2t.

Ref.: Zhongbing Huang, Chao Zhang, Haiqing Lin, "Magnetic instability and pair binding in aromatic hydrocarbon superconductors", Sci. Rep. 2, 922 (2012), (pub. 04 December 2012). DOI:10.1038/ srep00922 (2012).

ELECTRON SPIN DECOGHERENCE IN SEMICONDUCTOR QUANTUM DOTS

Electron spins in semiconductor quantum dots are promising candidates as solid-state quantum bits. A critical obstacle is the short electron spin coherence time due to the randomly fluctuating nuclear field from the nuclear spins of the host lattice. Combating electron spin decoherence is of paramount importance for quantum information. This motivates a rapidly developing field of nuclear stabilization, which aims at suppressing the fluctuation of the nuclear field through a nonlinear feedback loop mediated by the electrons and/or holes.

Recently, two groups [Xu et al., Nature 459, 1105 (2009); Latta et al., Nature Phys. 5, 758 (2009)] observed significant nuclear stabilization by optical pumping in single quantum dots. A key observation in both experiments is the maintenance (i.e., locking) of resonant optical absorption over a wide range of pump frequency away from the nominal resonance. A puzzling feature is that the locking occurs nearly symmetrically on both sides of the resonance, in sharp contrast to previous works, where the locking is highly asymmetric. This feature cannot be explained by the existing mechanisms, which are based on the flip of nuclear spins by the electron through the isotropic contact hyperfine interaction. To date, the symmetric locking remains an open problem.

In this paper, Wen Yang, in corporation with Lu Sham, provides a general mechanism capable of explaining this feature [see Fig. 1(b)]. The key process is the flip of the nuclear spins through their non-collinear hyperfine interaction with the hole excited by non-resonant pumping (instead of the isotropic contact hyperfine interaction with the electron under resonant pumping, as considered in previous theories). This new mechanism provides an avenue for electron spin coherence time prolongation through the non-collinear hyperfine interaction, in addition to the widely explored isotropic contact hyperfine interaction. Moreover, they also predict a spike-like behavior when the magnetic field is reversed [see Fig. 1 (e)], as observed experimentally [Hogele et al., Phys. Rev. Lett. 108, 197403 (2012)].

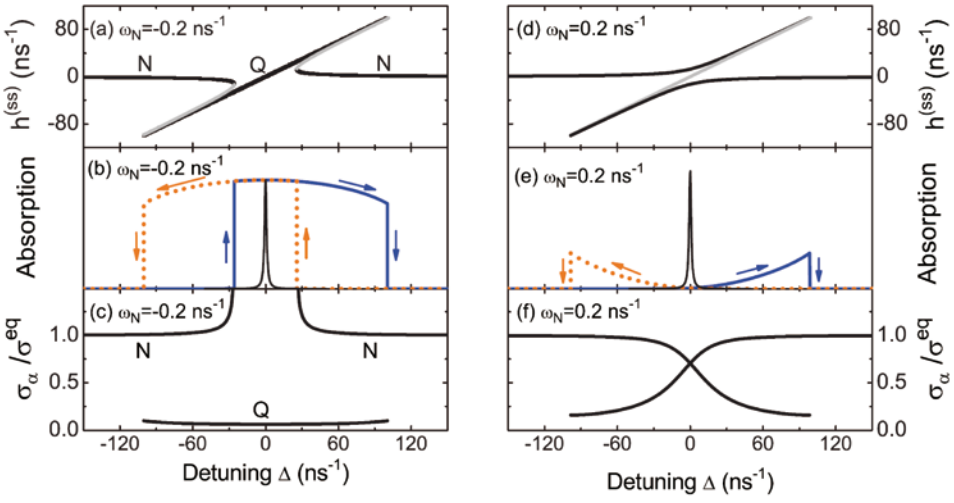


Fig. 1. (a) and (d): Stable (black lines) and unstable (gray lines) nuclear field induced by the optical pumping in steady state. (b) and (e): Optical absorption spectra obtained by sweeping the pumping frequency in different directions (indicated by the arrows). The sharp Lorentzian peaks at Δ=0 (nominal resonance) are absorption spectra in the absence of the nuclei. (c) and (f): Suppression of the root-mean-square fluctuation σ_α relative to its thermal equilibrium value σ^{eq} in stable states established by optical pumping.

SUPERCONVERGENCE OF POLYNOMIAL SPECTRAL COLLOCATION

In numerical computation, we often observe that the convergent rate exceeds the best possible global rate at some special points. Those points are called superconvergent points, and the phenomenon is called the superconvergence phenomenon, which is well understood for the traditional finite element method, i.e., the so-called h-version finite element method. As a comparison, a relevant study for the p-version finite element method and the spectral method is lacking. Only very special and simple cases have been discussed.

The study of the superconvergence phenomenon for the h-version method has had a great impact on scientific computing, especially on a posteriori error estimates and adaptive methods, which is well documented in the literature. With a belief that the scientific community would also benefit from the study of the superconvergence phenomenon of spectral collocation methods as well as related p-version and spectral methods, Prof. Zhang investigated superconvergence phenomenon of some orthogonal polynomial interpolations. The results are twofold:1) Identify those points where derivatives of the interpolant converge faster when interpolating function values; and 2) locate those points where the function value of the interpolant superconverges when interpolating the first derivative.

The theoretical analysis indicates that interpolating function values at zeros of certain orthogonal polynomial, the derivative approximation is superconvergent at (or near) extremes of the same polynomial, and the derivative approximation error reaches its maximum at (or near) the interpolation points. Similarly, interpolating derivatives (or equivalently, solving simple ODEs by the spectral collocation method) at zeros of certain orthogonal polynomial, the function value approximation is superconvergent at (or near) extremes of the same polynomial, and the function value approximation error reaches its maximum at (or near) the interpolation points.

The finding suggests: the common practice that using the same set of points in spectral and spectral collocation methods to evaluate both function and derivative values may not be a good strategy, at least from a view point of approximation theory.For more details, c.f.,

Zhimin Zhang, Superconvergence points of polynomial spectral interpolation, SIAM Journal on Numerical Analysis, Vol. 50, No. 6 (2012), pp. 2966-2985.

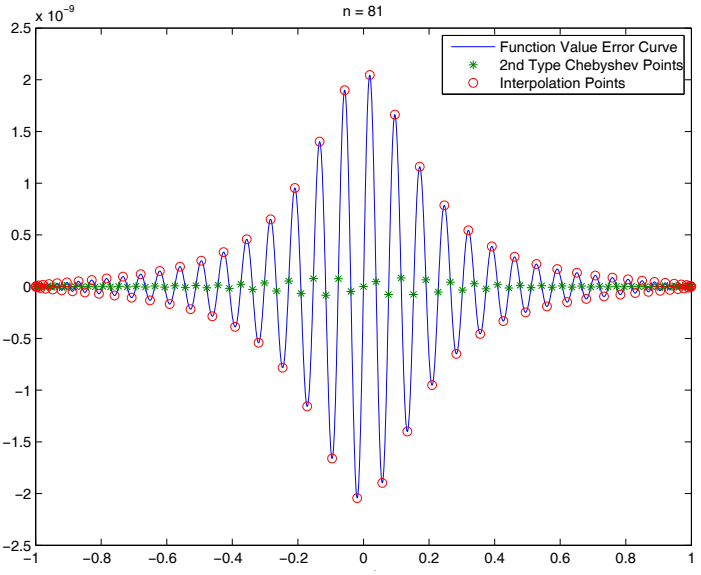


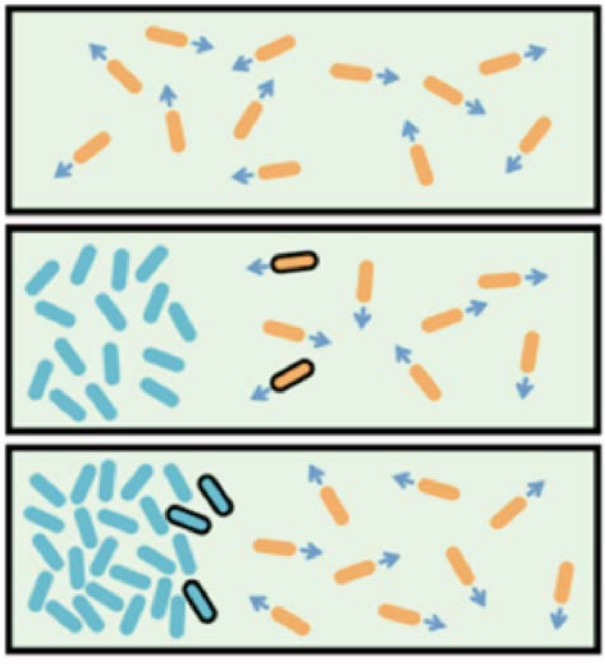
Figure 1 demonstrates the distribution of the function approximation error when solving a simple ODE by the spectral collocation method using zeros of the Chebyshev polynomial of degree 81. Errors at superconvergent points are identified by green star, which are the Chebyshev points of the second kind, i.e., extreme points of the Chebyshev polynomial of degree 81. On the other hand, function approximation error, marked by the red circle, reaches its maximum at the interpolation points.

PATTERN FORMATION IN ENGINEERED BACTERIAL COLONIES

The Year 2012 marked centenary celebrations of the life and work of Alan Turing around the world. During the last part of his life, Turing worked on mathematical models for pattern formation in biology. In 1952, he published his last paper titled "The Chemical Basis of Morphogenesis" which proposeda novel paradigm of autonomous pattern formation that involves the diffusion of two types of morphogens ("activator" and "inhibitor") whose interaction stimulates their own synthesis. However, deciphering the molecular mechanism in specific biological contexts remains challenging due to insufficient knowledge on the typically many players and their complex relationships.

Recently, CSRC researcher Prof. Lei-Han Tang joined a team of scientists from HKU, UCSD, Marburg and HKBU in an experimental and theoretical exploration of pattern formation in an expanding population of bacterial cells. Robust stripe patterns arise when the bacterial motility is made to slow down significantly in a crowded environment, as shown in Fig. 1. The coupling was achieved with a synthetic biology toolkit that contains a quorum-sensing module and a motility-control module. The ensuing theoretical analysis established that patterning in this system results from a recurrent instability at the propagating front of the bacterial colony. The instability can be tempered or even eliminated when the overall bacterial motility is decreased. This offers a way to tune the period of the stripes through controlled gene expression, as done in the experiment. Within a two-component model of bacterial cell density ρ and signaling molecule (AHL) concentration h, the spatial density profiles of a growing colony are computed analytically in the steadily propagating regime. This allows for the estimation of the phase boundary between the pattern-forming and no pattern regimes.

Since the original work (C. Liu et al., Science 334:238-241, 2011) was published, it generated quite a bit of excitement in the scientific community for demonstrating i) the possibility of using synthetic biology methods to control the population dynamics of bacteria to orchestrate specific patterns; ii) a novel mechanism of pattern formation which could serve as a new paradigm of embryonic segmentation in, e.g. somitogenesis; iii) the potential for scientific progress in tackling complex biological phenomenon through close collaboration between biologists and physicists.



See:
X. Fu, L.-H. Tang, L. Liu, J.-D. Huang, T. Hwa and P. Lenz (2011) Stripe formation in bacterial systems with density-suppressed motility. Phys. Rev. Lett.108, 198102 (2012).

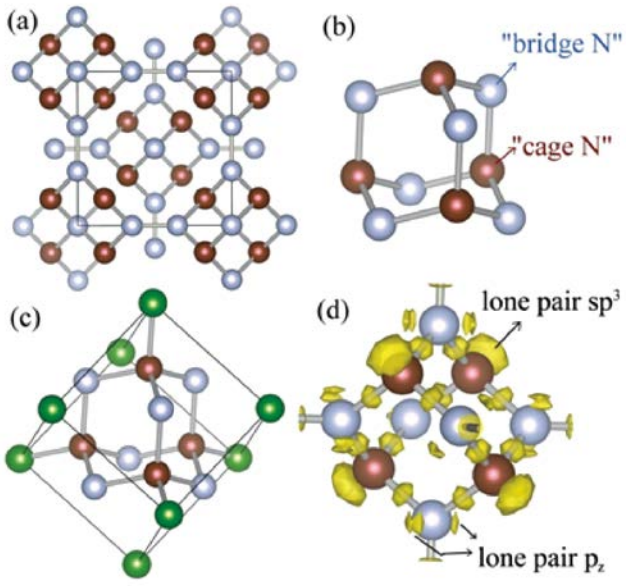
THE NEW DEVELOPMENTS IN POLYMERIC NITROGEN RESEARCH---"CAGELIKE DIAMONDOID NITROGEN"

Under high pressure, triply bonded molecular nitrogen dissociates into singly bonded polymeric nitrogen, a potential high-energy-density material. The discovery of stable high-pressure forms of polymeric nitrogen is of great interest.

The research was performed by Postdoctor Xiaoli Wang in Beijing Computational Science Research Center, Prof. Yanming Ma in Jilin University, Dr. Maosheng Miao in University of California–Santa Barbara and Prof. Chris J. Pickard in University College London. The researchers used the CALYPSO (Crystal structure AnaLYsis by Particle Swarm Optimisation, http://www.calypso.cn) technology developed by Prof. Ma to explore nitrogen polymorphism at high pressure. Their calculations predict that nitrogen will form a striking stabilization of cagelike diamondoid nitrogen at high pressures. Diamondoid nitrogen possesses a wide energy gap and isenergetically most stable among all known polymeric structures above 263 GPa. Their findings represent a significant step toward the under-standing of the behavior of solid nitrogen at extreme conditions.

This work has been published in Physical Review Letters (Phys. Rev. Lett. 109, 175502 (2012)), and highlighted by Chemistry World. The study is an exciting piece of work, says Julian Gale, a computational chemist at Curtin University in Perth, Australia. "It demonstrates the power of computational crystallography for predicting new structures," he says. "Although quantitative prediction of polymorphism is notoriously difficult, this study provides a strong indication that there is a new and very different form of nitrogen awaiting experimental discovery at high pressure."

References: X Wang et al, Phys. Rev. Lett., 2012, 109, 175502.
http://www.rsc.org/chemistryworld/2012/10/nitrogen-allotrope-polymorph-cage-adamantane



(a) Top view of the N_{10}-cage structure. (b) Side view of one N10 cage to compare with the diamondoid. (c) Side view of the cubic diamond structure. The N_{10} cage can be derived by cutting out the eight green vertex atoms of thecubic diamond. (d) The calculated ELF isosurface within one N_{10} cage at ELF=0.83.

金纳米棒之间的等离子激元耦合之普适规律和FANO共振

UNIVERSAL SCALING AND FANO RESONANCE IN THE PLASMON COUPLING BETWEEN GOLD NANORODS

金属纳米晶体之间的等离子激元耦合，可导致等离子激元对应频率的大移位，巨大的电场增强，和新的等离子激元模式。金属纳米棒，与球形纳米颗粒不同，由于几何的各向异性，它同时具有横向和纵向的等离子激元模式。因此，金属纳米棒之间的等离子激元耦合要比纳米球之间的复杂得多。对于后者，已有可行的实验方法和精确解析解描述其等离子激元耦合。在这项研究中，他们进行了大规模的有限差分时域模拟来理解金纳米棒沿其长轴对齐时的二聚化等离子激元耦合，对等离子激元耦合棒之间距，纵向等离子激元的能量，和棒头形状的影响都进行了详细分析（图１）。他们并发现其耦合能量可以用一个简单而普适的双曲公式来描述（图２）。为了更好的理解两个金纳米棒之间的等离子激元耦合，他们发展了一个基于两个相互作用的机械谐振子的理论模型。该模型清晰直观，简单高效，与FDTD模拟结果的偏差度低于3.5%，而且只要得到金纳米棒的本征能量，原则上任意尺寸的金纳米棒之间的耦合作用均可以得到描述。该模型连同普适方程，可以用来高精确度地确定金棒二聚体的耦合等离子激元能量。当两个金纳米棒的尺寸不同时，会出现一个蓝移的弱散射峰和一个红移的强散射峰（图1b），以及在弱散射峰的低频侧出现一个散射低谷。从电荷分布可以看出低能量和高能量的散射峰分别对应偶极距和四极距的等离子体模式（图3）。这两个模式之间的杂化构成了两条散射通道，一条为超辐射模式，一条为亚辐射模式，两者的干涉形成了Fano型的不对称谱线，其行为依赖于棒间距和棒单体的等离子激元能量。该项研究结果将有助于预测各种金纳米棒二聚体的耦合等离子激元能量和理解在等离子体纳米结构的Fano共振，有望用于等离子激元增强光谱、生物探测、纳米天线等。

详情见：ACS NANO, Vol 5, No. 7, 5976-5986 (2011), Kat Choi Woo, Lei Shao, Huanjun Chen, Yao Liang, Jianfang Wang*, and Hai-Qing Lin*

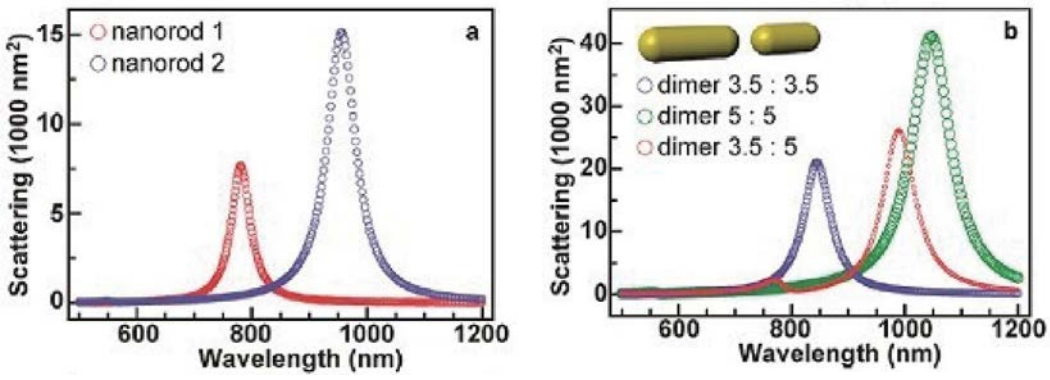


图1. (a)半球形头金属纳米棒的散射谱线. (b)金属纳米棒二聚体的散射谱线

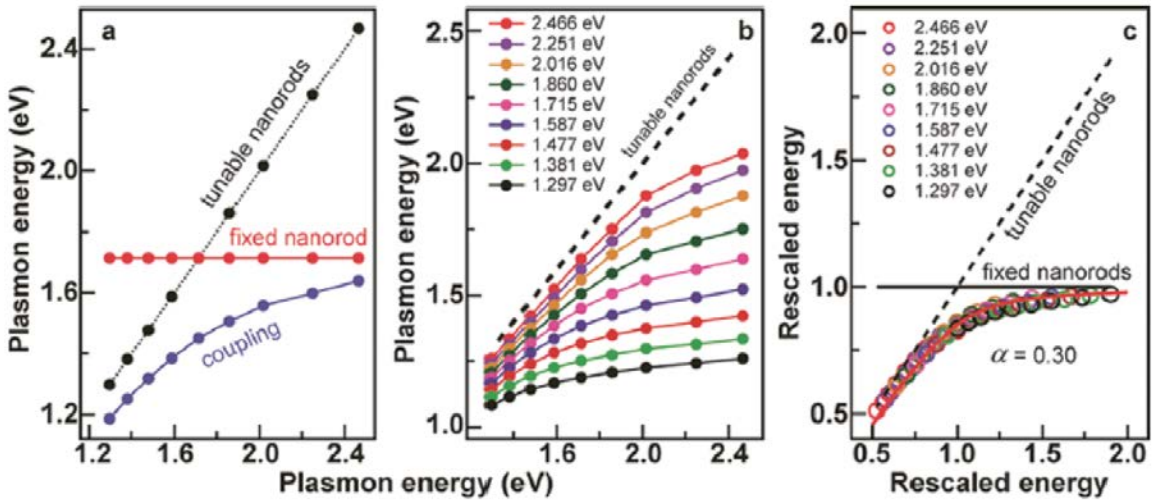


图2. 金属纳米棒二聚体的等离子激元耦合作用在能谱上的体现

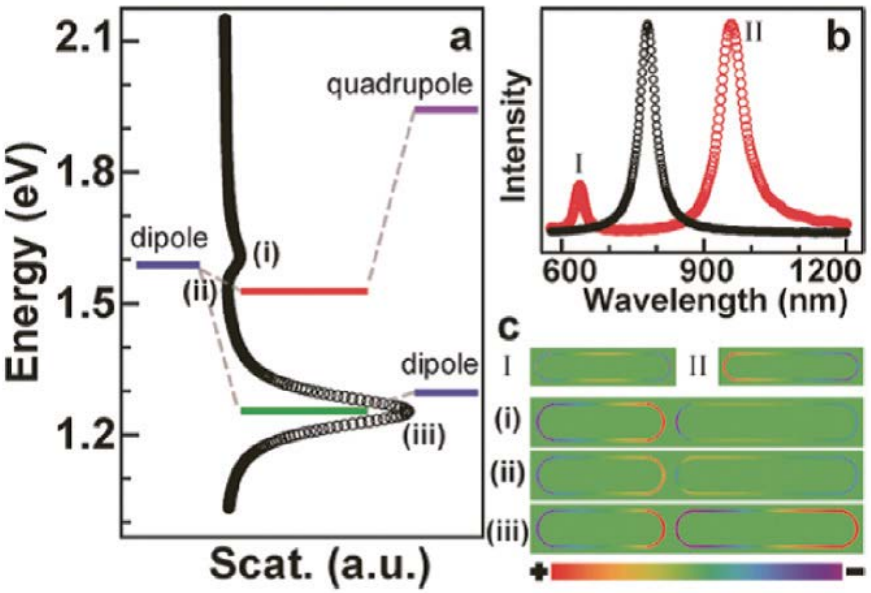


图3. 金属纳米棒的杂化二聚体的散射谱及其对应模式的电荷分布

与上述研究相关的工作可参考

"Angle- and Energy-Resolved Plasmon Coupling in Gold Nanorod Dimers",ACS NANO, Vol 4, No. 6, 3053-3062 (2010)
L. Shao, K. C. Woo, H. J. Chen, Z. Jin, J. F. Wang*, and Hai-Qing Lin*

在这项研究工作中，他们还研究了金纳米棒二聚体中的等离子激元耦合行为。当二聚体中的金纳米棒具有相近的尺寸时，耦合作用会导致对称和反对称的等离子激元模式。图4给出了纳米棒之间的距离、取向以及纳米棒尺寸对耦合强度的影响。结果表明，当纳米棒的夹角增大时，反对称模和对称模的散射强度之比衰减很快，但两个模式的频率几乎保持不变。由于纳米棒之间区域的电场在对称模时极大地增强，而在反对称模时则非常弱，使得模式的选择非常重要。此外，他们还进一步研究了端对端排列的不同尺寸的纳米棒之间由于耦合作用导致的分裂行为（图5）。这些结果可以指导等离子体器件如何在频率可控的情况下不减弱电场的增强效果。

另外，这个研究小组在具有高介电常数衬底的金纳米棒结构中实现了Fano共振，

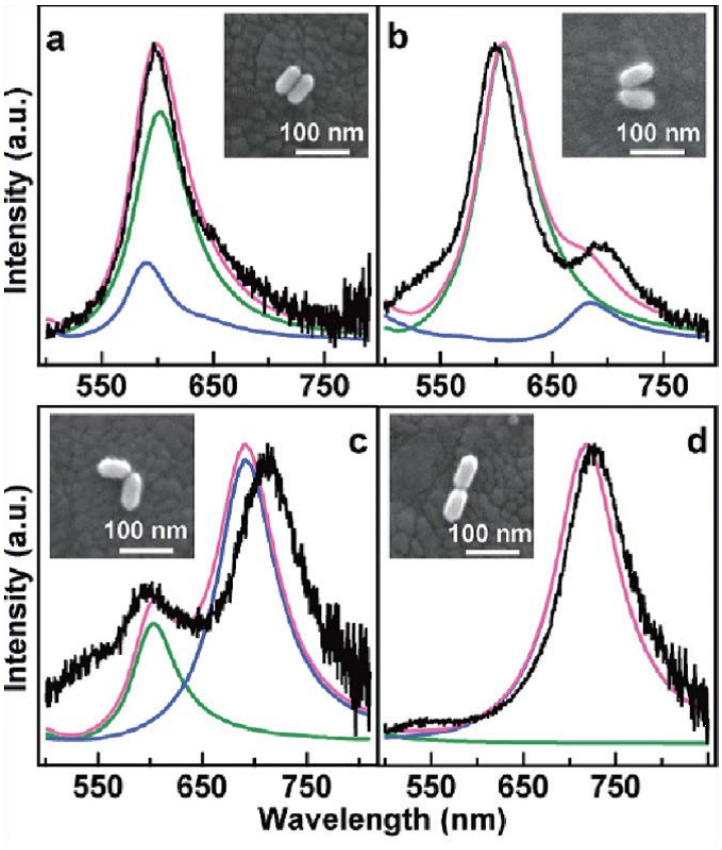


图4　(a)-(d)中的黑实曲线是二聚体金纳米棒在夹角分别为0, 30, 87, 180°时的散射谱，绿色和蓝色曲线分别是FTDT模拟的夹角为0, 30, 90, 180°时的反束缚和束缚模，粉色曲线是二者的叠加。

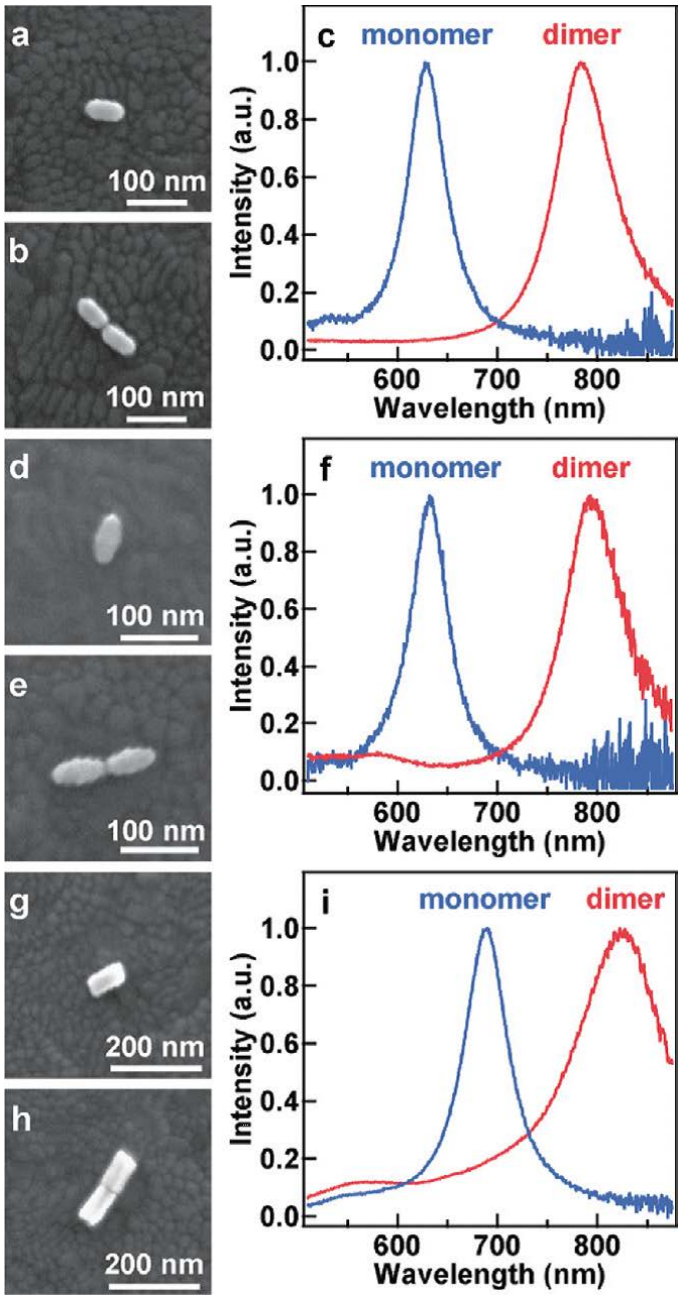


图5　(a)-(c) 单纳米棒和二聚体的SEM影像和散射谱，(d)-(f) 双锥体形状的纳米单元与其二聚体的SEM影像和散射谱，(g)-(i) 平头单纳米棒和二聚体的SEM影像和散射谱。

详情请见："Observation of the Fano Resonance in Gold Nanorods Supported on High-Dielectric-Constant Substrates", ACS NANO, Vol 5, No. 8, 6754-6763 (2011)
Huanjun Chen, Lei Shao, Tian Ming, Kat Choi Woo, Yat Cho Man, Jianfang Wang,* Hai-Qing Lin*.

该研究成果对理解等离子体系统中不同模式的干涉作用提供了清晰的物理图像，并有望于开发基于等离子体的光调控器件。

NUMERICALLY EXACT OF QUANTUM TRANSPORT IN SINGLEMOLECULE JUNCTIONS

Charge transport in single-molecule junctions has been of great interest recently due to the potential application in molecular electronic devices. Employing different experimental techniques, a wealth of interesting transport phenomena have been observed, including Coulomb blockade, the Kondo effect, negative differential resistance, switching and hysteresis, as well as transport characteristics that resemble those of a diode or a transistor. These findings have provide new information in the basic mechanisms which govern quantum transport at the molecular scale. It has also stimulated much interest in the theoretical modeling and simulation of vibrationally coupled electron transport in molecular junctions.

Previously, a variety of theoretical approaches have been developed and employed, including scattering theory, nonequilibrium Green's function (NEGF) approaches, and master equation methods. Although much physical insight has been obtained by the application of these methods, all these approaches involve significant approximations. This has motivated Professor Haobin Wang's research group at Beijing Computational Science Research Center (CSRC) and New Mexico State University to develop a systematic, numerically exact methodology to study quantum dynamics and quantum transport including many-body effects, in particular, correlated electronic-nuclear dynamics — the multilayer multiconfiguration time-dependent Hartree (ML-MCTDH) theory in second quantization representation [J. Chem. Phys. 131, 024114 (2009)]. This development unifies the ML-MCTDH methodology for both distinguishable and indistinguishable particle systems and thus formally completes the theory that Prof. Wang proposed several years ago [J. Chem. Phys. 119(3), 1289 (2003)].

The flexibility offered by the ML-MCTDH-SQR formalism leads to a promising new methodology to accurately treat equilibrium or nonequilibrium quantum mechanical problems with identical particles, especially for many important model problems in condensed matter chemical physics.

Recently, in collaboration with Professor Michael Thoss' group in Germany, Professor Wang applied the ML-MCTDH-SQR to study the effect of vibrational motion on electron transport in a commonly used model for single-molecule junctions. The results demonstrate the importance of electronic-vibrational coupling for the transport characteristics. For situations where the energy of the bridge state is located close to the Fermi energy, the simulations show the timedependent formation of a polaron state that results in a pronounced suppression of the current corresponding to the phenomenon of phonon blockade. They have shown

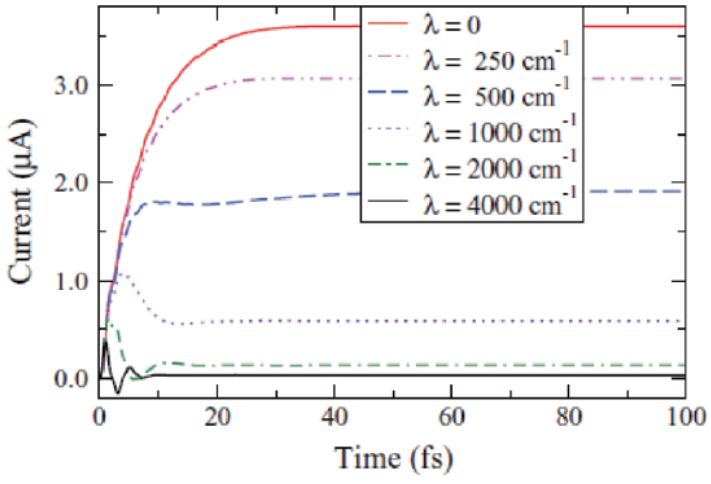


FIG. 1. Time-dependent current I(t) in the phononblockade regime for different coupling strengths to the vibrational bath as specified by the reorganization energy λ. The electronic parameters are αe = 0.2 eV, βe = 1 eV, Ed - Ef = 0, and V = 0.1 V. The characteristic frequency of the vibrational bath is ωc = 500 cm-1 .

that this phenomenon could not be explained solely by the polaron shift of the energy but requires methods that incorporate the dynamical effect of the vibrations on the transport. The accurate results obtained with the ML-MCTDH in this parameter regime were compared to results from the NEGF approach, which offered much insight in the improvement of the NEGF theory. The time-dependent treatment employed in the MLMCTDH-SQR method provides not only information on the steady state but also on the transient dynamics and can thus also been used to study the influence of timedependent electrical fields, such as, e.g., AC gate fields or optical pulses on the transport process.

The research results were published in THE JOURNAL OF CHEMICAL PHYSICS 135, 244506 (2011). The research was supported by the US National ScienceFoundation and the CSRC.

Link to the publication: http://jcp.aip.org/resource/1/jcpsa6/v135/i24/p244506_s1

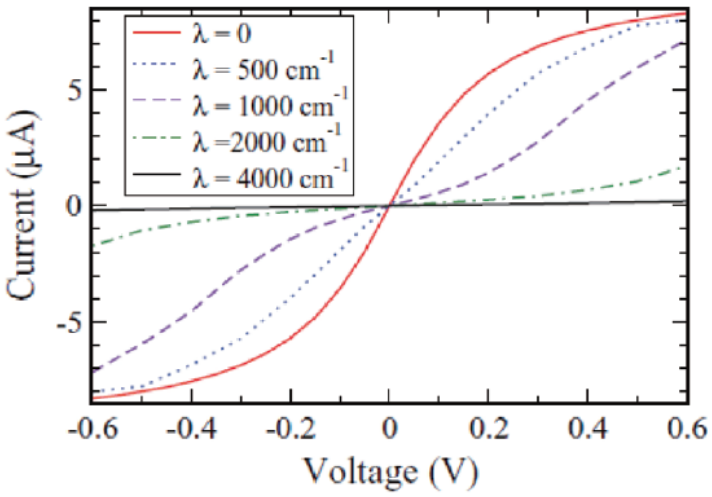


FIG. 2. Dependenc e of the cur r ent -vol t age characteristics in the phononblockade regime on the electronic-vibrational coupling strength. The electronic parameters are the same as in Fig. 1.

PHASE DIAGRAM OF GE

A long-standing goal of physics, chemists, and materials scientists is to have a complete phase diagram of given material. Germanium (Ge) is an important element for semiconductor industry and has many advantages over silicon (Si) due to its higher intrinsic electron mobility and higher intrinsic carrier concentrations; larger bulk excitonic Bohr radii, enabling integration with current semiconductor processing technology. However, its phase diagram has not been completed due to the limited data. For example, the high-pressure behaviors of Ge remain a challenge.

Recently, CSRC researchers, Prof. Hai-Qing Lin and Dr. Chao Zhang, along with collaborators from Carnegie Institution of Washington, USA and City University of Hong Kong, China, performed theoretical simulations and experiments to obtain a complete high-pressure phase diagram of the compressed Ge. Their results show extraordinary agreement between theory and experiment in terms of the way Ge behaves under pressure.

New paths were designed for the investigations of the β-tin → Imma → sh phase transitions in nanocrystalline Ge under conditions of hydrostatic stress. Under pressure, Ge undergoes a structural change from β-tin phase to Imma phase at 66 GPa, and then to sh phase at 90 GPa. Also, the order of phase transitions were determined both from theoretical and experimental studies The superconductivity of Ge up to 190 GPa was obtained using the acquired structural data in the first-principles calculations based on the density-functional theory. It provides evidence that the standard electron-phonon coupling mechanism is responsible for superconductivity in Ge.

This research was also supported by NSFC, the HKRGC, and the Department of Energy in the United States.

See: Xiao-Jia Chen, Chao Zhang, Yue Meng, Rui-Qin Zhang, Hai-Qing Lin, Viktor V. Struzhkin, Ho-kwang Mao, "β-tin → Imma → sh Phase Transitions of Germanium", Phys. Rev. Lett. 106, 135502 (2011), (pub. 30 March 2011). http://prl.aps.org/abstract/PRL/v106/i13/e135502.

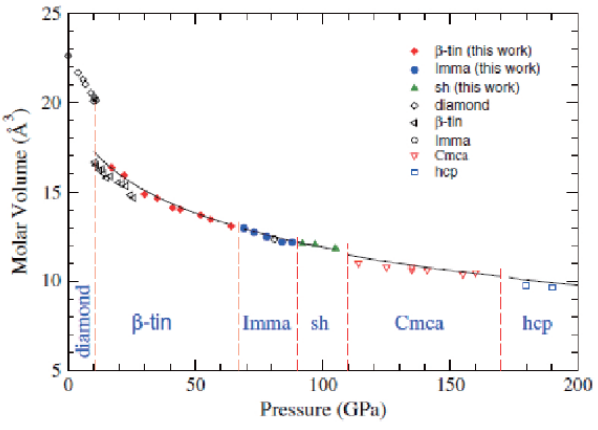


Figure 1. Molar volume vs pressure of Ge. The vertical dashed lines indicate the phase boundaries.

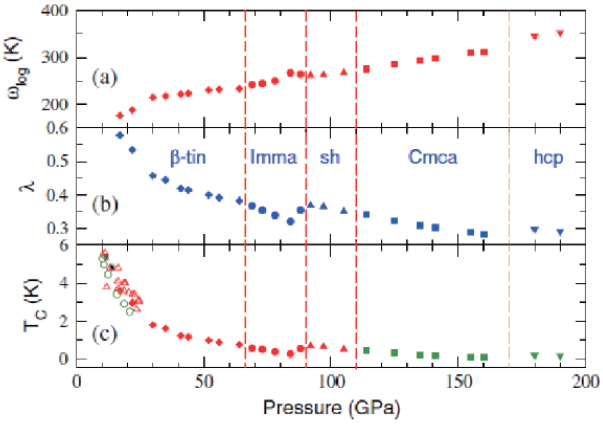
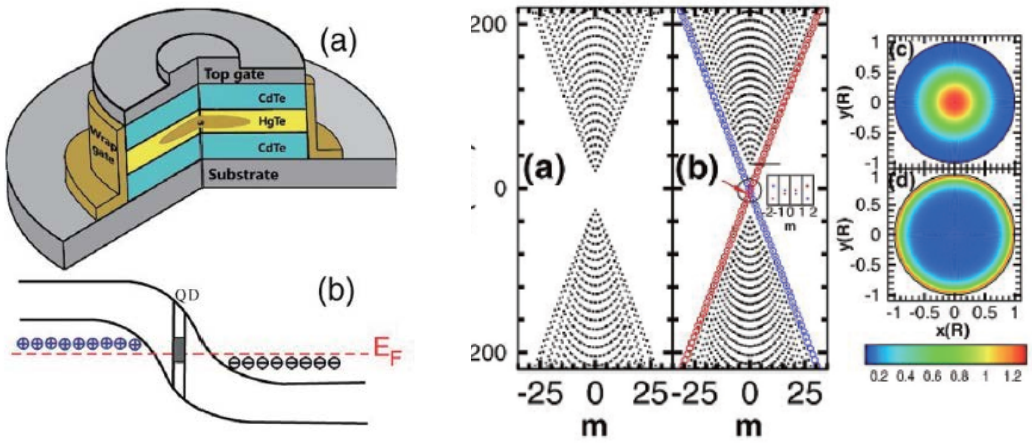


Figure 2. Pressure dependence of superconducting properties of GE.

二维拓扑绝缘体量子点研究取得新进展

近年来拓扑绝缘体材料以其独特的物性吸引了科学界广泛的研究关注。这类材料内部是绝缘体，而在边界或/和表面则显示出金属的特性。这种独特的性质无法按照传统的材料分类方法来区分。其能带结构由Z2拓扑不变量来刻画。目前人们注意力集中在拓扑绝缘体块材的制备和输运性质研究方面。相对而言，拓扑绝缘体纳米结构的研究则刚刚开始，这对构造新型的电子学器件是十分重要的。由于纳米制备技术复杂，因此目前实验上难于制备高质量的拓扑绝缘体纳米结构。

半导体材料HgTe恰巧是一种拓扑绝缘体，并且材料生长和器件制备技术已相当成熟。在国家基金委，中科院创新工程，科技部和北京计算科学研究中心的支持下，半导体超晶格国家重点实验室常凯研究员和博士生娄文凯，从理论上提出了一个利用半导体刻蚀技术制备拓扑绝缘体HgTe量子点的方案。在通常的半导体量子点中，基态中的电子会集中分布在量子点中心。HgTe量子点的电子基态则分布在量子点边缘附近。这类新的量子态是边缘态沿量子点边界量子化的结果。由于这种特征，人们可以期待在量子点中能够看到Aharonov-Bohm效应，并以此来检测边缘态的存在。同时这类新的量子点在偶极近似下是光跃迁禁戒的，即所谓的“暗态”。因此可能用来存储量子信息。



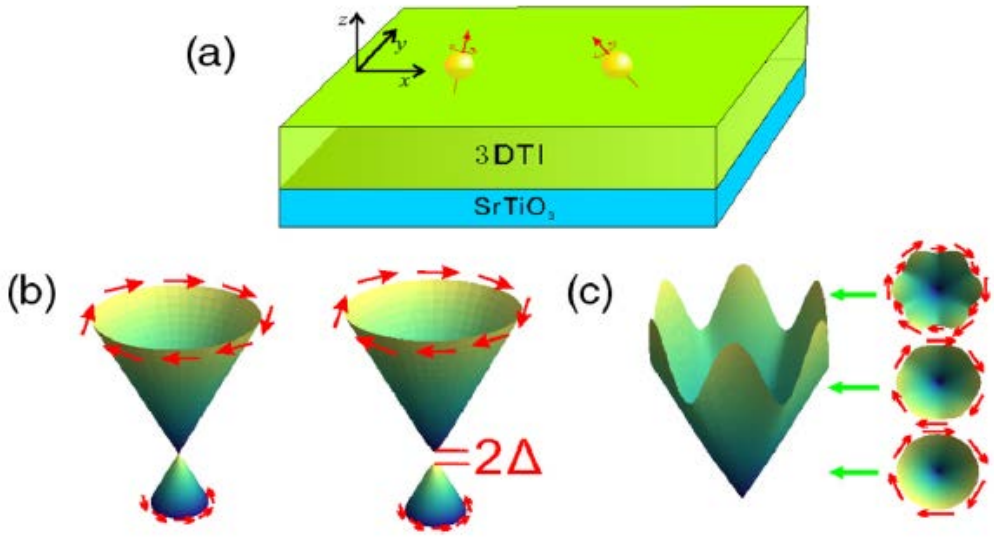
该研究成果发表在国际著名物理学期刊《物理评论快报》(Phys. Rev. Lett., 106, 206802(2011)，http://link.aps.org/doi/10.1103/PhysRevLett.106.206802)。
该项研究对于研究拓扑绝缘体纳米结构和构造相干电子学器件具有一定的指导意义。

三维拓扑绝缘体表面磁性的全电控制

在国家基金委，中科院创新工程和和北京计算科学研究中心的支持下，半导体所常凯研究员和博士生朱家骥，与美国斯坦福大学物理系张首晟教授合作从理论上研究了BiSe 等材料表面磁性全电控制的可能性。

通过控制载流子浓度以控制材料磁性是半导体自旋电子学领域的一个重要研究方向。这种控制方案已经在稀磁半导体GaMnAs中得以实现。但是当费米能级处于普通的半导体材料的能隙中时，半导体处于绝缘状态，因此以电子或空穴为媒介引致的磁离子之间的自旋关联消失，体系的铁磁性随之消失。最近发现的新型的拓扑绝缘体材料展现出反转的能带结构和较窄的带隙（0.4eV左右)，且具有奇特的新特性: 它的体内是绝缘的，但是表面表现出金属特性。这类材料输运和磁光特性的研究工作正成为国际前沿研究领域的热点之一。

这种类金属的电子表面态具有令人惊奇的自旋极化和手征特性，且由于时间反演对称性的保护，而不容易受到杂质散射的破坏。如何利用电场来控制表面的磁性引起人们极大的研究兴趣。半导体所常凯研究员和博士生朱家骥，与美国斯坦福大学物理系张首晟教授合作从理论上研究了BiSe 等材料表面磁性全电控制的可能性。由于表面态电子具有手征特性，导致磁离子之间扭曲的RKKY相互作用。这种RKKY相互作用由海森堡项，DM项和伊辛项构成。通过改变栅压，可以改变各项的相对权重，从而控制磁离子之间的自旋关联的形式，形成不同的磁相。该文的结果为实现人工控制的强关联系统提供了理论基础。文章发表在Phys. Rev. Lett. 106, 097201(2011)。



A NEW CRITERION FOR ZERO QUANTUM DISCORD

The quantum correlation of a bipartite state is usually measured by quantum discord, introduced by Ollivier and Zurek [Phys. Rev. Lett. 88 017901 (2001)]. The question of how to find out whether a quantum state has zero quantum discord or not is fundamentally important; it is the first step to distinguish the quantum features of a bipartite state from the classical. They propose a new

criterion for judging zero quantum discord for arbitrary bipartite states. In the computational basis {|1A 1B >,.....,|1AMB >,|2A 1B >,.....,|NAMB >}, a general AB bipartite quantum state can be represented by a density matrix,

$$\rho = \begin{pmatrix} \rho_{11} & \cdots & \rho_{1(\mathrm{NM})} \\ \vdots & \ddots & \vdots \\ \rho_{(\mathrm{NM})1} & \cdots & \rho_{(\mathrm{NM})(\mathrm{NM})} \end{pmatrix}$$

The (NM)×(NM) matrix in equation (1) can be partitioned into N2 blocks,

$$\rho = \begin{pmatrix} \rho^{(1_A 1_A)} & \cdots & \rho^{(1_A \mathrm{N}_A)} \\ \vdots & \ddots & \vdots \\ \rho^{(\mathrm{N}_A 1_A)} & \cdots & \rho^{(\mathrm{N}_A \mathrm{N}_A)} \end{pmatrix}$$

with each block being an M × M matrix,

$$\rho^{(i_A j_A)} = \begin{pmatrix} \rho_{((i-1)M+1)((j-1)M+1)} & \cdots & \rho_{((i-1)M+1)(jM)} \\ \vdots & \ddots & \vdots \\ \rho_{(iM)((j-1)M+1)} & \cdots & \rho_{(iM)(jM)} \end{pmatrix}$$

A bipartite quantum state has zero quantum discord if and only if all the blocks of its density matrix are normal matrices and commute with each other. Given a bipartite state with zero quantum discord, the question of how to find the set of local projectors that do not disturb the whole state after being imposed on one subsystem is also presented. A class of two-qubit X-state is used to test the criterion, and an experimental scheme is proposed for realizing it. Consequently, they prove that the positive operator-valued measurement cannot extinguish the quantum correlation of a bipartite state with nonzero quantum discord.

See: Jie-Hui Huang, Lei Wang and Shi-Yao Zhu, "A new criterion for zero quantum discord", New Journal of Physics, 13 063045 (2011), (pub. 28 June 2011).

Link to the pblication: http://iopscience.iop.org/1367- 2630/13/6/063045

HIGH-EFFICIENCY REFLECTION OF A PROBE FIELD IN V-TYPE THREE-LEVEL ATOMS OF CESIUM VAPOR DRIVEN BY TWO COUNTERPROPAGATING COUPLING FIELDS

In the two papers, they experimentally and theoretically investigated the highefficiency reflection of a probe field in V-type three-level atoms of cesium vapor driven by two counterpropagating coupling fields. More than 60% of reflection efficiency is observed at the phase-matching angle. The underlying mechanism theoretically is investigated as the four-wave mixing (or reflection from a grating) is enhanced by the electromagnetically-induced transparency. Both of the two Doppler-free two-photon resonances (one for the probe and copropagating fields, the other for the reflected and the counterpropagation fields) play an important role in satisfying the phase matching in the reflection direction. The phase compensation due to the anomalous dispersion and the decrease of effective absorption length in the atomic system allow the efficient reflection to be observed in a wide range of incident angles of the probe field and detunings of the coupling field. The phase compensation mechanism induced by anomalous dispersion in the reflection process of four-wave mixing is important, because the four wave vectors do not match in the vacuum. The maximum reflection occurs when the frequency of the probe beam (and consequently the frequency of the reflected signal) is slightly red detuned from the transition frequency, which is attributed to the phase compensation from the steep anomalous dispersion accompanied with a strong probe absorption. The dependences of the efficiency on the angle between the coupling and probe lights, on the intensity of the coupling, field and on atomic density are studied. The theoretical model is in good agreement with the experimental results.

See:

1.Jun-Xiang Zhang, Hai-Tao Zhou, Da-Wei Wang, and Shi-Yao Zhu, "Enhanced reflection via phase compensation from anomalous dispersion in atomic vapor", PHYSICAL REVIEW A 83, 053841 (2011), (pub. 27 May 2011).

2.Hai-Tao Zhou, Da-Wei Wang, Dan Wang, Jun-Xiang Zhang, and Shi-Yao Zhu, "Efficient reflection via four-wave mixing in a Doppler-free electromagneticallyinduced-transparency gas system", PHYSICAL REVIEW A 84, 053835 (2011), (pub. 17 November 2011).

Link to the publication: http://pra.aps.org/abstract/PRA/v83/i5/e053841

EFFECT OF THE THIRD LEVEL ON TIME EVOLUTION OF THE SPONTANEOUS UPPER LEVEL DECAY DUE TO COUNTERROTATING TERMS

In the previous studies, two-level approximation is very good when the interaction is on resonant. It is also sometimes used when the counter rotating terms are included, such as the spontaneous emission. Here they study under what condition, other levels (here a third level) can be neglected or can't be neglected. They find that the third level has great influence on the time evolution of the spontaneous decay from the excited state, when the counter-rotating terms are taken into account. The influence in the cascade-type and V-type three-level systems is investigated for two initial states, excited from the ground states of thewhole system (atom plus vacuum modes) and from the bare atom. The third level results in the additional virtual photon processes, emitting a photon from one level and reabsorbing the same photon to another level and vice versa. The main influence of the third level is to accelerate the decay, which leads to or enhances the anti-Zeno effect, especially for the initial state excited from the ground state of the whole system. Therefore, the third level cannot be neglected, if the counter-rotating terms are taken into account. It can be neglected only when the third level is far away from the upper level or the coupling is very small compared with the transition coupling.

See:
Y. B. Dong, Z. H. Li, Y. Li, and Shi-Yao Zhu, "Effect of the third level on time evolution of the spontaneous upper level decay due to counter-rotating terms", PHYSICAL REVIEW A 85, 013832 (2012), (pub. 23 January 2012).

Link to the publication: http://pra.aps.org/abstract/PRA/v85/i1/e013832

科研项目

RESEARCH PROJECTS

Since its establishment, CSRC has undertaken a total of 228 projects from the Ministry of Science and Technology of China, National Natural Science Foundation of China, China Academy of Engineering Physics, China Postdoctoral Science Foundation and so on. The total project funding exceeds 300 million Yuan.

自成立至今，中心承担中央组织部、科学技术部、国家基金委、博士后科学基金，以及中国工程物理研究院、军委科技委、工信部、国防科工局等项目共228项，项目总经费超过3亿元。

SOURCE OF FUNDING: MINISTRY OF SCIENCE AND TECHNOLOGY OF CHINA (MOST)

NO	PI 项目负责人	SOURCE 经费来源	GRANT NO. 项目编号	CATEGORY 项目类别	PROJECT TITLE 项目名称	FUNDING 项目经费	FROM 起始时间	TO 结束时间
1	Hai-Qing Lin 林海青	MOST 科学技术部	2011CB922200	Major Research Plan 重大科学研究计划	固态微结构中光诱导集体激发、光电耦合效应及其原型器件研究	2400	2011-01	2015-12
2	Nan Zhao 赵　楠	MOST 科学技术部	2014CB848700	Thematic Project for Young Scientist 青年科学家专题项目	自旋及其复合系统的量子操纵与相干集成研究	500	2014-01	2018-12
3	Chang-Pu Sun 孙昌璞	MOST 科学技术部	2014CB921403	Major Research Plan 重大科学研究计划	固体量子计算的器件物理基础	120	2014-01	2018-12
4	Jian-Qiang You 游建强	MOST 科学技术部	2016YFA0301200	National Key Research and Development Project 国家重点研发计划	高品质腔与固体量子态的耦合及其量子调控	2736	2016-07	2021-06
5	Hai-Qing Lin 林海青	MOST 科学技术部	2017YFA0303400	National Key Research and Development Project 国家重点研发计划	低维固态极性结构中量子态调控及其原型器件研究	2737	2017-07	2022-06

SOURCE OF FUNDING: NATIONAL NATURAL SCIENCE FOUNDATION OF CHINA (NSFC)

NO	PI 项目负责人	SOURCE 经费来源	GRANT NO. 项目编号	CATEGORY 项目类别	PROJECT TITLE 项目名称	FUNDING 项目经费	FROM 起始时间	TO 结束时间
1	Hai-Qing Lin 林海青	NSFC 国家自然科学基金委员会	U1530401	CSRC Program of Joint Fund 联合基金项目中心项目	科学计算与物理系统模拟研究	3360	2015-02	2018-12
2	Hai-Qing Lin 林海青	NSFC 国家自然科学基金委员会	U1930402	CSRC Program of Joint Fund 联合基金项目中心项目	科学计算与物理系统模拟研究	2600	2020-01	2022-12
3	Chang-Pu Sun 孙昌璞	NSFC 国家自然科学基金委员会	11534002	Key Program 重点项目	有限开放系统的量子相干效应及其应用	400	2016-01	2020-12
4	Su-Huai Wei 魏苏淮	NSFC 国家自然科学基金委员会	11634003	Key Program 重点项目	透明导电体的物理机理研究与新材料设计	310	2017-01	2021-12
5	Lei-Han Tang 汤雷翰	NSFC 国家自然科学基金委员会	11635002	Key Program 重点项目	活性系统的热耗散及长时动力学	280	2017-01	2021-12
6	Hai-Qing Lin 林海青	NSFC 国家自然科学基金委员会	11734002	Key Program 重点项目	海森堡模型和Kitaev模型的元激发、激发谱和量子相变	340	2018-01	2022-12
7	Shiwu Gao 高世武	NSFC 国家自然科学基金委员会	11934003	Key Program 重点项目	表面激发态和非绝热动力学方法及应用	330	2020-01	2024-12
8	Hai-Qing Lin 林海青	NSFC 国家自然科学基金委员会	91230203	Key Program of Major Research Plan 重大研究计划重点项目	复杂结构及其相变的多尺度模型与算法	320	2013-01	2016-12
9	Zhimin Zhang 张智民	NSFC 国家自然科学基金委员会	91430216	Key Program of Major Research Plan 重大研究计划重点项目	强非线性偏微分方程基于梯度重构的新型算法	300	2015-01	2018-12

SOURCE OF FUNDING: NATIONAL NATURAL SCIENCE FOUNDATION OF CHINA (NSFC)

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10	Qi Wang 王 奇	NSFC 国家自然科学基金委员会	91630207	Key Program of Major Research Plan 重大研究计划重点项目	多相物质体系的计算建模算法设计与数值分析	190	2017-01	2019-12
11	Ju Ming 明 炬	NSFC 国家自然科学基金委员会	91330104	Training Program of the Major Research Plan 重大研究计划培育项目	实际复杂系统不确定量化中的降阶建模理论	70	2014-01	2016-12
12	Jian-Qiang You 游建强	NSFC 国家自然科学基金委员会	91421102	Training Program of the Major Research Plan 重大研究计划培育项目	固态杂化量子体系中量子态的调控和相干动力学研究	50	2015-01	2016-12
13	Hai-Qing Lin 林海青	NSFC 国家自然科学基金委员会	U1230202	Key Program of Joint Fund 联合基金项目重点项目	氧化镁晶体微观结构、力学性质及超高压物性的研究	300	2013-01	2016-12
14	Jian-Qiang You 游建强	NSFC 国家自然科学基金委员会	U1330201	Key Program of Joint Fund 联合基金项目重点项目	超导量子比特的优化与混合量子器件的研究	320	2014-01	2017-12
15	Shi-Yao Zhu 朱诗尧	NSFC 国家自然科学基金委员会	U1330203	Key Program of Joint Fund 联合基金项目重点项目	人工微结构中宏观量子效应的研究	340	2014-01	2017-12
16	Lei-Han Tang 汤雷翰	NSFC 国家自然科学基金委员会	U1430237	Key Program of Joint Fund 联合基金项目重点项目	复杂自适应物质的跨尺度计算平台	400	2015-01	2018-12
17	Li-Min Liu 刘利民	NSFC 国家自然科学基金委员会	51222212	Excellent Young Scientist Fundation 优秀青年科学基金项目	材料的界面物理与化学	100	2013-01	2015-12
18	Wen Yang 杨 文	NSFC 国家自然科学基金委员会	11322542	Excellent Young Scientist Fundation 优秀青年科学基金项目	固态量子信息	100	2014-01	2016-12
19	Chi-Yung Yam 任志勇	NSFC 国家自然科学基金委员会	21322306	Excellent Young Scientist Fundation 优秀青年科学基金项目	复杂体系的多尺度模拟	100	2014-01	2016-12

20	Yong Li 李　勇	NSFC 国家自然科学基金委员会	11422437	Excellent Young Scientist Fundation 优秀青年科学基金项目	量子光学	100	2015-01	2017-12
21	Pei-Hong Zhang 张培鸿	NSFC 国家自然科学基金委员会	11328401	Joint Research Fund for Overseas Chinese, Hong Kong and Macao Young Scholars 海外及港澳学者合作研究基金	功能材料的电子激发态性质：理论方法发展与实际应用	20	2014-01	2015-12
22	Hia-Guang Liu 刘海广	NSFC 国家自然科学基金委员会	11811540392	International (Regional) Cooperation and Exchange Program 国际(地区)合作与交流项目	利用X射线自由电子激光研究分子结构和动力学机理	10	2018-07	2020-06
23	Chang-Pu Sun 孙昌璞	NSFC 国家自然科学基金委员会	11881260567	International (Regional) Cooperation and Exchange Program 国际(地区)合作与交流项目	2018年量子信息科技学术研讨会	4	2018-09	2018-12
24	Yong Li 李　勇	NSFC 国家自然科学基金委员会	11144011	Fund of Director of the Science Department 科学部主任基金	首届全国原子分子光学物理青年科学家论坛	6	2011-12	2012-04
25	Li-Min Liu 刘利民	NSFC 国家自然科学基金委员会	11244001	Fund of Director of the Science Department科学部主任基金	水与有缺陷二氧化钛表面相互作用的理论研究	12	2012-01	2012-12
26	Chang-Pu Sun 孙昌璞	NSFC 国家自然科学基金委员会	11447609	Emergency Management Project 应急管理项目	“生命过程中能量转换与信息处理的量子物理问题”理论物理高级研讨班	20	2015-01	2015-12
27	Zhimin Zhang 张智民	NSFC 国家自然科学基金委员会	11726603	Mathematics Tianyuan Fund 数学天元基金	非线性Hamiltonian 系统高效谱方法及其应用	20	2018-01	2018-12
28	Bo Wen 闻　波	NSFC 国家自然科学基金委员会	11847213	Theoretical Physics Fund 理论物理专款	基于极化子增强二氧化钛光催化机理的理论研究	18	2019-01	2019-12
29	Hui-Hui Qin 秦慧慧	NSFC 国家自然科学基金委员会	11847244	Theoretical Physics Fund 理论物理专款	量子系统非对称性度量研究和量子非局域性关联研究	18	2019-01	2019-12

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30	Xiao-Long Deng 邓小龙	NSFC 国家自然科学基金委员会	11202020	Young Scientists Fund 青年科学基金项目	多相流自由界面不稳定性的计算流体力学研究	26	2013-01	2015-12
31	Xiao-Jie Liu 刘晓洁	NSFC 国家自然科学基金委员会	11204013	Young Scientists Fund 青年科学基金项目	石墨烯表面金属纳米材料生长形貌以及生长机制的探索	25	2013-01	2015-12
32	Yan-Chao Li 李彦超	NSFC 国家自然科学基金委员会	11104009	Young Scientists Fund 青年科学基金项目	低维体系中的量子相变及其研究方法探索	26	2012-01	2014-12
33	Jun-Feng Gao 高峻峰	NSFC 国家自然科学基金委员会	11304008	Young Scientists Fund 青年科学基金项目	从碳团簇到石墨烯：金属表面石墨烯成核生长的多尺度模拟	25	2014-01	2016-12
34	Zhen-Guo Fu 付振国	NSFC 国家自然科学基金委员会	11304009	Young Scientists Fund 青年科学基金项目	拓扑绝缘体中新奇的量子散射效应	25	2014-01	2016-12
35	Wen-Jie Nie 聂文杰	NSFC 国家自然科学基金委员会	11304010	Young Scientists Fund 青年科学基金项目	腔光机械系统中的 Casimir 效应及其若干量子特性研究	25	2014-01	2016-12
36	Xiu-Feng Lang 郎秀峰	NSFC 国家自然科学基金委员会	21303006	Young Scientists Fund 青年科学基金项目	原子水平理解高能面覆盖贵金属纳米结构的表面增强拉曼光谱	25	2014-01	2016-12
37	Zeng-Zhao Li 李增朝	NSFC 国家自然科学基金委员会	11404019	Young Scientists Fund 青年科学基金项目	基于马约拉纳束缚态的杂化固态量子体系的量子动力学研究	25	2015-01	2017-12
38	Rui Li 李　睿	NSFC 国家自然科学基金委员会	11404020	Young Scientists Fund 青年科学基金项目	具有强自旋轨道耦合的半导体量子点中单量子态的调控	25	2015-01	2017-12
39	Zhi-Hai Wang 王治海	NSFC 国家自然科学基金委员会	11404021	Young Scientists Fund 青年科学基金项目	耦合量子光学体系的相干控制	25	2015-01	2017-12

40	Wai-Xiang Cao 曹外香	NSFC 国家自然科学基金委员会	11501026	Young Scientists Fund 青年科学基金项目	非线性双曲方程的间断有限元超收敛分析和应用	18	2016-01	2018-12
41	Zhen-Hua Li 李振华	NSFC 国家自然科学基金委员会	11504017	Young Scientists Fund 青年科学基金项目	密度矩阵级联方程在开放量子体系中的应用研究	20	2016-01	2018-12
42	Shu-Hui Zhang 张书辉	NSFC 国家自然科学基金委员会	11504018	Young Scientists Fund 青年科学基金项目	二维材料中局域自旋间接耦合的全电调控的理论研究	20	2016-01	2018-12
43	Teng-Fei Cao 曹腾飞	NSFC 国家自然科学基金委员会	21503012	Young Scientists Fund 青年科学基金项目	黑磷-氮化硼杂化异质结光催化特性的第一性原理研究	21	2016-01	2018-12
44	Yu Du 杜　宇	NSFC 国家自然科学基金委员会	11601026	Young Scientists Fund 青年科学基金项目	求解高波数Helmholtz问题的PPR方法和弱有限元方法	18	2017-01	2019-12
45	Zi-Yu Hu 胡自玉	NSFC 国家自然科学基金委员会	11604008	Young Scientists Fund 青年科学基金项目	二维材料的新型结构相和其边缘态的量子调控的理论研究	22	2017-01	2019-12
46	Mao-Xing Liu 刘卯鑫	NSFC 国家自然科学基金委员会	11604009	Young Scientists Fund 青年科学基金项目	多量子比特与玻色场耦合系统量子相变研究	22	2017-01	2019-12
47	Jun Li 李　俊	NSFC 国家自然科学基金委员会	11605005	Young Scientists Fund 青年科学基金项目	核磁共振体系的量子控制模型及其应用	20	2017-01	2019-12
48	Bao-Shuang Shang 尚宝双	NSFC 国家自然科学基金委员会	51601009	Young Scientists Fund 青年科学基金项目	金属玻璃塑性局域重组方向敏感性研究	20	2017-01	2019-12
49	Guo-Fei Pang 庞国飞	NSFC 国家自然科学基金委员会	11701025	Young Scientists Fund 青年科学基金项目	分数阶导数对流-弥散方程参数识别的多重精度高斯过程回归算法	20	2018-01	2020-12
50	Lin Hu 胡　麟	NSFC 国家自然科学基金委员会	11704021	Young Scientists Fund 青年科学基金项目	非平衡态下二维宽带隙半导体中缺陷和掺杂性质的研究和调控	25	2018-01	2020-12
51	Shao-Jie Yuan 袁少杰	NSFC 国家自然科学基金委员会	11704022	Young Scientists Fund 青年科学基金项目	超导量子比特的弱测量及其量子力学时间对称性的研究	27	2018-01	2020-12

SOURCE OF FUNDING: NATIONAL NATURAL SCIENCE FOUNDATION OF CHINA (NSFC)

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52	Lei Kang 康　雷	NSFC 国家自然科学基金委员会	11704023	Young Scientists Fund 青年科学基金项目	典型狄拉克材料的非线性光学性质的理论研究	25	2018-01	2020-12
53	Chun-Fang Zhang 张春芳	NSFC 国家自然科学基金委员会	11704024	Young Scientists Fund 青年科学基金项目	芳香烃超导材料制备中涉及的化学反应的理论研究	26	2018-01	2020-12
54	Wei Wu 吴　威	NSFC 国家自然科学基金委员会	11704025	Young Scientists Fund 青年科学基金项目	量子开放系统动力学的数值研究	25	2018-01	2020-12
55	Wen-Zhao Zhang 张闻钊	NSFC 国家自然科学基金委员会	11704026	Young Scientists Fund 青年科学基金项目	开放量子系统中光机械振子辐射压冷却的理论研究	25	2018-01	2020-12
56	Shu-Xian Hu 胡淑贤	NSFC 国家自然科学基金委员会	21701006	Young Scientists Fund 青年科学基金项目	含氮冠醚三价次锕系离子和镧系离子配合物成键及电子结构的理论研究	25	2018-01	2020-12
57	Xiao Li 李　晓	NSFC 国家自然科学基金委员会	11801024	Young Scientists Fund 青年科学基金项目	非局部相场方程的保持能量稳定与最大模稳定的高效数值方法	23	2019-01	2021-12
58	Ji Li 李　季	NSFC 国家自然科学基金委员会	11801025	Young Scientists Fund 青年科学基金项目	基于矩阵分解的相位恢复非凸优化算法研究	20	2019-01	2021-12
59	Hu Chen 陈　虎	NSFC 国家自然科学基金委员会	11801026	Young Scientists Fund 青年科学基金项目	无界域上分数阶和非局部扩散方程的高精度数值方法研究	23	2019-01	2021-12
60	Li-Jing Jing 晋力京	NSFC 国家自然科学基金委员会	11804020	Young Scientists Fund 青年科学基金项目	多模光力超导电路中非线性效应的增强和探测	28	2019-01	2021-12
61	Zhi-Huang Luo 罗智煌	NSFC 国家自然科学基金委员会	11805008	Young Scientists Fund 青年科学基金项目	利用核自旋系统进行拓扑相量子模拟的实验研究	25	2019-01	2021-12

62	Mondaini Rubem	NSFC 国家自然科学基金委员会	11650110441	Fund for International Young Scientists 外国青年学者基金项目	Many-body localization in full fermionic systems and its applications to quantum gases	35	2017-01	2018-12
63	Ahrens Sven	NSFC 国家自然科学基金委员会	11650110442	Fund for International Young Scientists 外国青年学者基金项目	Investigation of the angular momentum conservation of light in photon-spin interactions	17.5	2017-01	2017-12
64	Cadez Tilen	NSFC 国家自然科学基金委员会	11650110443	Fund for International Young Scientists 外国青年学者基金项目	Dynamical correlation functions of 1D correlated electron models	17.5	2017-01	2017-12
65	BANDARU SATEESH	NSFC 国家自然科学基金委员会	21650110464	Fund for International Young Scientists 外国青年学者基金项目	Computational Modeling of Metal oxide Surface-Photo catalysts for Water Splitting reactions	35	2017-01	2018-12
66	Kyle John Welch	NSFC 国家自然科学基金委员会	11750110409	Fund for International Young Scientists 外国青年学者基金项目	Emergent complexity in the collective motion of simple, self-propelled agents	30	2018-01	2019-12
67	Stephen Russell	NSFC 国家自然科学基金委员会	11750110427	Fund for International Young Scientists 外国青年学者基金项目	Fast Solvers for Advection-Diffusion: Sparse Grids and Adaptive Time-Stepping	15	2018-01	2018-12
68	Stefano Chesi	NSFC 国家自然科学基金委员会	11750110428	Fund for International Young Scientists 外国青年学者基金项目	Magnetic phases and superradiant-like dynamics of nuclear spins in a quantum dot	30	2018-01	2019-12
69	Tharnier Puel de Oliveira	NSFC 国家自然科学基金委员会	11750110429	Fund for International Young Scientists 外国青年学者基金项目	Thermodynamic Unbalance Transverse Field Xy Spin Chain - Non-Equilibrium Phase Transitions, Transport And Entanglement	20	2018-01	2018-12
70	Santanu Sinha	NSFC 国家自然科学基金委员会	11750110430	Fund for International Young Scientists 外国青年学者基金项目	Multiphase flow in porous media: a new computational approach	30	2018-01	2019-12
71	Tirthankar Dutta	NSFC 国家自然科学基金委员会	11750110431	Fund for International Young Scientists 外国青年学者基金项目	Theoretical Study of Interfacial Magnetism and Transport of Metals and Insulators	30	2018-01	2019-12
72	Jorge Botana Alcalde	NSFC 国家自然科学基金委员会	11850410445	Fund for International Young Scientists 外国青年学者基金项目	Design of mixed-anion structures for industrial applications	40	2019-01	2020-12

SOURCE OF FUNDING: NATIONAL NATURAL SCIENCE FOUNDATION OF CHINA (NSFC)

NO	PI 项目负责人	SOURCE 经费来源	GRANT NO. 项目编号	CATEGORY 项目类别	PROJECT TITLE 项目名称	FUNDING 项目经费	FROM 起始时间	TO 结束时间
73	Ahrens Sven	NSFC 国家自然科学基金委员会	11750410688	Fund for International Young Scientists 外国青年学者基金项目	Investigation of the angular momentum conservation of light in photon-spin interactions	15	2018-01	2018-12
74	Rubem Mondaini	NSFC 国家自然科学基金委员会	11851110757	Fund for International Young Scientists 外国青年学者基金项目	Out-of-equilibrium systems: Thermalization, Many-body localization and topological Time-crystals	34.5	2019-01	2020-12
75	Georg Engelhardt	NSFC 国家自然科学基金委员会	11950410510	Fund for International Young Scientists 外国青年学者基金项目	Spectroscopy of molecular excitation dynamics- far beyond linear response	20	2020-01	2020-12
76	Shi-Yao Zhu 朱诗尧	NSFC 国家自然科学基金委员会	11174026	General Program 面上项目	反旋波项在光和原子相互作用中的影响	65	2012-01	2015-12
77	Yong Li 李　勇	NSFC 国家自然科学基金委员会	11174027	General Program 面上项目	光力系统中微纳机械振子的冷却原理研究	60	2012-01	2015-12
78	Lei-Han Tang 汤雷翰	NSFC 国家自然科学基金委员会	11175013	General Program 面上项目	全耦合及有限维空间Kuramoto模型同步相变的统计物理研究	66	2012-01	2015-12
79	Xiang Gao 高　翔	NSFC 国家自然科学基金委员会	11274035	General Program 面上项目	原子体系散射及其相关精密谱学的理论研究	78	2013-01	2016-12
80	Wen Yang 杨　文	NSFC 国家自然科学基金委员会	11274036	General Program 面上项目	半导体量子点中的电子自旋退相干及其抑制的理论研究	75	2013-01	2016-12
81	Jin Yu 喻　进	NSFC 国家自然科学基金委员会	11275022	General Program 面上项目	单分子基因转录复制的非平衡态物理机制解析	70	2013-01	2016-12
82	Nan Zhao 赵　楠	NSFC 国家自然科学基金委员会	11374032	General Program 面上项目	基于金刚石“氮-空位”中心的腔量子电动力学研究	76	2014-01	2017-12

83	Zhimin Zhang 张智民	NSFC 国家自然科学基金委员会	11471031	General Program 面上项目	若干具有弱导数的新型计算方法的梯度重构	70	2015-01	2018-12
84	Chong-Bin Chou 周崇斌	NSFC 国家自然科学基金委员会	11474016	General Program 面上项目	张量积投影态在变分蒙特卡罗方法的理论及应用	90	2015-01	2018-12
85	Qi Wang 王　奇	NSFC 国家自然科学基金委员会	11571032	General Program 面上项目	活性的、各向异性流体的数学建模分析与计算	45	2016-01	2019-12
86	Bing Huang 黄　兵	NSFC 国家自然科学基金委员会	11574024	General Program 面上项目	晶格匹配的层状合金做为新型高效光源材料的理论探索	62	2016-01	2019-12
87	Stefano Chesi	NSFC 国家自然科学基金委员会	11574025	General Program 面上项目	半导体纳米结构的空穴自旋的相干性质	62	2016-01	2019-12
88	Xin-Liang Xu 徐辛亮	NSFC 国家自然科学基金委员会	11575020	General Program 面上项目	宏观热涨落体系的非平衡态涨落定理	62	2016-01	2019-12
89	Hia-Guang Liu 刘海广	NSFC 国家自然科学基金委员会	11575021	General Program 面上项目	X射线自由电子激光在单分子成像中的应用及相关计算方法与理论研究	56	2016-01	2019-12
90	Peng-Fei Guan 管鹏飞	NSFC 国家自然科学基金委员会	51571011	General Program 面上项目	非晶合金中β-弛豫结构起源的计算模拟研究	66	2016-01	2019-12
91	Li-Min Liu 刘利民	NSFC 国家自然科学基金委员会	51572016	General Program 面上项目	水溶液条件下光电催化材料理论设计及其性能优化	63	2016-01	2019-12
92	Guang-Hui Hu 胡广辉	NSFC 国家自然科学基金委员会	11671028	General Program 面上项目	基于固定入射方向的反媒介理论和算法研究	48	2017-01	2020-12
93	Yang Ding 丁　阳	NSFC 国家自然科学基金委员会	11672029	General Program 面上项目	波状运动中的力矩规律在解释生物驱动控制和设计机器人柔性材料中的应用	56	2017-01	2020-12

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94	Rubem Mondaini	NSFC 国家自然科学基金委员会	11674021	General Program 面上项目	关联超流体中的赝能隙相变研究	60	2017-01	2020-12
95	Dong-Bo Zhang 张东波	NSFC 国家自然科学基金委员会	11674022	General Program 面上项目	低维材料电子性质的应变调控：自洽密度泛函紧束缚广义布洛赫方法	59	2017-01	2020-12
96	Chi-Yung Yam 任志勇	NSFC 国家自然科学基金委员会	21673017	General Program 面上项目	纳米等离子体太阳能电池的光学-电学相结合研究	65	2017-01	2020-12
97	Su-Huai Wei 魏苏淮	NSFC 国家自然科学基金委员会	51672023	General Program 面上项目	复杂半导体清洁能源材料的理论研究	62	2017-01	2020-12
98	Ji-Wei Zhang 张继伟	NSFC 国家自然科学基金委员会	11771035	General Program 面上项目	多尺度非局部模型的理论分析和高效数值方法	48	2018-01	2021-12
99	Yong-Yong Cai 蔡勇勇	NSFC 国家自然科学基金委员会	11771036	General Program 面上项目	高振荡色散方程的多尺度计算方法及分析	48	2018-01	2021-12
100	Wen Yang 杨　文	NSFC 国家自然科学基金委员会	11774021	General Program 面上项目	适用于连续模型的通用格林函数方法及载流子局域输运和干涉现象的理论研究	62	2018-01	2021-12
101	Jian-Qiang You 游建强	NSFC 国家自然科学基金委员会	11774022	General Program 面上项目	超越玻恩-马科夫近似的固态量子比特系统的量子动力学研究	69	2018-01	2021-12
102	Xiang Gao 高　翔	NSFC 国家自然科学基金委员会	11774023	General Program 面上项目	低能电子-离子散射过程中的Breit效应理论研究	62	2018-01	2021-12

103	Yong Li 李　勇	NSFC 国家自然科学基金委员会	11774024	General Program 面上项目	光力系统中光学非互易性传输的理论研究	62	2018-01	2021-12
104	Jin Yu 喻　进	NSFC 国家自然科学基金委员会	11775016	General Program 面上项目	蛋白因子和分子机器在DNA上的信号探测和信息识别	54	2018-01	2021-12
105	Zhimin Zhang 张智民	NSFC 国家自然科学基金委员会	11871092	General Program 面上项目	电磁场方程及其特征值问题高效高精度数值方法	55	2019-01	2022-12
106	Ling Wang 汪　玲	NSFC 国家自然科学基金委员会	11874080	General Program 面上项目	矩阵乘积态的切空间投影法研究强关联系统的自旋动力学结构因子	64	2019-01	2022-12
107	Rui-Qin Zhang 张瑞勤	NSFC 国家自然科学基金委员会	11874081	General Program 面上项目	氮化碳表面非金属原子梯度掺杂对光生载流子产生和分离影响的计算研究	63	2019-01	2022-12
108	Qi Wang 王　奇	NSFC 国家自然科学基金委员会	11971051	General Program 面上项目	热力学一致模型的计算建模保结构算法设计分析与实现	52	2020-01	2023-12
109	Xin-Liang Xu 徐辛亮	NSFC 国家自然科学基金委员会	11974038	General Program 面上项目	活性物质集体运动的涌现及其非平衡态物理特性	63	2020-01	2023-12
110	Rubem Mondaini	NSFC 国家自然科学基金委员会	11974039	General Program 面上项目	强关联系统中d波配对的非平衡探索研究	63	2020-01	2023-12
111	Stefano Chesi	NSFC 国家自然科学基金委员会	11974040	General Program 面上项目	基于半导体量子点的自旋量子比特的长距耦合	64	2020-01	2023-12
112	Shu-Xian Hu 胡淑贤	NSFC 国家自然科学基金委员会	21976014	General Program 面上项目	辐照下氧化铀/水界面表面腐蚀机理的量子化学研究	65	2020-01	2023-12
113	Hia-Guang Liu 刘海广	NSFC 国家自然科学基金委员会	31971136	General Program 面上项目	应用时间分辨串行晶体衍射和分子动力学模拟方法研究氯离子输运视紫 质蛋白结构和动力学	58	2020-01	2023-12

SOURCE OF FUNDING: OTHERS

NO	PI 项目负责人	SOURCE 经费来源	GRANT NO. 项目编号	CATEGORY 项目类别	PROJECT TITLE 项目名称	FUNDING 项目经费	FROM 起始时间	TO 结束时间
1	Chang-Pu Sun 孙昌璞	Organization Department, CCCPC 中央组织部	——	Innovation Team in Key Areas 重点领域创新团队	量子信息及其物理基础	——	2014-01	
2	Su-Huai Wei 魏苏淮	Ministry of Industry and Information Technology of China 工业和信息化部	2016YFB0700700	National Key Research and Development Project 国家重点研发计划	环境友好型高稳定性太阳能电池的材料设计与器件研究	1800	2016-07	2020-06
3	Peng-Fei Guan 管鹏飞	State Administration of Science, TIND 国防科技工业局	TZ2018004	Scientific Challenge Project 国防基础科研核科学挑战专题	辐照条件多尺度计算与模拟研究	2094	2018-01	2021-12
4	Bing Huang 黄　兵	Science and Technology Commission, CMC 军委科技委	2017-JCJQ-ZD-030	Key Basic Research Program of Basic Strengthening Plan 基础加强计划重点基础研究项目	非平衡态下半导体材料缺陷的基础科学问题研究	2500	2018-01	2021-12
5	Xin-Liang Xu 徐辛亮	Science and Technology Commission, CMC 军委科技委	17-ZLXD-ZL-07-32-01-01	Strategic Pilot Project 战略先导计划	自组织集体运动仿生技术研究	60	2017-01	2018-12

6	Xiao-Long Deng 邓小龙	China Academy of Engineering Physics 中国工程物理研究院	201501043	Dean's Fund 院长基金	陡峭界面可压缩多相流计算流体力学方法发展与应用	140	2015-10	2018-09
7	Shu-Xian Hu 胡淑贤	China Academy of Engineering Physics 中国工程物理研究院	YZJJSQ2017072	Dean's Fund 院长基金	锕系化合物的多组态量子化学研究	130	2018-01	2020-12
8	Jun-Feng Gao 高峻峰	China Academy of Engineering Physics 中物院发展基金	2013B0302056	Development Fund 中物院发展基金	金属衬底对石墨烯成核生长的影响的理论模拟	17	2013-07	2015-07
9	Yan-Jun Chen 陈彦军	China Academy of Engineering Physics 中物院科学技术发展基金	2011B0102031	General Project 一般项目	利用谐波辐射在超快时间尺度内探测分子结构的理论研究	20	2011-07	2013-06
10	Li-Min Liu 刘利民	China Academy of Engineering Physics 中物院科学技术发展基金	2012B0302052	General Project 一般项目	功能化石墨烯对光催化材料电子性质的调制	18	2012-07	2014-06
11	Su-Huai Wei 魏苏淮	Beijing Municipal Commission of Science and Technology 北京市科学技术委员会	Z181100005118003	--	铜铟镓硒电池的碱金属后处理及相关技术研究	100	2018-06	2021-05

SOURCE OF FUNDING: CHINA POSTDOCTORAL SCIENCE FOUNDATION (CPSF)

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1	Xing-Ju Zhao 赵兴举	CPSF 中国博士后科学基金	BX201700025	Creative Talents Plan 博士后创新人才支持计划	半导体薄膜与衬底相互作用下电子结构的原子级计算	20	2017-06	2019-05
2	Sheng Chen 陈　升	CPSF 中国博士后科学基金	BX20180032	Creative Talents Plan 博士后创新人才支持计划	若干奇性问题的高效谱方法	20	2018-07	2020-06
3	Jian-Ping Wang 王建平	CPSF 中国博士后科学基金	BX20180033	Creative Talents Plan 博士后创新人才支持计划	非铅半导体钙钛矿量子点发光材料的理论设计	20	2018-07	2020-06
4	Xiao-Lei Ma 马小磊	CPSF 中国博士后科学基金		International Exchange Program for Incoming Postdoctoral Fellows 博士后国际交流计划引进项目		40	2019-06	2021-05
5	Wei-Jie Huang 黄卫杰	CPSF 中国博士后科学基金		International Exchange Program for Outgoing Postdoctoral Fellows 博士后国际交流计划派出项目		30	2019-07	2021-06
6	Xiao-Bo Jing 景晓波	CPSF 中国博士后科学基金		International Exchange Program for Outgoing Postdoctoral Fellows 博士后国际交流计划派出项目		30	2019-07	2021-06
7	Can Shao 邵　灿	CPSF 中国博士后科学基金		International Exchange Program 博士后国际交流计划学术交流项目	APS March Meeting	3	2019-01	2019-12
8	Xing-Ju Zhao 赵兴举	CPSF 中国博士后科学基金		International Exchange Program 博士后国际交流计划学术交流项目	APS March Meeting	3	2019-01	2019-12

9	Ji Li 李　季	CPSF 中国博士后科学基金		International Exchange Program 博士后国际交流计划学术交流项目	SIAM Conference on Computational Science and Engineering (CSE19)	3	2019-01	2019-12
10	Yan-Chao Li 李彦超	CPSF 中国博士后科学基金	2012T50040	Special Support 特别资助	准一维体系中的量子相变及其相关问题研究	15	2012-09	2014-08
11	Xiao-Jie Liu 刘晓洁	CPSF 中国博士后科学基金	2013T60056	Special Support 特别资助	准一维体系中的量子相变及其相关问题研究	15	2013-07	2015-07
12	Zhen-Guo Fu 付振国	CPSF 中国博士后科学基金	2014T70029	Special Support 特别资助	拓扑表面自旋态量子散射的STM/STS理论研究	15	2014-07	2016-06
13	Jun-Feng Gao 高峻峰	CPSF 中国博士后科学基金	2014T70030	Special Support 特别资助	气源调控石墨烯化学气相沉积的理论研究	15	2014-07	2016-06
14	Wai-Xiang Cao 曹外香	CPSF 中国博士后科学基金	2016T90027	Special Support 特别资助	对流扩散方程的间断有限元方法的超收敛分析和应用	15	2016-07	2018-06
15	Yi-Min Wang 王艺敏	CPSF 中国博士后科学基金	2016T90028	Special Support 特别资助	超强和深度强耦合电路QED系统的量子调控	15	2016-07	2018-06
16	Zhen-Kun Tang 唐振坤	CPSF 中国博士后科学基金	2016T90029	Special Support 特别资助	高浓度电解质中锂离子反常超快传输机理的第一原理研究	15	2016-07	2018-06
17	Hui Shao 邵　慧	CPSF 中国博士后科学基金	2017T100031	Special Support 特别资助	二维量子自旋系统的准粒子激发和动力学性质的研究	15	2017-06	2019-05
18	Jian-Wei Zhou 周建伟	CPSF 中国博士后科学基金	2017T100032	Special Support 特别资助	Cahn-Hilliard方程约束最优控制问题的谱(元)方法研究	15	2017-06	2019-05

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19	Yan Wang 王 燕	CPSF中国博士后科学基金	2018T110037	Special Support 特别资助	固态去湿问题的数学分析与数值模拟	15	2018-07	2020-06
20	Wei Wu 吴 威	CPSF中国博士后科学基金	2018T110038	Special Support 特别资助	自旋环境中退相干行为的数值研究	15	2018-07	2020-06
21	Wen-Zhao Zhang 张闻钊	CPSF中国博士后科学基金	2018T110039	Special Support 特别资助	基于光机械系统的超灵敏探测研究	15	2018-07	2020-06
22	Xiao-Lei Ma 马小磊	CPSF中国博士后科学基金	2019TQ0024	Special Support 特别资助（站前）	关于active matter中压强的研究	18	2019-06	2021-05
23	Xiao-Xu Xu 徐小绪	CPSF中国博士后科学基金	2019TQ0025	Special Support 特别资助（站前）	无相位反散射问题的唯一性和数值算法	18	2019-06	2021-05
24	Jun-Feng Gao 高峻峰	CPSF中国博士后科学基金	2013M530019	First Class 面上一等资助	二维单原子层薄膜在金属表面的生长机理	8	2013-04	2015-03
25	Xi-Hua Xu 徐喜华	CPSF中国博士后科学基金	2014M550018	First Class 面上一等资助	非理想物态方程爆轰的高精度数值方法研究	8	2014-05	2016-04
26	Xun-Wei Xu 徐勋卫	CPSF中国博士后科学基金	2014M550019	First Class 面上一等资助	耦合光力系统中光场和机械振子的非经典态制备	8	2014-05	2016-04
27	Wen-Lei LI 黎文磊	CPSF中国博士后科学基金	2014M560038	First Class 面上一等资助	非线性系统可积性与复杂性	8	2014-09	2016-08

28	Rui Li 李　睿	CPSF 中国博士后科学基金	2014M560039	First Class 面上一等资助	半导体量子点中自旋量子比特的电操控研究	8	2014-09	2016-08
29	Wai-Xiang Cao 曹外香	CPSF 中国博士后科学基金	2015M570026	First Class 面上一等资助	高阶波动方程的局部间断有限元超收敛研究	8	2015-05	2017-06
30	Li-Zhen Chen 陈丽贞	CPSF 中国博士后科学基金	2015M580038	First Class 面上一等资助	不可压流体的非结构网格谱元法并行计算	8	2015-11	2017-10
31	Heng-Fu Lin 林恒福	CPSF 中国博士后科学基金	2016M590032	First Class 面上一等资助	磷烯的单双层侧向异质结特性和磁各向异性的理论研究	8	2015-05	2017-04
32	Feng Peng 彭　枫	CPSF 中国博士后科学基金	2016M590033	First Class 面上一等资助	高压下新型高氮含能材料设计	8	2015-05	2017-04
33	Da Wang 王　达	CPSF 中国博士后科学基金	2016M590034	First Class 面上一等资助	磷烯的掺杂及其异质结构的电化学性能研究	8	2015-05	2017-04
34	Xiao-Jun Zheng 郑晓军	CPSF 中国博士后科学基金	2016M590035	First Class 面上一等资助	近邻库仑相互作用对FeSe中磁性和超导电性的影响	8	2015-05	2017-04
35	Hui Shao 邵　慧	CPSF 中国博士后科学基金	2016M600034	First Class 面上一等资助	随机数值解析延拓方法和量子自旋系统动力学性质的研究	8	2016-11	2018-10
36	Ming-Xia Huo 霍明夏	CPSF 中国博士后科学基金	2018M630062	First Class 面上一等资助	基于量子光学系统的量子模拟器的研究及应用	8	2018-06	2020-05

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37	Zhen Liu 刘 震	CPSF 中国博士后科学基金	2018M630064	First Class 面上一等资助	高压下离子化合物与惰性气体反应机理的第一性原理研究	8	2018-06	2020-05
38	Wei Wang 王 威	CPSF 中国博士后科学基金	2018M640053	First Class 面上一等资助	特征值问题的大规模、高精度快速算法研究	8	2018-12	2020-11
39	Georg Engelhardt	CPSF 中国博士后科学基金	2018M640054	First Class 面上一等资助	开放量子系统的调控	8	2018-12	2020-11
40	Yu-Ran Zhang 张煜然	CPSF 中国博士后科学基金	2018M640055	First Class 面上一等资助	量子拓扑态的多体纠缠性质的研究	8	2018-12	2020-11
41	Xu-Ying Zhao 赵旭鹰	CPSF 中国博士后科学基金	20110490279	Second Class 面上二等资助		3	2011-06	2013-05
42	Yan-Chao Li 李彦超	CPSF 中国博士后科学基金	20110490280	Second Class 面上二等资助	准一维系统中的量子相变相关问题研究	3	2011-06	2013-05
43	Jun Cao 曹 军	CPSF 中国博士后科学基金	2012M510309	Second Class 面上二等资助	非绝热动力学模拟方法的一些改进及其应用	5	2012-05	2014-04
44	Zeng-Zhao Li 李增朝	CPSF 中国博士后科学基金	2012M520146	Second Class 面上二等资助	Majorana费米子与量子信息处理的理论研究	5	2012-10	2014-09
45	Xiao-Sen Yang 杨孝森	CPSF 中国博士后科学基金	2012M520147	Second Class 面上二等资助	自旋轨道耦合超冷费米气体的研究	5	2012-10	2014-09
46	Zhen-Guo Fu 付振国	CPSF 中国博士后科学基金	2012M520148	Second Class 面上二等资助	拓扑绝缘体中新奇量子散射效应的理论研究	5	2012-10	2014-09

47	Zhao Liu 刘　钊	CPSF 中国博士后科学基金	2012M520149	Second Class 面上二等资助	拓扑平带中分数陈绝缘体的研究	5	2012-10	2014-09
48	Jin-Ying Xu 徐金英	CPSF 中国博士后科学基金	2012M520150	Second Class 面上二等资助	光子晶体及零折射率超材料中电子能量损失的研究	5	2012-10	2014-09
49	Yan Chai 柴　彦	CPSF 中国博士后科学基金	2012M520151	Second Class 面上二等资助	生物分子马达工作机理和动力学性质的理论研究	5	2012-10	2014-09
50	Sheng-Wen Li 李圣文	CPSF 中国博士后科学基金	2013M530516	Second Class 面上二等资助	相互作用复合系统中的关联噪声	5	2013-04	2015-03
51	Shao-Gui Wu 伍绍贵	CPSF 中国博士后科学基金	2013M530517	Second Class 面上二等资助	生物膜相态及膜溶机理的耗散粒子动力学研究	5	2013-04	2015-03
52	Wei Tan 谭　为	CPSF 中国博士后科学基金	2013M530518	Second Class 面上二等资助	人工微结构中驻波场下的类量子干涉行为研究	5	2013-04	2015-03
53	Liang Chen 陈　亮	CPSF 中国博士后科学基金	2013M540845	Second Class 面上二等资助	量子反常霍尔体系中的磁性无序	5	2013-09	2015-09
54	Wen-Hui Hu 胡文晖	CPSF 中国博士后科学基金	2014M550594	Second Class 面上二等资助	金刚石中氮-空位缺陷中心的动态核极化	5	2014-05	2016-04
55	Xian-Fang Yue 岳现房	CPSF 中国博士后科学基金	2014M550595	Second Class 面上二等资助	四原子分子碰撞中非绝热过程的量子-经典混合方法研究	5	2014-05	2016-04
56	Jian Lv 吕　健	CPSF 中国博士后科学基金	2014M550596	Second Class 面上二等资助	中等尺寸硼团簇Bn（n=21-40）的结构与性质	5	2014-05	2016-04
57	Xun-Wang Yan 闫循旺	CPSF 中国博士后科学基金	2014M550597	Second Class 面上二等资助	芳烃类有机超导体的晶体结构和电子态	5	2014-05	2016-04

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58	Yao Yao 姚 尧	CPSF 中国博士后科学基金	2014M550598	Second Class 面上二等资助	量子Fisher信息在量子度量学中的应用	5	2014-05	2016-04
59	Zhi-Hai Wang 王治海	CPSF 中国博士后科学基金	2014M560879	Second Class 面上二等资助	循环三能级原子的量子光学现象研究	5	2014-09	2016-08
60	Shan-He Su 苏山河	CPSF 中国博士后科学基金	2015M580964	Second Class 面上二等资助	光驱动量子热机中的量子相干效应及其应用研究	5	2015-11	2017-10
61	Yi-Min Wang 王艺敏	CPSF 中国博士后科学基金	2015M580965	Second Class 面上二等资助	超强耦合系统和量子Rabi模型的几个问题研究	5	2015-11	2017-10
62	Li-Ping Yang 杨立平	CPSF 中国博士后科学基金	2015M580966	Second Class 面上二等资助	强耦合自旋环境中中心自旋退相干理论研究	5	2015-11	2017-10
63	Deng-Ke Zhang 张登科	CPSF 中国博士后科学基金	2015M580967	Second Class 面上二等资助	基于磁振子的量子变光转换器	5	2015-11	2017-10
64	Yu Du 杜 宇	CPSF 中国博士后科学基金	2016M591053	Second Class 面上二等资助	求解高波数亥姆霍兹问题的数值方法的误差分析	5	2015-05	2017-04
65	Yue-Zheng Gong 龚跃政	CPSF 中国博士后科学基金	2016M591054	Second Class 面上二等资助	保结构算法在多相流数值模拟中的应用理论基础研究	5	2015-05	2017-04
66	Xi-Zheng Zhang 张禧征	CPSF 中国博士后科学基金	2016M591055	Second Class 面上二等资助	基于多体长程相互作用系统的量子态调控与探测的研究	5	2015-05	2017-04
67	Fei Gao 高 飞	CPSF 中国博士后科学基金	2016M591056	Second Class 面上二等资助	纳米尺度甲烷的活化与转化	5	2015-05	2017-04

68	Zhen-Hua Wang 王振华	CPSF 中国博士后科学基金	2016M591057	Second Class 面上二等资助	单轴压力下石墨烯及类石墨烯材料拓扑超导态的研究	5	2015-05	2017-04
69	Wen-Xiong Song 宋文雄	CPSF 中国博士后科学基金	2016M591058	Second Class 面上二等资助	Ge2Sb2Te5相变存储材料的晶体相结构及其相变机理研究	5	2015-05	2017-04
70	Kai Fu 符　凯	CPSF 中国博士后科学基金	2016M591059	Second Class 面上二等资助	过冷流动沸腾的传热机理研究	5	2015-05	2017-04
71	Lei Bian 卞　磊	CPSF 中国博士后科学基金	2016M600902	Second Class 面上二等资助	狄拉克方程的准确数值边界条件的研究	5	2016-11	2018-10
72	Hua-Liang Shi 时华良	CPSF 中国博士后科学基金	2016M600903	Second Class 面上二等资助	金属纳米结构共振模的计算	5	2016-11	2018-10
73	Chun-Mei Su 苏春梅	CPSF 中国博士后科学基金	2016M600904	Second Class 面上二等资助	Zakharov方程在亚音速极限域下的数值方法及误差分析	5	2016-11	2018-10
74	Wei Xiong 熊　伟	CPSF 中国博士后科学基金	2016M600905	Second Class 面上二等资助	基于纳米机械振子的固态混合量子器件的理论研究	5	2016-11	2018-10
75	Hao Yuan 袁　浩	CPSF 中国博士后科学基金	2016M600906	Second Class 面上二等资助	新型耦合电路 QED系统中光子的非平衡量子相	5	2016-11	2018-10
76	Lei Kang 康　雷	CPSF 中国博士后科学基金	2016M600907	Second Class 面上二等资助	狄拉克材料在太赫兹光电技术上的应用	5	2016-11	2018-10
77	Li-Jing Jing 晋力京	CPSF 中国博士后科学基金	2016M600908	Second Class 面上二等资助	多模光力学系统的非线性动力学研究	5	2016-11	2018-10
78	Kai Zhang 张　凯	CPSF 中国博士后科学基金	2016M600909	Second Class 面上二等资助	超稳非晶态Sb2Se3薄膜的稳定性机制及其光学性能研究	5	2016-11	2018-10

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79	Xiao Li 李 晓	CPSF 中国博士后科学基金	2017M610748	Second Class 面上二等资助	非局部相场方程的能量稳定且渐近相容的数值方法	5	2017-05	2019-04
80	Jian-Fang Lu 卢键方	CPSF 中国博士后科学基金	2017M610749	Second Class 面上二等资助	非局部扩散模型的间断有限元模拟与分析	5	2017-05	2019-04
81	Yan Wang 王 燕	CPSF 中国博士后科学基金	2017M610750	Second Class 面上二等资助	弯曲基底上薄膜固态去湿问题的数学模型与数值模拟	5	2017-05	2019-04
82	Jian-Wei Zhou 周建伟	CPSF 中国博士后科学基金	2017M610751	Second Class 面上二等资助	基于广义Jacobi多项式谱元方法的后验误差研究	5	2017-05	2019-04
83	Wei Qin 秦 伟	CPSF 中国博士后科学基金	2017M610752	Second Class 面上二等资助	腔QED系统中基于耗散机制实现基本量子门的研究	5	2017-05	2019-04
84	Wei Wu 吴 威	CPSF 中国博士后科学基金	2017M610753	Second Class 面上二等资助	量子耗散系统动力学的研究	5	2017-05	2019-04
85	Lin Hu 胡 麟	CPSF 中国博士后科学基金	2017M610754	Second Class 面上二等资助	低维材料中缺陷诱发的载流子非辐射性复合的新物理机制	5	2017-05	2019-04
86	Ji Li 李 季	CPSF 中国博士后科学基金	2017M620589	Second Class 面上二等资助	相位恢复数值算法研究：凸优化与低秩模型	5	2017-11	2019-10
87	Hai-Xia Dong 董海霞	CPSF 中国博士后科学基金	2017M620590	Second Class 面上二等资助	三维Stokes界面问题的高效数值方法及其理论分析	5	2017-11	2019-10
88	Peng-De Wang 王鹏德	CPSF 中国博士后科学基金	2017M620591	Second Class 面上二等资助	两类非局部发展方程的保结构数值方法	5	2017-11	2019-10

89	Jian-Feng Wang 王建峰	CPSF 中国博士后科学基金	2017M620592	Second Class 面上二等资助	设计并寻找理想的拓扑半金属和拓扑超导材料	5	2017-11	2019-10
90	Cheng Jiang 江　成	CPSF 中国博士后科学基金	2017M620593	Second Class 面上二等资助	宇称-时间-对称的光力系统中的非线性效应研究	5	2017-11	2019-10
91	Hu Chen 陈　虎	CPSF 中国博士后科学基金	2018M631316	Second Class 面上二等资助	无界域上分数阶扩散方程的高精度数值方法研究	5	2018-06	2020-05
92	Peng Zhang 张　鹏	CPSF 中国博士后科学基金	2018M631317	Second Class 面上二等资助	锂离子电池正极材料充放电反应机理研究与新材料设计	5	2018-06	2020-05
93	Teng-Fei Zhao 赵腾飞	CPSF 中国博士后科学基金	2019M650457	Second Class 面上二等资助	关于外域上非线性Schrodinger方程的数学研究	8	2019-05	2021-04
94	Ben Aicha Ibtissem	CPSF 中国博士后科学基金	2019M650458	Second Class 面上二等资助	单组测量数据的时域反问题的唯一性和稳定性	8	2019-05	2021-04
95	Sheng Chen 陈　升	CPSF 中国博士后科学基金	2019M650459	Second Class 面上二等资助	几类奇异摄动问题的高精度谱/谱元法	8	2019-05	2021-04
96	Bo Gong 宫　博	CPSF 中国博士后科学基金	2019M650460	Second Class 面上二等资助	求解一类带有模式转换的随机最优控制问题的数值方法	8	2019-05	2021-04
97	Pankaj Bhalla	CPSF 中国博士后科学基金	2019M650461	Second Class 面上二等资助	拓扑量子物质中的信息传递	8	2019-05	2021-04
98	Zhen-Zhen Li 李珍珍	CPSF 中国博士后科学基金	2019M650463	Second Class 面上二等资助	表面吸附模型中自旋声子耦合作用的研究	8	2019-05	2021-04
99	Can Shao 邵　灿	CPSF 中国博士后科学基金	2019M650464	Second Class 面上二等资助	低维强关联系统的非平衡超快动力学研究	8	2019-05	2021-04

学术论文

PUBLICATIONS

As of August 2019, CSRC has published a total of 2442 papers, including 1151 papers with CSRC IP.

截至2019年8月, 中心合计发表论文约2442篇, 其中第一单位及通讯作者第一单位发表论文1151篇, 其他合作论文1291篇。

CSRC PUBLICATIONS (SOURCE FROM WEB OF SCIENCE):

ACADEMIC YEARS 学术年度	TOTAL PUBLICATIONS 总发表文章数	CSRC IP 归属中心文章	NOT CSRC IP 其他合作论文
2018.08~2019.07	365	214	151
2017.08~2018.07	416	229	187
2016.08~2017.07	550	273	277
2015.08~2016.07	343	151	192
2014.08~2015.07	284	129	155
2013.08~2014.07	237	90	147
2012.08~2013.07	158	41	117
2011.08~2012.07	74	20	54
2009.08~2011.07	15	4	11
Total 合计	2442	1151	1291

CSRC PUBLICATIONS 2018.08~2019.07

1.	"Molecular Tunnel Junction-Controlled High-Order Charge Transfer Plasmon and Fano Resonances"; Cui, Ximin; Qin, Feng; Lai, Yunhe; Wang, Hao; Shao, Lei; Chen, Huanjun; Wang, Jianfang; Lin, Hai-qing; ACS NANO, 12, 12 (2018)
2.	"Critical Level Crossings and Gapless Spin Liquid in the Square-Lattice Spin-1/2 J(1) - J(2) Heisenberg Antiferromagnet"; Wang, Ling; Sandvik, Anders W.; PHYSICAL REVIEW LETTERS, 121, 10 (2018)
3.	"Bubble-wrap carbon: an integration of graphene and fulterenes"; Liu, Wei; Liu, Jing-yao; Xia, Jing; Lin, Hai-qing; Miao, Mao-sheng; NANOSCALE, 10, 24 (2018)
4.	"Improving spin-based noise sensing by adaptive measurements"; Zhang, Yi-Hao; Yang, Wen; NEW JOURNAL OF PHYSICS, 20 (2018)
5.	"Suppressed Stark shift of helical edge states in topological-insulator quantum dots"; Liu, Dingyang; Zhang, Shu-Hui; Huang, Yongwei; Li, Jun; Qu, Jinxian; Yang, Wen; PHYSICAL REVIEW B, 98, 24 (2018)
6.	"Pairing and superconductivity in the flat band: Creutz lattice"; Mondaini, Rubem; Batrouni, G. G.; Gremaud, B.; PHYSICAL REVIEW B, 98, 15 (2018)
7.	"Singlet pairing and superconductivity in t-J ladders with Mott insulating stripes"; Cheng, Chen; Mondaini, Rubem; Rigol, Marcos; PHYSICAL REVIEW B, 98, 12 (2018)
8.	"Tunable electronic and magneto-optical properties of monolayer arsenene: From GW(0) approximation to large-scale tight-binding propagation simulations"; Yu, Jin; Katsnelson, Mikhail, I; Yuan, Shengjun; PHYSICAL REVIEW B, 98, 11 (2018)
9.	"Superconductivity and phase stability of potassium-doped biphenyl"; Zhong, Guo-Hua; Yang, Dong-Yu; Zhang, Kai; Wang, Ren-Shu; Zhang, Chao; Lin, Hai-Qing; Chen, Xiao-Jia; PHYSICAL CHEMISTRY CHEMICAL PHYSICS, 20, 39 (2018)
10.	"Memory-induced geometric phase in non-Markovian open systems"; Luo, Da-Wei; You, J. Q.; Lin, Hai-Qing; Wu, Lian-Ao; Yu, Ting; PHYSICAL REVIEW A, 98, 5 (2018)
11.	"Enhanced nonlinear interaction effects in a four-mode optomechanical ring"; Jin, Li-Jing; Qiu, Jing; Chesi, Stefano; Wang, Ying-Dan; PHYSICAL REVIEW A, 98, 3 (2018)
12.	"Stochastic decoupling approach to the spin-boson dynamics: Perturbative and nonperturbative treatments"; Wu, Wei; PHYSICAL REVIEW A, 98, 3 (2018)
13.	"Interplay between nematic fluctuation and superconductivity in a two-orbital Hubbard model: a quantum Monte Carlo study"; Liu, Guangkun; Fang, Shichao; Zheng, Xiaojun; Huang, Zhongbing; Lin, Haiqing; JOURNAL OF PHYSICS-CONDENSED MATTER, 30, 44 (2018)
14.	"Quantum Zeno and anti-Zeno dynamics in a spin environment"; Wu, Wei; ANNALS OF PHYSICS, 396 (2018)
15.	"Coherent dynamics of a qubit-oscillator system in a noisy environment"; Wu, Wei; Cheng, Jun-Qing; QUANTUM INFORMATION PROCESSING, 17, 11 (2018)
16.	"Theory of non-Markovian dynamics in resonance fluorescence spectrum"; Kumar, Abhishek; OPTICAL AND QUANTUM ELECTRONICS, 50, 8 (2018)

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17.	"Three-mode optomechanical system for angular velocity detection"; Li, Kai; Davuluri, Sankar; Li, Yong; CHINESE PHYSICS B, 27, 8 (2018)
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3.	"Precision measurement of electrical charge with optomechanically induced transparency"; Zhang, Jian-Qi; Li, Yong; Feng, Mang; Xu, Yi; PHYSICAL REVIEW A, 86, 5 (2012)
4.	"Effect of the Casimir force on the entanglement between a levitated nanosphere and cavity modes"; Nie, Wenjie; Lan, Yueheng; Li, Yong; Zhu, Shiyao; PHYSICAL REVIEW A, 86, 6 (2012)
5.	"Dynamics of correlations and scaling behaviors in a spin-chain environment"; Li, Yan-Chao; Lin, Hai-Qing; Xu, Jing-Bo; EPL, 100, 2 (2012)
6.	"Phonon-mediated superconductivity in quasi-1D Sc3CoC4"; Zhang, Chao; Tse, John S.; Tanaka, Kaori; Lin, Hai-Qing; EPL, 100, 6 (2012)

CSRC PUBLICATIONS 2012.08~2013.07

7.	"Geometric global quantum discord"; Xu, Jianwei; JOURNAL OF PHYSICS A-MATHEMATICAL AND THEORETICAL, 45, 40 (2012)
8.	"Strong-field approximations for the orientation dependence of the total ionization of homonuclear diatomic molecules with different internuclear distances"; Chen, Yanjun; Zhang, Bing; JOURNAL OF PHYSICS B-ATOMIC MOLECULAR AND OPTICAL PHYSICS, 45, 21 (2012)
9.	"CREATING QUANTUM DISCORD THROUGH LOCAL GENERALIZED AMPLITUDE DAMPING"; Xu, Jianwei; INTERNATIONAL JOURNAL OF QUANTUM INFORMATION, 10, 6 (2012)
10.	"Phase field approach for simulating solid-state dewetting problems"; Wei Jiang , Weizhu Bao, Carl V. Thompson and David J. Srolovitz; ACTA MATERIALIA, 60, 15 (2012)
11.	"Effects of intrinsic surface defects on thiophenol self-assembly on Au(111): Surface structures and reaction mechanisms"; X.L. Fan, C. Zhang, Y. Liu, and W.M. Lau*; JOURNAL OF PHYSICAL CHEMISTRY C, 116, 37 (2012)
12.	"Wurtzite-type CuInSe2 for high-performance solar cell absorber: ab initio exploration of the new phase structure"; Xu, Li-Chun; Wang, Ru-Zhi; Liu, Li-Min; Chen, Yuan-Ping; Wei, Xiao-Lin; Yan, Hui; Lau, Woon-Ming; JOURNAL OF MATERIALS CHEMISTRY, 22, 40 (2012)
13.	"Dimension-dependent phase transition and magnetic properties of VS2"; Zhang, Hui; Liu, Li-Min; Lau, Woon-Ming; JOURNAL OF MATERIALS CHEMISTRY A, 1, 36 (2013)
14.	"R-graphyne: a new two-dimensional carbon allotrope with versatile Dirac-like point in nanoribbons"; Yin, Wen-Jin; Xie, Yue-E.; Liu, Li-Min; Wang, Ru-Zhi; Wei, Xiao-Lin; Lau, Leo; Zhong, Jian-Xin; Chen, Yuan-Ping; JOURNAL OF MATERIALS CHEMISTRY A, 1, 17 (2013)
15.	"Optical Diode Made from a Moving Photonic Crystal"; Wang, Da-Wei; Zhou, Hai-Tao; Guo, Miao-Jun; Zhang, Jun-Xiang; Evers, Joerg; Zhu, Shi-Yao; PHYSICAL REVIEW LETTERS, 110, 9 (2013)
16.	"Dimethyl Disulfide on Cu(111): From Nondissociative to Dissociative Adsorption"; Fan, Xiao-Li; Liu, Yan; Ran, Run-Xin; Lau, Woon-Ming; JOURNAL OF PHYSICAL CHEMISTRY C, 117, 13 (2013)
17.	"beta-MnO2 as a cathode material for lithium ion batteries from first principles calculations"; Wang, Da; Liu, Li-Min; Zhao, Shi-Jin; Li, Bai-Hai; Liu, Hao; Lang, Xiu-Feng; PHYSICAL CHEMISTRY CHEMICAL PHYSICS, 15, 23 (2013)
18.	"QUANTUM INFORMATION Best of both worlds"; Zhao, Nan; Wrachtrup, Joerg; NATURE MATERIALS, 12, 2 (2013)
19.	"From fractional Chern insulators to Abelian and non-Abelian fractional quantum Hall states: Adiabatic continuity and orbital entanglement spectrum"; Liu, Zhao; Bergholtz, Emil J.; PHYSICAL REVIEW B, 87, 3 (2013)
20.	"Controlling edge state transport in a HgTe topological insulator by superlattice effect"; Lin, L. -Z.; Cheng, F.; Zhang, L. B.; Zhang, D.; Yang, Wen; PHYSICAL REVIEW B, 87, 24 (2013)
21.	"Numerically exact, time-dependent study of correlated electron transport in model molecular junctions"; Wang, Haobin; Thoss, Michael; JOURNAL OF CHEMICAL PHYSICS, 138, 13 (2013)
22.	"Effects of intrinsic defects on methanthiol monolayers on Cu(111): A density functional theory study"; Fan, Xiao-Li; Yang, Yong-Liang; Liu, Yan; Lau, Woon-Ming; JOURNAL OF CHEMICAL PHYSICS, 138, 13 (2013)

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23.	"Spectrum of collective spontaneous emission beyond the rotating-wave approximation"; Li, Yong; Evers, Joerg; Feng, Wei; Zhu, Shi-Yao; PHYSICAL REVIEW A, 87, 5 (2013)
24.	"Non-Markovian quantum state diffusion for an open quantum system in fermionic environments"; Chen, Mi; You, J. Q.; PHYSICAL REVIEW A, 87, 5 (2013)
25.	"Higher-order wave-particle duality"; Huang, Jie-Hui; Woelk, Sabine; Zhu, Shi-Yao; Zubairy, M. Suhail; PHYSICAL REVIEW A, 87, 2 (2013)
26.	"Experimental test of the first- and second-order duality relations for the two-photon states"; Huang, Jie-Hui; Liu, Hong-Yu; Gao, Jiang-Rui; Zubairy, M. Suhail; Zhu, Shi-Yao; PHYSICAL REVIEW A, 88, 1 (2013)
27.	"Numerical methods and comparison for computing dark and bright solitons in the nonlinear Schrodinger equation"; Bao, Weizhu; Tang, Qinglin; Xu, Zhiguo; JOURNAL OF COMPUTATIONAL PHYSICS, 235, (2013)
28.	"Cooling a charged mechanical resonator with time-dependent bias gate voltages"; Zhang, Jian-Qi; Li, Yong; Feng, Mang; JOURNAL OF PHYSICS-CONDENSED MATTER, 25, 14 (2013)
29.	"Electronic and spin transport properties of graphene nanoribbon mediated by metal adatoms: a study by the QUAMBO-NEGF approach"; Zhang, G. P.; Liu, Xiaojie; Wang, C. Z.; Yao, Y. X.; Zhang, Jian; Ho, K. M.; JOURNAL OF PHYSICS-CONDENSED MATTER, 25, 10 (2013)
30.	"Atomic structure and electronic properties of folded graphene nanoribbons: A first-principles study"; Yin, Wen-Jin; Xie, Yue-E; Liu, Li-Min; Chen, Yuan-Ping; Wang, Ru-Zhi; Wei, Xiao-Lin; Zhong, Jian-Xin; Lau, Leo; JOURNAL OF APPLIED PHYSICS, 113, 17 (2013)
31.	"Metals on Graphene: Interactions, Growth Morphology, and Thermal Stability"; Liu, Xiaojie; Wang, Cai-Zhuang; Hupalo, Myron; Lin, Hai-Qing; Ho, Kai-Ming; Tringides, Michael C.; CRYSTALS, 3, 1 (2013)
32.	"Analytical expressions of global quantum discord for two classes of multi-qubit states"; Xu, Jianwei; PHYSICS LETTERS A, 377, 42798 (2013)
33.	"Analysis and computation for ground state solutions of bose-fermi mixtures at zero temperature"; Cai, Yongyong; Wang, Hanquan; SIAM JOURNAL ON APPLIED MATHEMATICS, 73, 2 (2013)
34.	"Ab initio molecular dynamics simulation on the formation process of He@C-60 synthesized by explosion"; Li, Jian-Ying; Liu, Li-Min; Jin, Bo; Liang, Hua; Yu, Hai-Jun; Zhang, Hong-Chang; Chu, Shi-Jin; Peng, Ru-Fang; JOURNAL OF MOLECULAR MODELING, 19, 4 (2013)
35.	"Phase transitions of the q-state Potts model on multiply-laced Sierpinski gaskets"; Tian, Liang; Ma, Hui; Guo, Wenan; Tang, Lei-Han; EUROPEAN PHYSICAL JOURNAL B, 86, 5 (2013)
36.	"Superconductivity in beta-Tin Germanium"; Zhang, Chao; Chen, Xiao-Jia; Lin, Hai-Qing; JOURNAL OF SUPERCONDUCTIVITY AND NOVEL MAGNETISM, 26, 5 (2013)
37.	"Optimum valence bond scheme for its applications to the prediction of nano-structures and the study of matter properties"; Gao Xiang; Chen Xiao-Bo; Li Jun; Li Jia-Ming; ACTA PHYSICA SINICA, 62, 9 (2013)
38.	"Computational Studies on Physical Mechanisms of T7 RNA Polymerase Elongation and Nucleotide Selection"; Yu, Jin; BIOPHYSICAL JOURNAL, 104, 2 (2013)

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39.	"Molecular Dynamics Study of RNA Polymerase Transcription from Free Energy Calculation"; Wu, Shaogui; BIOPHYSICAL JOURNAL, 104, 2 (2013)
40.	"Switching Bacterial Flagella Motor"; Chai, Yan; Yu, Jin; Tu, Yuhai; Tang, Leihan; BIOPHYSICAL JOURNAL, 104, 2 (2013)
41.	"Quantum information transmission"; Wang, Lei; Huang, Jie-Hui; Dowling, Jonathan P.; Zhu, Shi-Yao; QUANTUM INFORMATION PROCESSING, 12, 2 (2013)

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1.	"Nondeterministic ultrafast ground-state cooling of a mechanical resonator"; Li, Yong; Wu, Lian-Ao; Wang, Ying-Dan; Yang, Li-Ping; PHYSICAL REVIEW B, 84, 9 (2011)
2.	"Dynamic of rescattering-electron wave packets in strong and short-wavelength laser fields: Roles of Coulomb potential and excited states"; Chen, Yanjun; PHYSICAL REVIEW A, 84, 4 (2011)
3.	"Tracing the structure of asymmetric molecules from high-order harmonic generation"; Chen, Yanjun; Zhang, Bing; PHYSICAL REVIEW A, 84, 5 (2011)
4.	"Magnetic behavior of Fe(Se,Te) systems: First-principles calculations"; Shi, Hongliang; Huang, Zhong-Bing; Tse, John S.; Lin, Hai-Qing; JOURNAL OF APPLIED PHYSICS, 110, 4 (2011)
5.	"Anomalous structural transformation, spontaneous polarization, piezoelectric response, and band structure of semiconductor aluminum nitride under hydrostatic pressure"; Duan, Yifeng; Qin, Lixia; Shi, Liwei; Tang, Gang; Shi, Hongliang; JOURNAL OF APPLIED PHYSICS, 110, 10 (2011)
6.	"Pairing in graphene: A quantum Monte Carlo study"; Ma, Tianxing; Huang, Zhongbing; Hu, Feiming; Lin, Hai-Qing; PHYSICAL REVIEW B, 84, 12 (2011)
7.	"Cooperative effects of two optical dipole antennas coupled to plasmonic Fabry-Perot cavity"; Yang, Zhong-Jian; Wang, Qu-Quan; Lin, Hai-Qing; NANOSCALE, 4, 17 (2012)
8.	"From Nondissociative to Dissociative Adsorption of Benzene-thiol on Au(111): A Density Functional Theory Study"; Fan, Xiaoli; Chi, Qiong; Liu, Chong; Lau, Woonming; JOURNAL OF PHYSICAL CHEMISTRY C, 116, 1 (2012)
9.	"Quantum phase diagram of the frustrated spin ladder with next-nearest-neighbor interactions"; Li, Yan-Chao; Lin, Hai-Qing; NEW JOURNAL OF PHYSICS, 14, (2012)
10.	"Hybrid density functional theory study of band gap tuning in AlN and GaN through equibiaxial strains"; Duan, Yifeng; Qin, Lixia; Shi, Liwei; Tang, Gang; Shi, Hongliang; APPLIED PHYSICS LETTERS, 100, 2 (2012)

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11.	"Effect of the third level on time evolution of the spontaneous upper level decay due to counter-rotating terms"; Dong, Y. B.; Li, Z. H.; Li, Y.; Zhu, Shi-Yao; PHYSICAL REVIEW A, 85, 1 (2012)
12.	"Relation between wave-particle duality and quantum uncertainty"; Liu, Hong-Yu; Huang, Jie-Hui; Gao, Jiang-Rui; Zubairy, M. Suhail; Zhu, Shi-Yao; PHYSICAL REVIEW A, 85, 2 (2012)
13.	"Collective spontaneous emission beyond the rotating-wave approximation"; Li, Yong; Evers, Joerg; Zheng, Hang; Zhu, Shi-Yao; PHYSICAL REVIEW A, 85, 5 (2012)
14.	"Thermally driven Casimir ratchet-oscillator system"; Nie, Wenjie; Lan, Yueheng; PHYSICAL REVIEW E, 86, 1 (2012)
15.	"Phase transitions and electron-phonon coupling in platinum hydride"; Zhang, Chao; Chen, Xiao-Jia; Lin, Hai-Qing; JOURNAL OF PHYSICS-CONDENSED MATTER, 24, 3 (2012)
16.	"Dynamics of electron transfer in complex glassy environment modeled by the Cole-Davidson spectral density"; Zhou, Yun; Shao, Jiushu; Wang, Haobin; MOLECULAR PHYSICS, 110, (2012)
17.	"An Effective Eigenchannel R-Matrix Method for Calculating Electron-Ion Scattering Processes with Spectroscopic Precision"; Gao Xiang; Li Jia-Ming; CHINESE PHYSICS LETTERS, 29, 3 (2012)
18.	"Reaction Pathways of Acetylene Adsorption on the Ge(001) Surface"; Fan Xiao-Li; Liu Yan; Liu Chong; Lau Woon-Ming; ACTA PHYSICO-CHIMICA SINICA, 28, 5 (2012)
19.	"Second harmonic generation in three-dimensional structures based on homogeneous centrosymmetric metallic spheres"; Xu, Jinying; Zhang, Xiangdong; OPTICS EXPRESS, 20, 2 (2012)
20.	"Inducing novel electronic properties in < 112 > Ge nanowires by means of variations in their size, shape and strain: a first-principles computational study"; Zhang, Chao; De Sarkar, Abir; Zhang, Rui-Qin; JOURNAL OF PHYSICS-CONDENSED MATTER, 24, 1 (2012)

CSRC PUBLICATIONS 2009.08~2011.07

1.	"Quantum interference due to energy shifts and its effect on spontaneous emission"; Li, Zheng-Hong; Wang, Da-Wei; Zheng, Hang; Zhu, Shi-Yao; Zubairy, M. Suhail; PHYSICAL REVIEW A, 82, 5 (2010)
2.	"A new criterion for zero quantum discord"; Huang, Jie-Hui; Wang, Lei; Zhu, Shi-Yao; NEW JOURNAL OF PHYSICS, 13, (2011)
3.	"Thermal quantum and classical correlations and entanglement in the XY spin model with three-spin interaction"; Li, Yan-Chao; Lin, Hai-Qing; PHYSICAL REVIEW A, 83, 5 (2011)
4.	"Universal Scaling and Fano Resonance in the Plasmon Coupling between Gold Nanorods"; Woo, Kat Choi; Shao, Lei; Chen, Huanjun; Liang, Yao; Wang, Jianfang; Lin, Hai-Qing; ACS NANO, 5, 7 (2011)

学术活动

EVENTS

Since its establishment, CSRC has hosted/co-organized 95 academic workshops and conferences, as well as 26 training courses.

成立至今，中心共主办/合办学术会议95次，开展院内培训班共计26期。

WORKSHOPS & CONFERENCES (2010-2019)
中心主办 / 合办的学术会议

DATE 时间	TITLE 会议名称
2019.12.14-16	The 7th International Workshop on Frontiers in Quantum Physics and Quantum Information: The workshop on topology and dynamics in non-Hermitian systems 第七届量子物理与量子信息前沿国际研讨会：非厄米系统拓扑与动力学
2019.10.27-30	Workshop on Modelling，Algorithm and Analysis on Complex Fluid Dynamics 复杂流体力学问题建模、算法与分析研讨会
2019.10.27	Workshop on Complex Systems and Social Computing 复杂系统与社会计算研讨会
2019.06.17-21	CSRC Summer School on Quantum Non-Equilibrium Phenomena: Methods and Applications 量子非平衡现象的方法与应用暑期班
2019.06.08-09	7th Workshop on Recent Advances on Spectral Methods and Related Applications 第七届谱方法及相关应用进展研讨会
2019.06.07	Forum on Numerical Methods for Computing Interfacial Phenomena 计算界面现象的数值方法论坛
2019.04.26-27	3rd Workshop on Numerical Methods for Fractional-derivative Problems 第三届分数阶微分问题数值方法研讨会
2018.9.18-20	Quantum Coherence in Energy Transfer and Conversion 能量转移和转换中的量子相干性研讨会
2018.8.11	Workshop on Numerical Solutions of Partial Differential Equations 偏微分方程数值解研讨班
2018.7.22-23	Forum on Applied and Computational Mathematics 应用和计算数学论坛
2018.6.30-7.4	2018 International Workshop on Frontiers of Theoretical and Computational Physics and Chemistry 2018年理论与计算物理化学前沿国际研讨会
2018.4.21-24	International Workshop On Image Processing and Inverse Problems 图像处理与反问题国际研讨会

WORKSHOPS & CONFERENCES (2010-2019)
中心主办 / 合办的学术会议

DATE 时间	TITLE 会议名称
2018.4.13-14	2nd Workshop on Numerical Methods for Fractional-derivative Problems: Singularities and Fast Algorithms 第二届分数阶微分问题数值方法研讨会：奇点和快速算法
2018.12.17-20	The 6th International Workshop on Frontiers in Quantum Physics and Quantum Information: high-precision measurement based on atomic systems 第六届量子物理与量子信息前沿国际研讨会:基于原子系统的高精度测量
2018.12.13	SIAM-CSRC Student Chapter:Workshop on Applied and Computatioanl Mathematics SIAM-CSRC学生分会：应用与计算数学研讨会
2018.12.12-13	Workshop on Protein Structure, Dynamics and Functions-II 第二届蛋白质分子结构和动力学方法研讨会
2018.11.26-11.30	CSRC Workshop on Computational Approach to Correlated Systems 关联系统计算方法研讨会
2018.06.18-06.21	Mini-workshop on Structure and Instability of Amorphous Materials 非晶态材料结构与不稳定性小型研讨会
2018.01.28-01.31	Workshop on Tensor Network States: Algorithms and Applications 张量网络算法及应用研讨会
2017.12.13-12.16	The 3rd CAEP Computational Materials and Computational Chemistry Forum 第三届中物院计算材料学与计算化学论坛
2017.12.04-09	Workshop on the Rabi Model, Strong Light-Matter Interactions and Other Quantum Phenomena in CQED Platforms 腔量子电动力学中的理论模型及实验培训会议
2017.09.15	CSRC Symposium on Active Matter and Related Topics 活性物质研讨会
2017.08.16-18	2017 Postdoctoral Academic National Forum: Semiconductor Energy Materials and Technology 2017年全国半导体能源材料与技术博士后学术论坛
2017.08.07-11	CSRC Summer School on Applied Inverse Problems 应用反问题暑期班
2017.07.15-16	CSRC Workshop on DNA Chromosome Structure and Dynamics DNA染色体结构与动力研讨会

WORKSHOPS & CONFERENCES (2010-2019)
中心主办 / 合办的学术会议

DATE 时间	TITLE 会议名称
2017.06.07-14	Focus Activity on Mathematical and Computational methods for Quantum and Kinetic Problems 量子与动力学理论中的数学问题与计算方法
2017.05.24-26	The 5th International Workshop on Frontiers in Quantum Physics and Quantum Information 第五届量子物理与量子信息前沿研讨会
2017.05.19-20	Workshop on Numerical Methods for Fractional-derivative Problems: Singularities and Fast Algorithms 分数阶微分方程的数值方法：奇异性和快速算法
2017.02.11-12	Workshop on Material Modeling and Computer Simulation: Concepts, Theories and Methods 材料建模与计算机模拟中的若干问题：概念、理论与方法
2016.12.16-17	Workshop on Imaging and Algorithm 成像与算法研讨会
2016.12.15	Forum on Computational Science at the Extreme Scale 极限计算科学论坛
2016.12.13	Mini-workshop on Inverse Scattering Problems 反散射问题迷你研讨会
2016.11.06-13	International CECAM-Workshop on Approximate Quantum Methods in the ab initio World 国际CECAM 研讨会-从头计算方法领域中的近似量子力学方法
2016.11.02-04	International Workshop on Spin Coherence and Topological Order in Semiconductor Nanosystems 半导体纳米系统自旋相干性与拓扑序列国际研讨会
2016.08.15-19	BAIL 2016 : International Conference on Boundary And Interior Layers -- Computational and Asymptotic Methods 边界与内部层国际会议 (BAIL 2016)
2016.08.08-10	International Conference on Algorithms and Applications for Excited State Electronic Structure Theories 激发态电子结构的算法与应用研讨会
2016.07.05-10	International Workshop on Nonlinear Partial Differential Equations and Scientific Computing 非线性偏微分方程与科学计算国际研讨会
2016.06.15-18	The 4th International Workshop on Frontiers in Quantum Optics and Quantum Information: Optomechanics meets circuit QED 第四届国际量子光学与量子信息前沿研讨会：光力学遇到电路QED

WORKSHOPS & CONFERENCES (2010-2019)
中心主办 / 合办的学术会议

DATE 时间	TITLE 会议名称
2016.04.21-24	The 6th Workshop on Quantum Many-Body Computation 第六届量子多体计算会议
2016.01.11-15	Workshop on Numerical Methods of Nonlinear Problems 非线性问题数值方法研讨会
2016.01.06	Algorithms Forum (3) on Finite Element Methods for DFT DFT有限元算法论坛
2015.12.26-27	Workshop on Recent Progress in Theoretical and Computational Studies of 2D Materials 二维材料理论与计算研究最新进展专题研讨会
2015.12.20-21	Forum on Modeling of Nonequilibrium Phenomena 非平衡态体系建模论坛
2015.11.26-28	The 3rd International Workshop on Frontiers in Quantum Optics and Quantum Information 第三届国际量子光学与量子信息前沿研讨会
2015.11.16-20	Algorithms Short Course on High Performance Numerical Linear Algebra 高性能数值线性代数算法培训班
2015.09.24	CSRC Workshop on LAMMPS for Non-equilibrium System 非平衡系统的LAMMPS分子动力学模拟研讨会
2015.08.19-24	International Symposium on material design & The 10th USPEX workshop 材料设计国际研讨会暨第十届USPEX会议
2015.08.18-19	CSRC Workshop on kinetics of enzymes and molecular machines 酶与分子机械动力学研讨会
2015.08.13-14	HK-CSRC forum 中心-香港合作交流论坛
2015.07.20-24	The 12th International Conference for Mesoscopic Methods in Engineering and Science 第十二届介观国际会议
2015.06.23-26	CSRC 2015 Summer School on HPC Parallel Computing 2015年高性能并行运算暑期学校
2015.05.30	ITP-CSRC Forum on Physics Approach to Biocomplexity: the Expanding Horizon ITP-CSRC联合论坛：面向生物复杂性的物理学前沿研究

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中心主办 / 合办的学术会议

DATE 时间	TITLE 会议名称
2015.05.21-25	The 8th International Conference on Computational Nanoscience and New Energy Materials 第八届计算纳米科学与新能源国际研讨会
2015.05.09-10	Spring School on Active Matter 2015年活性物质春季学校
2015.04.26-26	The 2nd International Workshop on Frontiers in Quantum Optics and Quantum Information: Celebration of the International Year of Light 第二届量子光学与量子信息国际前沿研讨会：庆祝国际光学年
2014.12.22-12.23	The Mini Workshop on Frontiers in Condensed Matter Physics and Quantum Information 凝聚态物理与量子信息前沿迷你研讨会
2014.12.04-12.05	Workshop on the Physics of Living Matter 生命物质物理学研讨会
2014.10.06-10.10	Workshop on Correlations, criticality, and coherence in quantum systems (Portugal) 量子系统中的相关性、临界性和相干性研讨会(葡萄牙)
2014.07.07-07.11	2014 CFD Summer School: Modern Techniques for Aerodynamic Analysis and Design 2014年计算流体力学暑期班：空气动力分析与设计的现代数值方法
2014.07.03-07.05	The 1st International Workshop on Frontiers in Quantum Optics and Quantum Information: Quantum Computing with Electron Spin Qubits 第一届国际量子光学与量子信息前沿国际研讨会：电子自旋量子位的量子计算
2014.05.27	Workshop on Green Materials for Energy 绿色能源材料国际学术研讨会
2014.05.22-05.24	Mathematical and Numerical Methods for Quantum, Kinetic and Nonlocal Problems 量子和运动学及非局部问题中的数学和计算方法
2014.05.21-05.21	Mini-Workshop on Quantum Information 量子信息专题系列报告
2014.05.16-05.18	International Workshop on the Finite Element Method and the Spectral Method 有限元与谱方法国际研讨会
2014.04.25-04.28	2014 Wuhan Computational Physics Workshop 2014年武汉计算物理研讨会
2014.04.07-04.09	Workshop on Quantum Optics and Quantum Information (2014) 量子光学与量子信息研讨会（2014）

WORKSHOPS & CONFERENCES (2010-2019)
中心主办 / 合办的学术会议

DATE 时间	TITLE 会议名称
2014.04.01-04.03	Focused workshop on “Biological underpinnings of cognitive abilities in health and diseases” “健康与疾病认知能力的生物学基础”专题研讨会
2014.03.23-04.13	Hands-on Workshop on Biomolecular Computation and Data Analysis 生物分子计算与数据分析实践研讨会
2013.12.27-12.29	Workshop on Vavity Optomechanics and its Applications 腔光力学及其应用学术研讨会
2013.12.23-12.24	Mini Workshop on Frontiers in Condensed Matter Theory and Quantum Information 凝聚态理论与量子信息前沿小型研讨会
2013.10.27-10.30	16th Asian Workshop on First-Principles Electronic Structure Calculations 第十六届第一性原理电子结构计算亚洲研讨会
2013.10.19-10.21	The 6th International Workshop on Solid State Quantum Computing 第六届固体量子计算国际研讨会
2013.08.21-08.23	Workshop on Quantum Optics (II) 第二次量子光学研讨会
2013.08.07-08.10	1st Workshop On Calypso 第一届Calypso研讨会
2013.07.29-08.16	CCAST-Summer School 2013 2013年CCAST暑期班
2013.06.19-06.20	Workshop on Complex Networks and Statistical Mechanics 复杂网络和统计力学研讨会
2013.06.15-06.16	Workshop on Energy Landscape of Complex Systems 复杂系统的能量景观研讨会
2013.05.26-05.29	Quantum Optics and New Materials (V) 第五次量子光学与新材料国际会议
2013.05.20-05.24	International Workshop on Computational and Applied Mathematics 计算与应用数学国际研讨会
2013.04.01-04.05	International Workshop on Critical Behavior in Lattice Models 格点模型中的临界现象国际研讨会

WORKSHOPS & CONFERENCES (2010-2019)
中心主办 / 合办的学术会议

DATE 时间	TITLE 会议名称
2012.11.13-11.15	Workshop on Frontiers of Quantum Optics and Quantum Information Science 量子光学与量子信息前沿科学讨论会
2012.10.28-11.17	Lectures on Monte Carlo Method and Its Applications 2012 2012年蒙特卡洛讲习班
2012.10.08-10.12	Workshop on Correlations and Coherence in Quantum Systems (Portugal) 量子系统中的相关性和连贯性国际会议
2012.07.09-07.13	2012 Summer School on the Lattice Boltzmann Method 2012年晶格波尔兹曼方法暑期讲习班
2012.06.06-06.07	Workshop on Computational and Applied Mathematics 计算与应用数学国际研讨会
2012.03.18-03.20	East Asia Joint Seminars on Statistical Physics 2012 2012东亚统计物理研讨会
2012.02.08-02.10	The First Chinese Young Researchers Symposium for Atomic Molecular and Optical Physics 首届全国原子分子光物理青年科学家论坛
2012.01.12-01.14	Simulation and Experimental Studies on the properties of matter under extreme conditions 极端条件下物质性质的模拟和实验研究会议
2011.12.21-12.24	International Workshop on Frontiers of Theoretical and Computational Physics and Chemistry 前沿理论及计算物理与化学国际研讨会
2011.12.03-12.04	Fluctuation Theorems and Interdisciplinary Applications 统计物理与复杂系统专题研讨会
2011.10.27-10.29	Workshop on Computational Challenges for Complex Physical Systems under Extreme Conditions 极端条件下复杂物理系统的计算挑战研讨会
2011.10.17-10.19	International workshop on high-volume experimental data, computational modeling and visualization 海量实验数据、计算建模及可视化国际学术研讨会
2011.09.12-09.15	International Workshop on Numerical Methods and Modelling for Compressible Multimaterial Flows and Mixing 多介质流体的建模与数值模拟国际研讨会
2011.08.17-08.19	The Sixth Chinese Youth Conference On Computational Physics 第六届全国青年计算物理学术会议

WORKSHOPS & CONFERENCES (2010-2019)
中心主办 / 合办的学术会议

DATE 时间	TITLE 会议名称
2011.06.21-06.25	Workshop on Advanced Monte Carlo Methods and Stochastic Dynamics 高等蒙特卡洛方法与随机动力学研讨会
2011.06.13-06.16	International Conference on Applied Mathematics and Interdisciplinary Research 国际应用数学与交叉研究研讨会
2011.05.02-05.06	Spring School on the lattice Boltzmann method 晶格波尔兹曼方法春季讲习班
2011.01.26-01.29	Conference on Quantum Optics and New Materials (IV) 量子光学与新材料会议（IV）
2010.12.03-12.04	Workshop on High Performance Computing & Applications 高性能计算与应用研讨会
2010.08.08-08.11	Conference on Quantum Optics and New Materials (III) 量子光学与新材料会议（III）
2010.06.26-06.28	International Conference on Harmonic analysis and partial differential equations 调和分析与偏微分方程国际会议

TUTORIALS (2016-2019) 院内培训班

DATE 时间	TITLE 会议名称
2019.12.14-16	非厄米系统动力学演化及其拓扑性质培训班
2019.10.14-18	微游泳体短期培训课程
2019.09.23-26	材料与能源前沿科学：激发态和动力学培训班
2019.08.23.27	强场物理培训班

TUTORIALS (2016-2019) 院内培训班

DATE 时间	TITLE 会议名称
2019.07.08-12	燃烧学：基础，计算模型与数值模拟培训班
2019.06.17-21	量子非平衡现象计算方法与应用培训研讨会
2019.06.02-06	深度学习在计算机视觉、求解微分方程和计算建模中的应用
2018.7.16-20	分子器件的第一性原理计算与设计暑期班
2018.7.1-4	化学和生物体系光过程的激发态动力学培训班
2018.5.21-25	科学与工程计算中的有限元方法培训班
2018.12.20-21	量子精密测量物理培训班
2018.11.26-11.30	关联系统计算方法培训会
2018.09.03-09.07	“低维纳米材料性能与结构表征技术”高级研修班
2017.12.04-09	腔量子电动力学中的理论模型及实验培训会议
2017.09.17-09.22	基于跨尺度高通量计算的新材料探索与设计
2017.07.10-14	AI深度学习及应用暑期班
2017.06.19-22	Workshop on Stochastic Computing and Uncertainty Quantification (UQ)
2017.06.05-09	湍流: 理论, 实验, 模型与数值模拟培训班
2017.05.22-23	量子开放系统理论与计算方法
2017.05.08-12	多相物质界面问题的数值处理方法培训班
2016.11.23-25	等离子体中基本原子过程及其计算方法培训班

TUTORIALS (2016-2019) 院内培训班

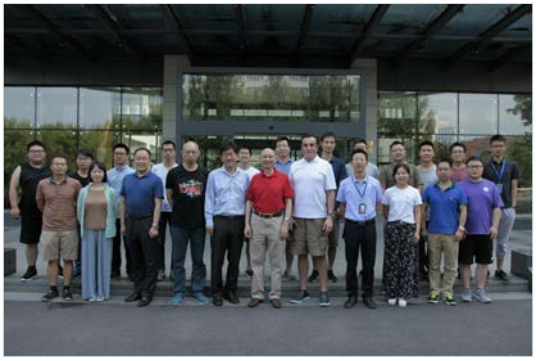
DATE 时间	TITLE 会议名称
2016.10.31-11.01	量子相干及拓扑序培训会议
2016.06.27-07.02	Summer Short Course on Monte Carlo methods and Applications
2016.05.16-20	能源材料设计与表征培训班
2016.04.10-15	谱方法春季班
2016.03.21-25	统计物理春季班重整化群方法及其应用培训班

2016

2017

2018

2019



CSRC COLLOQUIUM ON SCIENTIFIC FRONTIERS
(2012-2019.08) 科技前沿讲座

No.	DATE	SPEAKER 报告人	INSITUTE / 单 位	TITLE / 报告题目
1	2019-8-19	Peter Nordlander	Rice University, USA 美国莱斯大学	Plasmonic Nanostructures: Artificial Molecules
2	2019-3-20	Shi Jin 金 石	Shanghai Jiao Tong University 上海交通大学	Random Batch Methods (RBM) for Interacting Particle Systems
3	2019-3-20	Rudolf Podgornik	School of Physical Sciences, University of Chinese Academy of Sciences 中国科学院大学物理科学学院	Charges, Charge Regulations and Charge Fluctuations
4	2018-8-27	Jorge E. Hirsch	Department of Physics, University of California San Diego, USA 美国加利福尼亚大学圣地亚哥分校物理系	Theory of Superconductivity for All Superconductors
5	2018-8-14	Wilson Ho	Department of Physics and Astronomy, University of California, Irvine 加州大学尔湾分校物理与天文学系	Three Challenges for Theory and Computation
6	2018-5-17	David A. Weitz	Harvard University (USA) 哈佛大学	Multiphase Fluid Flow at the Micron Scale
7	2018-4-27	David W. McLaughlin	Mathematics and Neural Science, Courant Institute of Mathematical Sciences (NYU) 库恩特数学科学研究所	Large-Scale Computational Modeling in Neural Science
8	2018-2-5	Stephen L. Adler	Institute for Advanced Study, Princeton University, USA 美国普林斯顿大学高等研究院	Collapse Models
9	2017-9-13	Erio Tosatti	SISSA, and ICTP, Trieste, Italy 意大利国际高等研究院&意大利国际理论物理中心	Simulating, Emulating, Anticipating Condensed Matter Experiments: A Theorist’s Dream
10	2017-5-24	Franco Brezzi	Istituto Universitario di Studi Superiori (IUSS) of Pavia, Italy 意大利帕维亚高级研究大学	Basic Features of Virtual Element Methods
11	2017-2-16	Hong-Jun Gao 高鸿钧	Institute of Physics & University of Chinese Academy of Sciences 中科院物理研究所&中国科学院大学	纳米量子结构的构筑及其物性调控
12	2017-12-14	David R. Nelson	Harvard University (USA) 哈佛大学	Perforations, Curvature and Thermal Fluctuations in Free-Standing Graphene
13	2017-12-11	Luiz Davidovich	Federal University of Rio de Janeiro, Brazil 巴西里约热内卢联邦大学	Emergence of the Classical World from Quantum Mechanics: Schrödinger Cats, Entanglement, and Decoherence

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No.	DATE	SPEAKER 报告人	INSITUTE / 单 位	TITLE / 报告题目
14	2017-11-16	Claudio Verani	Department of Chemistry, Wayne State University, USA 美国韦恩州立大学化学系	Bioinspired Molecular Electronics, Corrosion, and Water Splitting at Wayne State University
15	2016-7-15	Tao Tang 汤 涛	South University of Science and Technology of China 南方科技大学	时间方向的离散与自适应
16	2016-5-24	Jisoon Ihm	Department of Physics and Astronomy, Seoul National University, Korea 韩国首尔国立大学物理与天文学系	Electodynamics Simulations of Topological Insulators and Materials Design for Hydrogen Storage
17	2016-4-19	Kim Sneppen	The Niels Bohr Institute, University of Copenhagen, Denmark 丹麦哥本哈根大学尼尔斯波尔研究所	Phages versus Bacteria: Competition, Diversity and Immunity
18	2016-4-11	Jie Shen 沈 捷	Purdue University (USA) and Xiamen University (China) 美国杜普大学&中国厦门大家	Fast Spectral Methods: Algorithms, Analysis and Applications
19	2016-3-9	Gang Bao 包 刚	School of Mathematical Sciences, Zhejiang University 浙江大学数学科学学院	Inverse Problems: Analysis, Computation, and Applications
20	2016-3-22	Peter Milonni	Los Alamos National Laboratory (USA) , and University of Rochester (USA) 洛斯阿拉莫斯国家实验室（美国）和罗切斯特大学（美国）	Electromagnetic Momenta and Forces in Dispersive Dielectric Media
21	2016-12-7	Zhao-Ping Li 李兆平	University College London, UK 英国伦敦大学学院	A Glimpse of Vision in Our Brain: from a Cortical Network to Visual Attention
22	2016-12-15	Chao Yang 杨 超	Institute of Software, CAS 中科院软件研究所	10M-Core Scalable Fully-Implicit Solver for Nonhydrostatic Atmospheric Dynamics
23	2016-12-15	Erio Tosatti	SISSA, and ICTP, Trieste, Italy 意大利国际高等研究院&意大利国际理论物理中心	Mechanical Non-equilibrium Condensed Matter Physics: Nanofriction
24	2016-1-20	Suhail Zubairy	Department of Physics and Astronomy, Texas A&M University, USA 美国德克萨斯农工大学物理与天文学系	Beyond the Rayleigh Limit in Optical Lithography
25	2016-10-26	John Kuriyan	Departments of Molecular and Cell Biology and Chemistry, University of California, Berkeley, USA 美国加州大学伯克利分校	Molecular Dynamics Simulations from the Perspective of Biology

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No.	DATE	SPEAKER 报告人	INSITUTE / 单 位	TITLE / 报告题目
26	2016-10-18	Matthew Fisher	Kavli Institute for Theoretical Physics, UC Santa Barbara, USA 美国加州圣塔芭芭拉分校Kavli理论物理研究所	Quantum Crystals, Quantum Computing and Quantum Cognition
27	2016-10-13	Marlan Scully	Texas A&M University and Princeton University, USA 美国德克萨斯州农工大学和普林斯顿大学	THE PHOTON CONCEPT: From Planck to Bose, Einstein to Yang and Mo-Zhi to Pan
28	2015-8-7	Le-Xing Ying 应乐兴	Department of Mathematics, Stanford University, USA 美国斯坦福大学数学系	The Fast Multipole Method
29	2015-8-7	Le-Xing Ying 应乐兴	Department of Mathematics, Stanford University, USA 美国斯坦福大学数学系	Sparsifying Preconditioners
30	2015-8-11	Mark Sussman	Department of Mathematics, Florida State University, USA 美国佛罗里达州立大学数学系	Computational Methods for Deforming Boundary Problems
31	2015-7-31	Peter Alexander Markowich	Department of Applied Mathematics and Theoretical Physics, University of Cambridge and Faculty of Mathematics, University of Vienna 剑桥大学应用数学与理论物理系和维也纳大学数学系	Three Forward PDE Problems with Urgent Need of Data Assimilation
32	2015-7-17	Jia-Ming Li 李家明	Department of Physics, Tsinghua University&Department of Physics, Shanghai Jiaotong University 清华大学物理系/上海交通大学物理系	基础研究的乐趣
33	2015-6-2	Xue-Cheng Tai 台雪成	Department of Mathematics, University of Bergen, Norway 挪威卑尔根大学数学系	Euler’s Elastica For Image Restoration And Segmentation And Fast Algorithms
34	2015-6-11	Wei-Tao Yang 杨伟涛	Department of Chemistry and Physics, Duke University, USA 美国杜克大学化学与物理系	Fractional Perspectives of DFT and Exchange-Correlation Energies/Electronic Excitation Energies from Pairing Matrix Fluctuations
35	2015-6-1	Xue-Cheng Tai 台雪成	Department of Mathematics, University of Bergen, Norway 挪威卑尔根大学数学系	Graph, Cuts and PDE Minimization for Image Processing

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No.	DATE	SPEAKER 报告人	INSITUTE / 单 位	TITLE / 报告题目
36	2015-5-8	Sriram Ramaswamy	TIFR Centre for Interdisciplinary Sciences, Tata Institute of Fundamental Research, Hyderabad, India 印度海得拉巴塔塔基础研究所TIFR跨学科科学中心	What Is Active Matter and Why Does It Matter?
37	2015-4-16	Xian-Tu He 贺贤土	Beijing Institute of Applied Physics and Computational Mathematics & Center for Applied Physics and Technology, Peking University 北京应用物理与计算数学研究所，北京大学应用物理与技术中心	Hybrid-Drive Work-Dominated Hotspot Ignition Scheme for Inertial Confinement Fusion
38	2015-4-13	Rui-Bao Tao 陶瑞宝	Physics Deparment, Fudan University 复旦大学物理系	Surface states, S-B correspondence and entanglement spectrum
39	2015-4-1	Nan-Xian Chen 陈难先	Department of Physics, Tsinghua University 清华大学物理系	应用物理中几个逆问题
40	2015-3-23	Bang-Fen Zhu 朱邦芬	Department of Physics, Tsinghua University 清华大学物理系	科研诚信—科研工作者的学术生命
41	2015-12-8	Boris Yakobson	Department of Chemistry, Rice University, USA 美国赖斯大学化学系	Predictive Modeling in 2D Materials: Morphology, Defects, Synthesis
42	2014-8-20	Marie-Paule Pileni	Université Pierre et Marie Curie (UPMC), 75005 Paris, France 法国巴黎皮埃尔和玛丽居里大学	Nano and Supra Crystals Real Challenges: Specific Chemical and Physical Properties
43	2014-6-26	Alex Hansen	Department of Physics, Norwegian University of Science and Technology, Norway 挪威科技大学物理系	The Physics of Fracture: How Far Can One Get with the Simple Fiber Bundle Model?
44	2014-6-16	Jin-Chao Xu 许进超	Department of Mathematics, The Pennsylvania State University, USA 美国宾夕法尼亚州立大学数学系	Algebraic Solvers for Large Scale Simulations
45	2014-6-11	Yan-Yan Li 李岩岩	Department of Mathematics, Rutgers University 罗格斯大学数学系	Estimates for Elliptic Systems from Composite Material
46	2014-5-13	Dieter Jaksch	Department of Physics, University of Oxford 牛津大学物理系	Quantum Simulation and Computation

CSRC COLLOQUIUM ON SCIENTIFIC FRONTIERS
(2012-2019.08) 科技前沿讲座

No.	DATE	SPEAKER 报告人	INSITUTE / 单 位	TITLE / 报告题目
47	2014-4-24	Gershon Kurizki	Department of Chemical Physics, Weizmann Institute of Science 魏茨曼科学研究所化学物理系	Quantum Control of Decoherence, Information Transfer, Thermodynamics and Dipole-Dipole Interactions
48	2014-3-26	Hugues Chaté	CEA – Saclay, France 法国原子能和替代能源委员会	Active Matter: An Emerging Interdisciplinary Field
49	2014-2-24	Edward S. Fry	Department of Physics and Astronomy, Texas A&M University 美国德州农工大学物理与天文学系	Determinism, Einstein, and Quantum Mechanics
50	2014-10-29	Oleg Prezhdo	University of Southern California, USA 美国南加州大学	Quantum Dots – Artificial Atoms, Large Molecules or Small Pieces of Bulk? Insights from Time-Domain Ab Initio Studies
51	2014-10-24	Pierre Meystre	Department of Physics and College of Optical Sciences, University of Arizona, USA 美国亚利桑那大学物理系和光学科学学院	Basic Physics and Applications of Quantum Optomechanics: From Nonlinear Phononics to Quantum Heat Engines
52	2014-10-10	Olga Kocharovskaya	Department of Physics and Astronomy, Texas A&M University, USA 美国德克萨斯农工大学物理与天文学系	Control of Light by Light in a Resonant Medium
53	2013-9-9	Zhi-Ming Chen 陈志明	The Institute of Computational Mathematics and Scientific/Engineering Computing, CAS 中科院计算数学与科学工程计算研究所	Computation of High Frequency Waves in Unbounded Domain: Perfectly Matched Layer and Source Transfer
54	2013-8-9	Ming-Jiu Ni 倪明玖	Shool of Physical Sciences, University of Chinese Academy of Sciences 中国科学院大学物理科学学院	气泡驱动液态金属流体在强磁场作用下的流动
55	2013-8-12	Xian-Tu He 贺贤土	Beijing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	新型惯性约束聚变方案
56	2013-7-22	Hong-Kai Zhao 赵宏凯	Department of Mathematics, University of California, Irvine 美国加州大学欧文分校数学系	Computing Partial Differential Equations on Point Clouds
57	2013-5-17	Max Gunzburger	Department of Scientific Computing, Florida State University 美国弗罗里达州立大学科学计算系	Computational Approaches to Uncertainty Quantification for Systems Governed by PDEs
58	2013-1-31	Qing-Huo Liu 柳清伙	Xiamen University and Duke University, USA 厦门大学&美国杜克大学	Multiscale Computational Electromagnetics and Super-Resolution Imaging

CSRC COLLOQUIUM ON SCIENTIFIC FRONTIERS
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No.	DATE	SPEAKER 报告人	INSITUTE / 单 位	TITLE / 报告题目
59	2013-1-18	Xue-Chu Shen 沈学础	Shanghai Institute of Technical Physics, Chinese Academy of Science 中科院上海技术物理所	Whispering Gallery Mode Exciton Polariton in Nano ZnO Wire; Polariton Lasing & Condensation
60	2013-10-9	Ping-Wen Zhang 张平文	School of Mathematical Sciences, Peking University 北京大学数学科学学院	The Mathematical Problems of Liquid Crystals
61	2012-9-20	Wei-Nan E 鄂维南	Peking University and Princeton University 北京大学&普林斯顿大学	Modeling Rare Events
62	2012-8-16	Yu-Hai Tu 涂豫海	IBM T. J. Watson Research Center IBM T.J. Watson研究中心	Quantitative Systems Biology in a Simple Organism: E. coli’s Memory, Computation, and Energy Cost
63	2012-8-10	Chi-Wang Shu 舒其望	Division of Applied Mathematics, Brown University 布朗大学应用数学系	Discontinuous Galerkin Finite Element Methods for High Order Nonlinear Partial Differential Equations
64	2012-7-4	Jonathan P. Dowling	Department of Physics & Astronomy, Louisiana State University 美国路易斯安那州立大学物理与天文学系	Schrödinger’s Rainbow - The Renaissance in Quantum Optical Interferometry
65	2012-6-26	Zhi-Jian Wang 王志坚	Department of Aerospace Engineering and CFD Center, Iowa State University 美国爱荷华州立大学航空工程与CFD中心系	High-Order CFD Methods: Efficient Implementation and Applications
66	2012-5-10	Jiang-Feng Du 杜江峰	Hefei National Laboratory for Physical Sciences at Microscale and Department of Modern Physics,University of Science and Technology of China 中国科技大学近代物理系	Quantum Discord for Investigating Quantum Correlations without Entanglement in Solids
67	2012-10-22	Yue-Sheng Xu 许跃生	Sun Yat-Sen University and Syracuse University (USA) 中国中山大学和美国锡拉丘兹大学	Proximity Algorithms for Solving Convex Optimization Problems in Signal and Image Processing
68	2012-10-19	Christoph H. Keitel	Max Planck Institute for Nuclear Physics (MPIK), Heidelberg 海德堡马克斯·普朗克核物理研究所	Relativistic Quantum Optics
69	2012-10-12	Pao-Liu Chow 周宝鎏	Wayne State University, Michigan, USA 美国密歇根州韦恩州立大学	Approximate Solutions of a Stochastic Parabolic Equation in Nonlinear Filtering

CSRC SEMINAR (2010-2019.08) 专题报告

NO.	DATE 日期	SPEAKER 报告人	INSITUTE 单位	TITLE 报告题目
1	2019-9-5	Shuai Lu 陆 帅	Fudan University 复旦大学	Increasing Stability in the Inverse Source Problem with Attenuation and Many Frequencies
2	2019-9-4	He-Hu Xie 谢和虎	Academy of Mathematics and Systems Science, Chinese Academy of Sciences 中国科学院数学与系统科学研究院	High Efficient Numerical Method for Nonlinear Eigenvalue Problems
3	2019-9-3	Hong-Xing Xu 徐红星	School of Physics and Technology, Wuhan University 武汉大学物理科学与技术学院	Ultrasensing Optical Spectroscopy of Plasmonic Nanocavity
4	2019-9-29	Min-Yi Huang 黄旻怡	Zhejiang Sci-Tech University 浙江理工大学数学科学系	PT-对称量子系统的嵌入性质及模拟问题
5	2019-9-27	Norbert J. Mauser	Wolfgang Pauli Institute & University of Vienna 沃尔夫冈泡利研究所 & 维也纳大学	Computational Semi-relativistic Quantum Mechanics: the Pauli Equation
6	2019-9-26	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics, CAS 中国科学院武汉物理与数学研究所	Spin Charge Separation with Quantum Criticality
7	2019-9-25	Dimitrie Culcer	University of New South Wales, Australia 新南威尔士大学	Resonant Photovoltaic Effect in Doped Magnetic Topological Materials
8	2019-9-19	Yshai Avishai	Physics Department, Ben Gurion University, Israel 本·古里安大学	Klein Scattering, Tunnelling and Bound-states in Graphene
9	2019-9-17	You-Quan Li 李有泉	Department of Physics, Zhejiang University 浙江大学物理系	Quantum Severalty: Fast Protein Folding, Speed up versus Suppresion
10	2019-9-17	Zhi-Qiang Sheng 盛志强	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	A nonlinear finite volume scheme preserving maximum principle for diffusion equation
11	2019-9-17	Shuo-Nan Wu 吴朔男	School of Mathematical Sciences, Peking University 北京大学数学科学学院	Robust discretization and solver for convection-dominated PDEs with applications to MHD multi-physics systems

CSRC SEMINAR (2010-2019.08) 专题报告

NO.	DATE 日期	SPEAKER 报告人	INSITUTE 单位	TITLE 报告题目
12	2019-9-12	Jie Xu 徐 劼	Institute of Computational Mathematics and Scientific/ Engineering Computing, CAS 中国科学院计算数学与科学工程计算研究所	Approximations on SO(3) by Wigner D-matrix and applications
13	2019-9-11	Yun-Long Xiao	School of Physical and Mathematical Sciences, Nanyang Technological University, Singapore 南洋理工大学物理与数学科学学院	The Complementary Information Principle of Quantum Mechanics
14	2019-9-10	Balázs Kovács	University of Tuebingen 图宾根大学	L^2 Error Estimates for Wave Equations with Dynamic Boundary Conditions
15	2019-8-8	Jiang-Guo (James) Liu	Colorado State University, USA 美国科罗拉多州立大学	Developing Finite Element Solvers for Poroelasticity in the 2-Field Approach
16	2019-8-6	Ji-Chun Li 李继春	University of Nevada-Las Vegas, USA 美国内华达大学拉斯维加斯分校	Analysis and Application of Some Numerical Methods for Maxwell’s Equations with Random Inputs
17	2019-8-5	Ke-Yu Xia 夏可宇	College of Engineering and Applied Sciences, Nanjing University 南京大学现代工程与应用科学学院	When Chiral Light Meets Chiral Matter: Optical Nonreciprocity and Isolation
18	2019-8-30	Jian-Wei Wang 王剑威	School of Physics, Peking University 北京大学物理学院	Integrated Photonics Quantum Technologies
19	2019-8-29	Kai Cui 崔 凯	Institute of Mechanics, CAS 中科院力学所	高压捕获翼:一种全新的高超音速气动布局
20	2019-8-27	Hong-Xing He 何洪兴	University of Houston, USA 美国休斯敦大学	Direct Phasing of Protein Crystals
21	2019-8-27	Xiao-Bing Feng 凤小兵	The University of Tennessee, USA 美国田纳西大学	Recent Developments in Numerical Methods for Stochastic Stokes and Navier-Stokes Equations
22	2019-8-23	Hao-Ran Chang 张浩然	Sichuan Normal University 四川师范大学	Generalized Passarino-Veltman Reduction at Finite Temperature and Chemical Potential

23	2019-8-22	Zhen-Nan Zhou 周珍楠	Peking University 北京大学	Numerical Methods for Some Nonlinear Transport Equations in Biology
24	2019-8-19	Mourad Choulli	University of Lorraine, France 法国洛林大学	Multidimensional Borg-Levinson Type Theorems
25	2019-8-12	Wei-Hua Deng 邓伟华	School of Mathematics and Statistics, Lanzhou University 兰州大学数学与统计学院	Heterogeneous and Nonergodic Diffusion: Multiscale Modelling and Simulation
26	2019-7-9	Uzi Landman	School of Physics, Georgia Institute of Technology, USA 美国乔治亚理工大学	Small is Different: Old Questions New Paradigms
27	2019-7-4	François Peeters	Department of Physics, University of Antwerp (Belgium) 比利时安特卫普大学物理系	Atomic Collapse and Flat Bands in Graphene
28	2019-7-25	Zhong-Yi Huang 黄忠亿	Tsinghua University 清华大学	Multiscale Methods for Problems with Singularities
29	2019-7-23	Wen-Jun Ying 应文俊	Shanghai Jiaotong University 上海交通大学	A Potential Theory Based Cartesian Grid Method
30	2019-7-19	Hao Shi 石　浩	Center for Computational Quantum Physics, Flatiron Institute, Simons Foundation 西蒙斯基金会计算量子物理中心	Auxiliary Field Quantum Monte Carlo for Transition Metal Systems: from Molecules to Solids
31	2019-7-18	Sheng-Fa Ye 叶生发	Max Planck Institute for Chemical Energy Conversion, Germany 德国马克斯-普朗克化学能源转化研究所	Elucidation of the Reaction Mechanism of O2 Activation by a Combined Spectroscopic and Computational Approach
32	2019-6-27	Ling-Xing Yao	Department of Mathematics, University of Akron (USA) 美国阿克伦大学	A Mathematical Model for Cell Migration and Simulations in 2D
33	2019-6-20	Lei Wu 吴　雷	University of Strathclyde (UK) 英国斯特拉斯克莱德大学	Can We Find Steady-State Solutions to Multiscale Rarefied Gas Flows Within Dozens of Iterations?
34	2019-6-11	Heng-Guang Li 李恒光	Wayne State University (USA) 美国维恩州立大学	The Finite Element Conditioning on a Class of Anisotropic Meshes
35	2019-4-8	Shi-Ju Ran 冉仕举	Department of Physics, Capital Normal University 首都师范大学物理系	Quantum Simulation and Machine Learning in the Age of Tensor Network

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36	2019-4-4	Shi-Yong Wang 王世勇	Shanghai Jiao Tong University 上海交通大学物理与天文学院	结构原子级精确的石墨烯纳米带的制备与性能表征
37	2019-4-27	Da-Wei Wang 王大伟	Department of Physics, Zhejiang University 浙江大学物理系	Simulating Chiral Dynamics in Quantum Optics
38	2019-4-24	Qing Lu 逯　擎	The Max Planck Institut für Kohlenforschung, Germany 德国马克斯普朗克煤炭研究所	色散力在碳氢键活化中的应用
39	2019-4-19	Giulio Chiribella	Department of Computer Science, The University of Hong Kong 香港大学计算科学系	A Second-Quantised Shannon Theory
40	2019-3-27	Jing-Zhi Li 李景治	Department of Mathematics, Southern University of Science and Technology 南方科技大学数学系	Determining a Random Schrodinger Equation with Unknown Source and Potential
41	2019-3-27	Hai-Gang Li 李海刚	Beijing Normal University 北京师范大学	Babuska Problem in Composite Materials and Its Applications
42	2019-3-26	Mikhail I. Katsnelson	Radboud University, Nijmegen, Netherlands 荷兰内梅亨大学	Theory of Magnetic Interactions in Real Materials
43	2019-3-20	Matthew Turner	University of Warwick, UK 英国华威大学	Instabilities in Confined Systems with Geometric Fluctuations
44	2019-3-20	David Dean	University of Bordeaux, France 法国国立波尔多第一大学	Dispersion in Confined Systems with Geometric Fluctuations
45	2019-1-25	Chen Li 李　晨	Max Planck Institute of Microstructure Physics, Germany 德国马克斯·普朗克微观结构物理研究所	Beyond Born-Oppenheimer Time Dependent Density Functional Theory for Molecular Dynamics Simulations
46	2019-1-23	Ke Liu 刘　克	Academy of Mathematics and Systems Science (CAS) 中国科学院数学与系统科学研究院	谈谈监管问题

47	2019-1-2	Oleg Prezhdo	University of Southern California, USA 美国南加州大学	Time-Domain Modeling of Excited State Dynamics in Halide Perovskites
48	2019-1-15	Robert Joynt	Department of Physics, University of Wisconsin-Madison, USA 美国威斯康星大学-麦迪逊	Discrete Scale Invariance and log B Periodic Quantum Oscillations in Topological Semimetals
49	2019-1-11	John E. Sader	School of Mathematics and Statistics, The University of Melbourne, Australia 澳大利亚墨尔本大学	Dynamics of Nanometre Scale Mechanical Resonators in Fluid with Applications to Atomic and Molecular Sensing
50	2019-10-9	Qing Peng	University of Michigan, Ann Arbor, USA 密歇根大学安娜堡分校	Mystery of the Formation of <100> Loops in Irradiated Iron
51	2019-10-29	Bo Lu 吕　博	Tianjin University 天津大学	Focus on the Surface Andreev Bound States of Unconventional Superconductors
52	2019-10-25	Hong-Kai Zhao 赵宏凯	Department of Mathematics, University of California, Irvine 加州大学尔湾分校	Intrinsic Complexity: From Approximation of Random Vectors and Random Fields to Solutions of PDEs
53	2019-10-22	Shi-Peng Mao 毛士鹏	Academy of Mathematics and Systems Science, CAS 中国科学院数学与系统科学研究院	Analysis of Finite Element Methods for Incompressible Magnetohydrodynamic Flows with Magnetic Vector Potential Formulations
54	2019-10-21	Francis Filbet	Université Paul Sabatier, Toulouse III, France 图卢兹第三大学	Asymptotically Stable Particle-In-Cell Methods for the Vlasov-Poisson System with a Strong External Magnetic
55	2019-10-21	Yuriy Maistrenko	FZ Jülich (Germany), TU Lodz (Poland), and NASU (Ukraine) 德国FZ Jülich, 波兰TU Lodz和乌克兰NASU	New Trends in Complex Networks: Chimera States and Solitary Oscillators
56	2019-10-16	Rosario Fazio	International Center for Theoretical Physics (ICTP), Italy 意大利国际理论物理中心	Topological Fractional Pumping in Optical Lattice
57	2019-10-15	Zaven Altounian	Department of Physics, McGill University, Canada 麦吉尔大学	General Motors and NdFeB Magnets
58	2019-10-14	Ray-Kuang Lee 李瑞光	Institute of Photonics Technologies, National Tsing Hua University, Hsinchu, Taiwan 国立清华大学	10dB Vacuum Noise Squeezing and its Application to the Gravitational Wave Detector and On-chip Quantum Circuits

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NO.	DATE 日期	SPEAKER 报告人	INSITUTE 单位	TITLE 报告题目
59	2019-10-10	Jie Du 杜 洁	Tsinghua University 清华大学	High-order Bound-preserving Discontinuous Galerkin Method for Stiff Multispecies Detonation
60	2018-9-28	Jian-Dong Guo 郭建东	Institute of Physics (CAS) 中国科学院物理研究所	等离激元的实验观测及其界面效应
61	2018-9-18	Lu-Xia Wang 王鹿霞	Department of Physics, University of Science and Technology Beijing 北京科技大学物理系	分子聚集体中的多激子动力学及金属纳米粒子的等离激元效应
62	2018-9-11	Gayanath Fernando	University of Connecticut, USA 美国康涅狄格大学	Titled Dirac Cones, Non-Symmorpic Symmetries and Possible Odd Frequency Superconductivity in Quasi-Two-Dimensional Organic Salts
63	2018-8-7	Mark Tuckerman	Department of Chemistry and Courant Institute of Mathematical Sciences, New York University, USA 美国纽约大学化学系和库恩特数学研究所	Molecular Dynamics Based Exploration and Learning of Free Energy Landscapes of Oligopeptides and Atomic and Molecular Crystals
64	2018-8-7	Run-Dong Zhao	Mechanical Engineering and Materials Science, Duke University 杜克大学机械工程与材料科学	Relativistic Energy Band Theory: The Exact Two-Component Algorithm and Its Code Implementation
65	2018-8-31	Arun Bansil	Physics Department, Northeastern University, USA 美国东北大学物理系	Toward a First-Principles Description of Stronger Correlations: Stripe and Magnetic Phases in Cupates to Topological Materials
66	2018-8-21	Xue-Feng Zhang 张学锋	College of Physics, Chongqing University 重庆大学物理学院	Frustrated Optical Lattice: From Topological Excitations to Deconfined Phase Transition
67	2018-8-21	Zhong-Yi Huang 黄忠亿	Department of Mathematical Sciences, Tsinghua University 清华大学数学科学学院	Asymptotic Analysis and Numerical Method for Singularly Perturbed Eigenvalue Problems
68	2018-8-21	Ruo Li 李 若	School of Mathematical Sciences, Peking University 北京大学数学科学学院	13-Moment System with Global Hyperbolicity for Quantum Gas

69	2018-8-20	Shu-Yang Dai 戴书洋	School of Mathematics and Statistics, Wuhan University 武汉大学数学与统计学院	Modeling and Simulations of Continuum Dislocation Array Dynamics
70	2018-8-20	Roberto Car	Princeton University&CSRC 普林斯顿大学和北京计算科学研究中心	Variational Approach to Monte Carlo Renormalization Group
71	2018-8-20	Xie Chen 陈　谐	California Institute of Technology, USA 美国加州理工学院	Fracton Order
72	2018-8-14	Diogo Bolster	Department of Civil & Environmental Engineering & Earth Sciences, University of Notre Dame, USA 美国圣母大学	Incomplete Mixing in Reactive Systems - Modeling up the Scales of Complexity
73	2018-8-13	Yu-Bin Yan	Department of Mathematics, University of Chester, UK 英国切斯特大学数学系	An Analysis of the Modified L1 Scheme for the Time-Fractional Partial Differential Equations with Nonsmooth Data
74	2018-8-12	Cheng Wang 王　成	University of Massachusetts Dartmouth, USA 美国马萨诸塞大学达特茅斯分校	A Positivity-Preserving Energy Stable Numerical Scheme for the Cahn-Hilliard Equation with Logarithmic Potential
75	2018-7-6	Dong-Ming Wei	Department of Mathematics, School of Science and Technology, Nazarbayev University, Kazakhstan 哈萨克斯坦纳扎尔巴耶夫大学科学技术学院数学系	Modelling and Simulation of Nonlinear Material Structures for Mechanical Pressure Sensing and Actuation Applications
76	2018-7-30	Angelo Bongiorno	Department of Chemistry, College of Staten Island (CUNY) 史泰登岛学院	Mechanical Properties of Epitaxial Graphene Films: Nanoindentation Experiments and DFT calculations
77	2018-7-25	Ke-Ji Liu 刘可伋	Shanghai University of Finance and Economics 上海财经大学	Direct Recovery of Wave-Penetrable Scatterers in a Stratified Ocean Waveguide
78	2018-7-25	Jin Cheng 程　晋	School of Mathematical Sciences, Fudan University 复旦大学数学系	Analyticity and Inverse Problems for PDE
79	2018-7-20	Gao-Feng Zheng 郑高峰	School of Mathematics and Statistics, Central China Normal University 华中师范大学数学与统计学院	Convergence of Solutions of the Weighted Allen-Cahn Equations to Brakke Flow
80	2018-7-19	Hong Qian	University of Washington, Seattle 美国华盛顿大学	Mathematicothermodynamics

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81	2018-7-19	Baruch Rosenstein	Electrophysics Department, NCTU 国立交通大学电子物理系	Charge Conserving Approach Alternative to the GW Approximation
82	2018-7-16	Ping Ao 敖　平	Shanghai Center for Quantitative Life Sciences and Physics Department, Shanghai University 上海大学定量生命科学国际研究中心	Emerging of "Hamiltonian" in General Nonequilibrium Processes
83	2018-7-16	Min Wang 汪　敏	Department of Mathematics and Statistics, Texas Tech University, USA 美国德克萨斯理工大学数学与统计系	An Introduction to Bayesian Hypothesis Testing for ANOVA Designs
84	2018-7-16	Dimitrie Culcer	University of New South Wales, Australia 澳大利亚新南威尔士大学	Quantum Kinetic Theory of Magneto-Transport in Topological Materials
85	2018-7-11	Tong-Ke Wang 王同科	Tianjin Normal University, School of Mathematical Sciences 天津师范大学数学科学学院	The Computation of Singular Integrals and Singular Volterra Integral Equations of the Second Kind Using Puiseux Expansions
86	2018-7-11	Zhi-Yue Zhang 张志跃	Nanjing Normal University, School of Mathematical Sciences 南京师范大学数学科学学院	Control Problem with PDE Constraints
87	2018-7-11	Ru-Qian Wu	Department of Physics and Astronomy, University of California, Irvine 加州大学尔湾分校物理与天文学系	Sources of Magnetic Fluctuation on Surface of Qubits
88	2018-6-8	Man Fang 方　满	University of South Carolina, USA 美国南卡罗来纳大学	Color, Drama & Symmetry
89	2018-6-8	Hui Xie 谢　辉	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	A Positivity-Preserving Finite Volume Scheme for 3D Radiation Diffusion Problems
90	2018-6-29	Si-Qin Cao	Chemistry Department, The Hong Kong University of Science and Technology 香港科技大学化学系	Extend the Applicability of MSM with the Consideration of the Memory Kernel

91	2018-6-29	Zhou Li 李　舟	RIKEN, Japan 日本理化所	Exotic Response in Topological Materials
92	2018-6-28	Xian-Min Xu 许现民	Institute of Computational Mathematics and Scientific\ Engineering Computing, CAS 计算数学与科学工程计算研究所	Onsager Principle as an Approximation Tool for Complex Two-Phase Flow Problems
93	2018-6-27	Yan Xue 薛　艳	School of Physics, Jilin University 吉林大学物理学院	微腔激子极化激元玻色爱因斯坦凝聚中关于孤子的研究
94	2018-6-14	Kah Chun Lau	California State University Northridge, USA 美国加利福尼亚州立大学北岭分校	Atomistic Simulation in Lithium-Sulfur Battery
95	2018-6-13	Shao-Hao Chen 陈少豪	Research Computing Group, Boston University, USA 美国波士顿大学	High-Performance Computing, Attosecond Physics and Deep Learning
96	2018-6-11	Long-Hua Zhao 赵龙花	Case Western Reserve University, USA 美国凯斯西储大学	Fluid-Structure Interactions with Biological Applications
97	2018-5-8	Wen-Jian Liu 刘文剑	Peking University 北京大学	The Big Picture of Relativistic Molecular Quantum Mechanics
98	2018-5-30	Emad Tajkhorshid	University of Illinois at Urbana-Champaign, USA 美国伊利诺伊大学香槟分校	High-Resolution Characterization of Biological Membranes and Membrane Proteins in Action
99	2018-5-29	Wen-Li Zou 邹文利	School of Physics, Northwest University 西北大学物理学院	精确相对论方法X2C及其在分子科学中的应用
100	2018-5-22	Robert Shekhter	Department of Physics, University of Gothenburg (Sweden) 瑞典哥德堡大学物理系	Mechanical Transportation of Electric Charge and Magnetic Spin in Electronic Nanodevices
101	2018-5-18	Jian-Hua Jiang 蒋建华	Soochow University 苏州大学	Inelastic Thermoelectricity: A New Light of an Old Field
102	2018-5-16	Hai-Jun Wu 武海军	Nanjing University 南京大学	FEM and CIP-FEM for Helmholtz Equation with High Wave Number and PML Truncation
103	2018-4-25	Zhong-Hua Qiao	Department of Applied Mathematics, The Hong Kong Polytechnic University 香港理工大学应用数学系	Semi-Implicit Methods for Phase Field Equations

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104	2018-4-24	Jing Huang	Principal Investigator, Westlake University 西湖大学	Improving the Accuracy of Molecular Simulations with Better Force Fields
105	2018-4-23	Oleg Prezhdo	University of Southern California, USA 美国南卡罗来纳大学	Excited State Dynamics of Photoexcited Charge Carriers in Halide Perovskites: Time-Domain Ab Initio Studies
106	2018-3-31	Jia-Chang Sun 孙家昶	Institute of Software, CAS 中科院软件所	Iso-Spectral Problem and Computational Mathematica
107	2018-3-23	Panagiotis Kotetes	Niels Bohr Institute, University of Copenhagen, Denmark 丹麦哥本哈根大学	Hybridization at Superconductor-Semiconductor Interfaces
108	2018-3-16	Robert Joynt	Department of Physics, University of Wisconsin-Madison, USA 美国威斯康星大学麦迪逊分校物理系	Steering of Random Spin Systems for Fast Quantum Annealing
109	2018-3-16	Nicholas Zabaras	Center for Informatics and Computational Science, University of Notre Dame, USA 美国圣母大学信息与计算科学中心	Bayesian Deep Learning as a Paradigm for Uncertainty Quantification in Scientific Computing
110	2018-3-1	Gérard Labrosse	CEO of “TchebyFlow” TchebyFlow公司	TchebyFlow: A New Generation of Scientific Computing Where Accuracy is Unlimited
111	2018-2-9	Hong-Jun Xiang 向红军	Department of Physics, Fudan University 复旦大学物理系	Theoretical Studies on Two-Dimensional Ferroelectrics and Ferromagnets
112	2018-2-7	Yan-Qing Hu 胡延庆	Sun-Yat Sen University 中山大学数据科学与计算机学院	渗流相变理论在社交网络中的应用
113	2018-2-6	Xian-Gang Wan 万贤纲	School of Physics, Nanjing University 南京大学物理系	Realization of Massive Relativistic Spin-3/2 Rarita-Schwinger Quasiparticle in Condensed Matter Systems
114	2018-2-5	Bruno Mota	Federal University of Rio de Janeiro, Brazil 巴西里约热内卢联邦大学	A Universal Scaling Rule for the Morphology of the Cerebral Cortex

115	2018-1-9	Jia Zhao 赵　佳	Utah State University, USA 美国犹他州立大学	Fully Discrete Second-order Linear Schemes for Hydrodynamic Phase Field Models of Binary Viscous Fluid Flows with Variable Densities
116	2018-1-8	Huan Lei	Pacific Northwest National Lab, USA 美国太平洋西北国家实验室	Data-Driven Modeling of Multiphysics Systems
117	2018-1-8	Xiao-Feng Yang 杨霄锋	University of South Carolina, USA 美国南卡罗来纳大学	On the Numerical Approximations for the Magneto-Hydrodynamic Equations: A Fully Decoupled, Linear and Unconditionally Energy Stable Scheme
118	2018-1-5	On Shun Pak	Santa Clara University, USA 美国圣塔克拉拉大学	Complex Life at Low Reynolds Number
119	2018-1-4	Carsten Carstensen	Humboldt-Universität zu Berlin, Germany 德国洪堡大学	Adaptivite Least Squares Finite Element Methods
120	2018-1-4	Jun Hu 胡　俊	School of Mathematical Sciences, Peking University 北京大学数学科学学院	Nodal Finite Element Methods
121	2018-1-30	Ji-Jun Zhao 赵纪军	Dalian University of Technology 大连理工大学	二维层内异质结的界面结构、生长机理与电子性质
122	2018-1-29	Xin Liu 刘　歆	Academy of Mathematics and Systems Science (CAS) 中国科学院数学与系统科学研究院	A Parallelizable Algorithm for Orthogonally Constrained Optimization Problems
123	2018-1-29	Qiu-Mei Huang 黄秋梅	Beijing University of Technology 北京工业大学	Continuous Galerkin Solutions for Delay Differential Equations of Pantograph Type
124	2018-12-6	Xin-Zheng Li 李新征	School of Physics, Peking University 北京大学物理学院	基于玻恩-黄展开的凝聚态体系第一性原理物性模拟
125	2018-1-25	Xiao-Jing Hao	University of New South Wales, Australia 澳大利亚新南威尔士大学	Promise, Progress and Challenges of Earth-Abundant and Environmentally-Friendly CZTS Solar Cells
126	2018-1-23	Hao-Huan Fu 付昊桓	National Supercomputing Center in Wuxi 国家超级计算无锡中心	神威•太湖之光：系统及应用

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127	2018-12-26	Jia-Lin Hong 洪佳林	Institute of Computational Mathematics and Scientific/ Engineering Computing, Academy of Mathematics and Systems Science, CAS 中国科学院计算数学与科学工程计算研究所，中科院数学与系统科学研究院	A Review on Symplectic Numerical Methods for Hamiltonian Systems
128	2018-12-26	Cheng Wang 王　成	University of Massachusetts Dartmouth, USA 美国马萨诸塞大学达特茅斯分校	Energy Stable Fourth Order Finite Difference Scheme for the Cahn-Hilliard Equation
129	2018-12-25	Eli Pollak	Weizmann Institute of Science, Israel 以色列魏兹曼科学研究所	The Path Leading from Protein Folding Transition Times to Quantum Tunneling Times
130	2018-12-19	Yuan Lou 楼　元	Ohio State University, USA & Renmin University of China 美国俄亥俄州立大学和中国人民大学	Asympototic Properties of Principle Eigenvalue for Some Elliptic Operators
131	2018-12-13	Yu-Jun Zhao 赵宇军	Department of Physics, South China University of Technology 华南理工大学物理系	Novel Structure Representation and Comparison for Cluster, Quasicrystal, and Crystal
132	2018-12-10	Xiao-Yu Yang 杨小渝	Computer Network Information Center (CAS) 中国科学院计算机网络信息中心	通过上传VASP计算结果文件快速构建材料计算数据库的方法和技术
133	2018-12-10	Yong-Sheng Zhang 张永生	University of Science and Technology of China 中国科学技术大学	使用弱测量方法分割量子纠缠非局域性
134	2018-12-10	Hong Jiang 蒋　鸿	College of Chemistry, Peking University 北京大学化学学院	First-Principles Approaches to Electronic Band Structure of Materials
135	2018-1-2	Cheng Wang 王　成	University of Massachusetts Dartmouth, USA 美国马萨诸塞大学达特茅斯分校	The Strong-Stability-Preserving (SSP) scheme for the Integrating Factor (IF) form of Exponential Time Differencing (ETD) problems
136	2018-1-16	Qi Ye 叶　祺	Sogou Inc. 搜狗公司	Machine Learning Techniques in Sponsored Search

137	2018-1-16	Niall Madden	National University of Ireland, Galway 爱尔兰国立高威大学	Robust Preconditioning for Singularly Perturbed Differential Equations
138	2018-11-6	Tillman Klamroth	University of Potsdam, Theoretical Chemistry, Germany 德国波茨坦大学理论化学	Simulations of Laser- and STM-Driven Reactions at Surfaces: Electronic Structure and Dynamics
139	2018-11-5	Yogesh Joglekar	Department of Physics, Indiana University-Purdue University Indianapolis (IUPUI), USA 美国印第安纳大学-普渡大学印第安纳波利斯分校	Parity-Time (PT) Symmetric “Hamiltonians” and Open Quantum and Classical Systems
140	2018-11-30	Gilberto Teobaldi	Stephenson Institute for Renewable Energy (SIRE), University of Liverpool, UK 英国利物浦大学斯蒂芬森可再生能源研究所	The (Untapped) Potential of Inorganic Nanotubes as Polarization-Enhanced (Co-)(Photo-)Catalyst: The Imogolite Case
141	2018-11-21	Chang-Pin Li	Department of Mathematics, Shanghai University 上海大学数学系	The Discontinuous Galerkin Finite Element Methods for Caputo-Type Partial Differential Equations
142	2018-11-20	Dimitrie Culcer	University of New South Wales, Australia 澳大利亚新南威尔士大学	Donor Clusters: Ground State, Exchange and Future Prospects
143	2018-11-1	Xiang-Gang Qiu 邱祥冈	Institute of Physics (CAS) 中国科学院物理研究所	铁基超导体的远红外光谱学研究
144	2018-1-10	Yue-Zheng Gong 龚跃政	Nanjing University of Aeronautics and Astronautics 南京航空航天大学	Second Order Fully-Discrete Energy Stable Methods on Staggered Grids for Hydrodynamic Phase Field Models of Binary Fluid Mixtures
145	2018-10-29	Ling Jiang 江　凌	Dalian Institute of Chemical Physics (CAS) 中科院大连化学物理研究所	团簇光谱及动力学研究
146	2018-10-26	Zi-Xiang Hu 胡自翔	College of Physics, Chongqing University 重庆大学物理学院	Quasiparticle Tunneling and Its Scaling in the Fractional Quantum Hall Effects
147	2018-10-23	Rosario Fazio	International Center for Theoretical Physics (ICTP), Italy 意大利国际理论物理中心	Quantum Time-Crystals
148	2018-10-18	David E. Keyes	Extreme Computing Research Center, King Abdullah University of Science and Technology 阿卜杜拉国王科技大学极限计算研究中心	Algorithmic Adaptations to Extreme Scale Computing

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NO.	DATE 日期	SPEAKER 报告人	INSITUTE 单位	TITLE 报告题目
149	2018-10-17	Ling-An Wu 吴令安	Institute of Physics (CAS) & University of Chinese Academy of Sciences, China 中国科学院物理研究所&中国科学院大学	X-Ray Ghost Imaging
150	2018-10-17	José Carlos Egues	University of São Paulo, Brazil 巴西圣保罗大学	Topological and Non-Topological Edge States in Quantum Dots and Chern Insulators
151	2018-10-16	Lev Shchur	Landau Institute for Theoretical Physics, Science Center in Chernogolovka, Russia 朗道理论物理研究所	Recent Developments with the Population Annealing Algorithm
152	2018-10-15	Jean-Pierre Leburton	University of Illinois at Urbana-Champaign, USA 美国伊利诺伊大学香槟分校	2D Materials for Bio-Sensing
153	2018-10-11	Lev Shchur	Landau Institute for Theoretical Physics, Science Center in Chernogolovka, Russia 朗道理论物理研究所	Timescales in the Wang-Landau Algorithm
154	2018-10-11	Bin Shan 单　斌	Huazhong University of Science and Technology 华中科技大学	贵金属催化剂的原子尺度设计
155	2017-9-8	Jun Li 李　俊	Department of Physics, Xiamen University 厦门大学物理系	Spin Photocurrents and Spin Injection in Semiconductors
156	2017-9-7	Bing-Sheng He 何炳生	Southern University of Science and Technology 南方科技大学	凸优化的分裂收缩算法
157	2017-9-12	Kazuhiro Yabana	Center for Computational Sciences, University of Tsukuba, Japan 日本筑波大学计算科学中心	Ab-initio Simulations for Attosecond Spectroscopy in Solids
158	2017-8-29	Liang Hong 洪　亮	School of Physics and Astronomy & Institute of Natural Sciences, Shanghai Jiao Tong University 上海交通大学物理与天文系	Neutron Scattering on Fully Deuterated Protein

159	2017-8-28	Qi-Min Yan 严琪闽	Department of Physics, Temple University, USA 美国天普大学物理系	Discovery of Solar Fuels Photoanode Materials with a Combination of High-Throughput Theory and Experiment
160	2017-8-28	Peter Deak Peter Deak	Bremen Center for Computational Materials Science, Universität Bremen, Germany 德国不来梅大学不来梅计算材料科学中心	Calculating Polarons in TiO2
161	2017-8-23	Zhang-Xing Chen 陈掌星	Department of Chemical & Petroleum Engineering, University of Calgary, Canada 加拿大卡尔加里大学化学与石油工程系	Unconventional Oil and Gas Reservoir Modeling and Simulation
162	2017-8-2	Hang Si 斯　杭	Weierstrass Institute (WIAS), Germany 德国维尔斯特拉斯研究所	An Introduction to Delaunay-based Mesh Generation and Adaptation
163	2017-8-1	Sheng Hui	Lewis-Sigler Institute for Integrative Genomics, Princeton University 普林斯顿大学	Glucose Feeds the TCA Cycle via Circulating Lactate
164	2017-7-6	Wei-Guo Yin 尹卫国	Condensed Matter Physics and Materials Science Division, Brookhaven National Laboratory, USA 美国布鲁克黑文国家实验室凝聚态物理与材料科学系	Novel Magnetism in Mixed 3d-5d Materials
165	2017-7-5	Remi Abgrall	University of Zurich, Zürich 苏黎世大学	Approximation of Transport Equations with Continuous Finite Elements: The Issue of the Mass Matrix
166	2017-7-3	Oleg Prezhdo	University of Southern California, USA 美国南卡罗来纳大学	Nonadiabatic Molecular Dynamics with Time-Domain Density Functional Theory
167	2017-7-3	Xiu Ye 叶　秀	University of Arkansas - Little Rock, USA 美国阿肯色大学小石城分校	The Weak Galerkin Method and Its Applications
168	2017-7-3	Ying Lu	Department of System Biology, Harvard Medical School 哈佛医学院系统生物学系	Kinetic and Structural Analysis of the 26S Proteasome
169	2017-7-28	Ying-Hai Wu 吴英海	Max Planck Institute of Quantum Optics, Germany 德国马克斯·普朗克量子光学研究所	Topological States of Bosons and Fermions in Synthetic Magnetic Fields
170	2017-7-19	Cheng Wang 王　成	University of Massachusetts Dartmouth, USA 美国马萨诸塞大学达特茅斯分校	A Second Order Accurate Energy Stable Linear Scheme for the Epitaxial Thin Film Growth Model Without Slope Selection

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171	2017-7-19	Jing Chen 陈 婧	Department of Biological Sciences, Virginia Tech, USA 美国弗吉尼亚理工大学生物科学系	Modeling Spatiotemporal Regulation of Mitotic Spindle Assembly Checkpoint
172	2017-7-17	Gang Yin 殷 刚	Wayne State University, USA 美国韦恩州立大学	Stochastic Systems Having Continuous Dynamics and Discrete Events and Applications
173	2017-6-6	Shao-Chun Chen 陈绍春	Zhengzhou University 郑州大学	Finite Elements for Some Singular Perturbation Problems
174	2017-6-6	Li Yang Li Yang	Department of Physics, Washington University in St Louis, USA 美国圣路易斯华盛顿大学物理系	Black Phosphorus and Beyond
175	2017-6-6	Guang-Ming Xie 谢广明	College of Engineering, Peking University 北京大学工学院	共融水下仿生机器人
176	2017-6-30	Wolfgang Bangerth	Colorado State University, USA 美国科罗拉多州立大学	Complex Simulations: From Numerical Mathematics via Software to Applications
177	2017-6-28	Patrick Sit	School of Energy and Environment, City University of Hong Kong 香港城市大学能源与环境学院	Ab initio Study of Novel Materials for Energy Conversion and Storage
178	2017-6-28	Jin Shang 尚 进	School of Energy and Environment, City University of Hong Kong 香港城市大学能源与环境学院	Active Adsorbents for Molecular Separation
179	2017-6-27	Joseph H. Eberly	Center for Coherence and Quantum Optics, University of Rochester, USA 美国罗切斯特大学相干和量子光学中心	Duality in Physics - the Role of Entanglement
180	2017-6-22	Jie Song 宋 劼	Purdue University, USA 美国普渡大学	Tensor Model for Bent-Core Liquid Crystals Based on Molecular Theory
181	2017-6-22	Yang Yang 杨 扬	Michigan State University, USA 美国密歇根州立大学	Photo-Acoustic and Thermo-Acoustic Tomography in an Inhomogeneous Medium

182	2017-6-2	Ping Lin 林　平	University of Dundee and University of Science and Technology Beijing 邓迪大学和北京科技大学	Mass Conservative and Energy Stable Finite Difference Methods for the Quasi-incompressible Navier-Stokes-Cahn-Hilliard System: Primitive Variable and Projection-Type Schemes
183	2017-6-15	Xue-Yu Song 宋学煜	Iowa State University, USA 美国爱荷华州立大学	Theoretical Prediction of Crystallization Kinetics of a Supercooled Fluid
184	2017-6-15	Hao Ge 葛　颢	Beijing International Center for Mathematical Research, Peking University 北京大学北京国际数学研究中心	Nonequilibrium Stochastic Processes at Single-Molecule and Single-Cell Levels
185	2017-6-14	K. Senthilkumar	Department of Physics, Bharathiar University, India 印度巴拉蒂亚尔大学物理系	Application of DFT to Find and Tune the Suitable Materials for Solar Energy Applications
186	2017-6-12	John Ekaterinaris	Embry-Riddle Aeronautical University, USA 美国安柏里德航空大学	Adaptive Mesh Refinement and Sub-Cell Discontinuity Resolution for High Order Discontinuous Galerkin Discretizations
187	2017-5-8	Klavs Hansen	Tianjin International Center of Nanoparticles and Nanosystems, Tianjin University 天津大学	Single Photon Transient Hot Electron Ionization of C60
188	2017-5-5	Jun Zhang 张　骏	Department of Physics and Courant Institute, New York University, USA 美国纽约大学物理与库仑研究所	Thermal Convection Dictated by Non-Trivial Boundary Conditions
189	2017-5-26	Katharina Schratz	Karlsruhe Institute of Technology, Germany 德国卡尔斯鲁厄理工学院	Exponential-Type Time Integrators for Nonlinear Schrödinger, Korteweg-De Vries and Klein-Gordon Type Equations
190	2017-5-22	Yavar Kian	University of Aix-Marseille, France 法国艾克斯-马赛大学	Determination of Time-Dependent Coefficients for Hyperbolic Equations
191	2017-5-17	Xiao-Quan Yu	University of Otago, New Zealand 新西兰奥塔哥大学	Hydrodynamics of Quantum Vortices in Two Dimensions
192	2017-5-17	Blair Blakie	University of Otago, New Zealand 新西兰奥塔哥大学	Self-Bound Droplets of a Dipolar Bose-Einstein Condensate: Stabilized by The Lee-Huang-Yang Corrections
193	2017-5-10	Garth N. Wells	Department of Engineering, University of Cambridge, UK 英国剑桥大学工程系	Automating Scientific Computing

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194	2017-5-10	Hai-Gang Li 李海刚	School of Mathematical Sciences, Beijing Normal University 北京师范大学数学科学学院	Optimal Estimates for Elliptic Equations and Systems from Composite Material
195	2017-4-5	Jian-Guo Yu 于建国	Middle Tennessee State University, USA 美国田纳西州立大学	GPU量化程序TeraChem, 功能和应用
196	2017-4-27	Jing Yuan 袁　景	School of Mathematics and Statistics, Xidian University 西安电子科技大学数学与统计学院	High-Performance Dual Optimization Theory and Algorithms to Medical Image Analysis and Machine Learning
197	2017-4-27	Ismail Ben Ayed	ETS, University of Quebec, Canada 加拿大魁北克大学	High-Order Graphs in Computer Vision: A Pseudo-Bound Optimization Approach
198	2017-4-14	Javier Carrasco	CIC Energigune, Spain 西班牙CIC能源中心	Atomistic Modelling of Materials for Rechargeable Batteries
199	2017-4-13	Hai Zhang 张　海	Department of Mathematics, Hong Kong University of Science and Technology 香港科技大学数学系	Wave Scattering by Sub-Wavelength Resonators and Their Applications
200	2017-4-13	Wen-Jia Jing 荆文甲	Yau Mathematical Sciences Center, Tsinghua University 清华大学丘成桐数学科学中心	Homogenization Theory, Random Fluctuations and Inverse Problems
201	2017-4-11	Qian-Fan Zhang 张千帆	School of Materials Science and Engineering, Beihang University 北京航空航天大学材料科学与工程学院	Theoretical and Modeling Design on Both Cathode and Anode Material System of Lithium-Sulfur Battery
202	2017-3-30	Cen-Ke Xu 许岑珂	Department of Physics, UC Santa Barbara, USA 美国加州圣塔芭芭拉分校物理系	Theory, Numerics, and Experimental Platform for Bosonic Symmetry Protected Topological States
203	2017-3-28	Stefano Leoni	Materials Discovery Group, School of Chemistry, Cardiff University, UK 英国卡迪夫大学化学学院	Mass a Ion Diffusion/Transport, and Voltage Evaluation in Battery Materials –An Integral Computational Approach
204	2017-3-27	Zhi-Yuan Li 李志远	South China University of Technology 华南理工大学	光和物质相互作用：从宏观到微观

205	2017-3-2	Jian-Guo Ma 马建国	Beihang University, China 北京航空航天大学	生物医学中的光声非线性影像: 光片荧光成像和超声谐波成像
206	2017-3-10	Xian-Rong Wang 王向荣	Department of Physics, The Hong Kong University of Science and Technology 香港科技大学物理系	Topologically Protected Unidirectional Edge Spin Waves and Beam Splitter
207	2017-2-15	Sergei Maslov	University of Illinois Urbana-Champaign, USA 美国伊利诺伊大学香槟分校	Using Deep Learning to Predict Drug Response in Cancer
208	2017-1-9	Jin-Hui Wu 吴金辉	Center for Quantum Sciences, Northeast Normal University, China 东北师范大学量子科学中心	Nonequilibrium phase transitions and single-photon interaction dynamics in Rydberg atoms
209	2017-1-5	Zhen-Nan Zhou 周珍楠	Duke University, USA 美国杜克大学	Towards a mathematical understanding of surface hopping algorithms
210	2017-1-3	Shi-Wei Zhang 张世伟	College of William and Mary,USA 美国威廉和玛丽学院	Ab initio computations of electron correlation effects: an auxiliary-field perspective
211	2017-12-8	Zi-Xiang Hu 胡自翔	College of Physics, Chongqing University 重庆大学物理学院	The Pseudopotential Description of the Fractional Quantum Hall Effect without Rotational Symmetry
212	2017-12-8	Li-Xin He 何力新	CAS Key Laboratory of Quantum Information, USTC 中国科学技术大学量子信息重点实验室	基于原子轨道基组的第一性原理计算软件ABACUS介绍
213	2017-1-23	Min Li 李　敏	China Center for Industrial Security Research, Beijing Jiaotong University 北京交通大学中国产业安全研究中心	世界领先的数据图库Neo4j
214	2017-12-26	Yong-Hyun Kim	Graduate School of Nanoscience and Technology & Department of Physics, KAIST 韩国科学技术院	Understanding Nanoscale Friction in Two-Dimensional Materials
215	2017-12-25	Cheng-Hua Sun 孙成华	Swinburne University of Technology, Australia 澳大利亚斯威本科技大学	世界性挑战：室温合成氨
216	2017-12-19	Oleg Prezhdo	University of Southern California, USA 美国南卡罗来纳大学	Quantum Dots – Artificial Atoms, Large Molecules or Small Pieces of Bulk? Insights from Time-Domain Ab Initio Studies

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217	2017-12-15	Yan-Hui Wang 王延辉	School of Electronics Engineering and Computer Science, Peking University 北京大学信息科学技术学院	磁选态-光检测小型铯原子钟研制进展
218	2017-12-13	Lin He 何　林	Department of Physics, Beijing Normal University 北京师范大学物理系	石墨烯中新奇量子物态的研究
219	2017-12-11	Wei Sha 沙　威	College of Information Science and Electronic Engineering, Zhejiang University 浙江大学信息与电子工程学院	Modeling, Understanding, and Manipulating Nonlinear Responses in Plasmonic Nanostructures
220	2017-11-8	Jing Wang 王　靖	Fudan University 复旦大学	Chiral Majorana Fermion Mode from Quantum Anomalous Hall Plateau Transitions
221	2017-11-8	Wei Zhang 张　伟	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Optical Properties of Hybrid Nanostructures: The Interference Effect
222	2017-11-28	Tao Cui 崔　涛	Academy of Mathematics and Systems Science (CAS) 中国科学院数学与系统科学研究院	PHG: A Framework for Parallel Adaptive Finite Element Method and Its Application on Heterogeneous Computer
223	2017-11-23	Tie-Jun Li 李铁军	School of Mathematical Sciences, Peking University 北京大学数学科学学院	Inferring Biological Networks with Strong Connections
224	2017-11-20	Mo-Han Chen	Department of Physics, Temple University, USA 美国天普大学物理系	First-Principles Molecular Dynamics Simulations of Liquid Water and Lithium
225	2017-1-12	Xi-Jun Yu 蔚喜军	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Local Discontinuous Galerkin Method Coupled with Implicit Integration Factor Methods for Reaction-Diffusion Systems
226	2017-11-2	Sheng-Jun Yuan 袁声军	School of Physics and Technology, Wuhan University 武汉大学物理科学与技术学院	A New Approach for the Mesoscopic and Macroscopic Modeling of Quantum Systems: Application in 2D Materials

227	2017-11-15	Daron M. Standley	Research Institute for Microbial Diseases, Osaka University, Japan 日本大阪大学微生物疾病研究所	Quantifying Structural and Functional Convergence in Immune Cell Repertoires
228	2017-11-15	Cristián G. Sánchez	National University of Córdoba, Argentina 阿根廷科尔多瓦国立大学	Plasmon-Driven Sub-Picosecond Breathing of Metal Nanoparticles
229	2017-11-10	Rosario Fazio	International Center for Theoretical Physics (ICTP), Italy 意大利国际理论物理中心	Dissipative Phase Transitions
230	2017-1-10	Qiang-Feng Zhang 张强锋	School of Life Sciences, Tsinghua University 清华大学生命科学学院	RNA Structurome Reveals a Hidden Layer of Complexity in Gene Regulation
231	2017-1-10	Robert Joynt	Department of Physics, University of Wisconsin-Madison, USA 美国威斯康星大学麦迪逊分校物理系	Interband Theory of Kerr Rotation in Unconventional Superconductors
232	2017-10-31	Wan-Tao Lu 鲁汪涛	Zhejiang University 浙江大学	Perfectly-Matched-Layer Boundary Integral Equation Method for Wave Scattering in A Layered Medium
233	2017-10-24	Xiao-Bao Yang 杨小宝	South China University of Technology 华南理工大学	第一原理高通量计算方法在合金结构搜索中的应用
234	2017-10-20	Tian-Yu Zhang	Department of Mathematical Sciences, Montana State University, USA 美国蒙大拿州立大学数学科学系	Metabolic Models at Community Scale
235	2017-10-18	Li-Zhi Zhang 张礼智	Center for Nanophase Materials Sciences, Oak Ridge National Laboratory, USA 美国橡树岭国家实验室纳米相材料科学中心	Prediction of New Intrinsic 2D Organic Topological Insulators
236	2017-10-17	Juarez L. F. Da Silva	São Carlos Institute of Chemistry, University of São Paulo, Brazil 巴西圣保罗大学圣卡洛斯化学研究所	Challenges in the Study of Transition-Metal Finite-Size Particles
237	2017-10-10	Dietmar Hoemberg	Technical University of Berlin&Weierstrass Institute for Applied Analysis and Stochastics(WIAS), Germany 德国柏林工业大学＆魏尔斯特拉斯应用分析与随机研究所	Joule Heating Models - Modelling, Analysis and Industrial Application
238	2016-9-8	Bin Dong 董　彬	Beijing International Center for Mathematical Research, Peking University 北京大学国际数学研究中心	Sparse Approximation of Tight Frames for CT Image Reconstruction, and Beyond

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239	2016-9-7	Jun Huang	Purdue University, USA 美国普渡大学	Nanoelectronic Device Simulation with NEMO5—A Novel Tunneling Transistor with Triple Heterojunctions
240	2016-9-30	Xiao-Ye Han 韩小野	Ford Motor Company and University of Windsor, Canada 福特汽车公司和加拿大温莎大学	Clean Combustion of Internal Combustion Engines
241	2016-9-20	Valerio Scarani	Department of Physics, National University of Singapore 新加坡国立大学物理系	Quantum Mirrors
242	2016-9-2	Ping-Bing Ming 明平兵	Academy of Mathematics and Systems Science, CAS 中科院数学与系统科学研究院	Least Squares Based High Order Numerical Method for Elliptic Multiscale Partial Differential Equations
243	2016-9-2	Simone Pigolotti	Universitat Politècnica de Catalunya, Spain 西班牙加泰罗尼亚政治大学	Populations in Fluids and the Importance of Diffusing Faster
244	2016-9-13	Jin Zhang 张　进	School of Mathematical Sciences, Shandong Normal University 山东师范大学数学科学院	Supercloseness of Continuous Interior Penalty Methods
245	2016-9-13	Jun Jing 景　俊	Institute of atomic and molecular physics, Jilin University 吉林大学原子与分子物理研究所	From Open Quantum Mechanics to Quantum Control
246	2016-9-12	Jesús María Sanz-Serna	Universidad Carlos III de Madrid, Spain 西班牙马德里卡洛斯三世大学	Simple Ergodic Variants of the Hamiltonian Monte Carlo Method
247	2016-8-9	Igor Boglaev	Institute of Fundamental Sciences, Massey University, New Zealand 新西兰梅西大学基础科学研究所	Monotone Numerical Methods for Nonlinear Parabolic Problems
248	2016-8-9	Ghassan Georges Batrouni	Physics Department, University of Nice- Sophia Antipolis, France 法国尼斯-索菲亚安提波利斯大学物理系	Quantum Monte Carlo Study Of The Rabi-Hubbard model
249	2016-8-9	Salvatore R. Manmana	Institute of Theoretical Physics, University of Göttingen, Germany 德国哥廷根大学理论物理研究所	Topological Phases and Superconductivity with Ultracold Polar Molecules

250	2016-8-9	Dieter Suter	University of Dortmund, Germany 德国多特蒙德大学	Spins as Qubits for Quantum Computing and Quantum Simulations
251	2016-8-9	Natalia Kopteva	Department of Mathematics and Statistics, University of Limerick, Ireland 爱尔兰利默里克大学数学与统计系	"A Posteriori Estimates for Singularly Perturbed Reaction-Diffusion Problems on Isotropic and Anisotropic Meshes "
252	2016-8-8	Matthieu Delbecq	Quantum Functional System Research Group, Center for Emergent Matter Science, RIKEN, Japan 日本理研大学新兴物质科学中心	Multi Spin Qubits Architecture as a Resource for Quantum Information Processing and for Probing Nuclear Spins Dynamics
253	2016-8-30	Peng Zhu	Department of Mathematics, Jiaxing University 嘉兴学院数学系	Uniform Convergence Analysis of High Order IPDG Methods for Singularly Perturbed Problem
254	2016-8-26	Li-Hui Chai	Department of Mathematics, University of California, Santa Barbara, USA 美国加利福尼亚大学圣塔芭芭拉分校数学系	Semiclassical Limit of the Schrodinger-Poisson-Landau-Lifshitz-Gilbert System
255	2016-8-25	Li-Min Wang 王利民	Institute of Process Engineering, CAS 中国科学院过程工程研究所	气固流动的格子Boltzmann模拟及最新应用
256	2016-8-25	Natan Andrei	Department of Physics and Astronomy, Rutgers University, USA 美国罗格斯大学物理与天文学系	Non-Equilibrium Dynamics of Quantum Integrable Systems
257	2016-8-24	Yue Fan 范　悦	Oak Ridge National Laboratory, USA 美国橡树岭国家实验室	Mechanics of Structural Materials away from Equilibrium: a Tale of Two Solids by Energy Landscape-based Atomistic Modeling
258	2016-8-23	Volker John	Weierstrass Institute for Applied Analysis and Stochastics & Free University of Berlin, Germany 魏尔斯特拉斯应用分析与随机研究所和德国柏林自由大学	On the Divergence Constraint in Mixed Finite Element Methods for Incompressible Flows
259	2016-8-23	Xiang Xu	Department of Mathematics and Statistics, Old Dominion University, USA 美国奥多明尼昂大学	Analysis and Numerics on a 2D Dynamic Q-Tensor Model
260	2016-8-23	Sebastian Franz	University of Technology in Dresden, Germany 德国德累斯顿工业大学	Numerical Methods for Changing-Type Systems
261	2016-8-22	Avy Soffer	Department of Mathematics, Rutgers University, USA 美国罗格斯大学数学系	Multi Time Scale Averaging to All Orders: Rigorous Theory, Theoretical and Computational Results

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NO.	DATE 日期	SPEAKER 报告人	INSITUTE 单位	TITLE 报告题目
262	2016-8-22	Edward S. Fry	Department of Physics, Texas A&M University, USA 美国德克萨斯农工大学物理系	Optics in Oceanography
263	2016-8-22	Wei-Bin Li 李伟斌	School of Physics, Huazhong University of Science and Technology 华中科技大学物理学院	Strongly Correlated Phases of Rydberg-Dressed Atoms in Optical Lattices
264	2016-8-22	Malte Braack	Department of Mathematics, University of Kiel, Germany 德国基尔大学数学系	Fishing Strategies as a Nonconvex Optimal Control Problem
265	2016-8-22	Hans-Goerg Roos	Department of Mathematics, Technical University of Dresden, Germany 德国德累斯顿工业大学数学系	Two Singularly Perturbed Question Marks
266	2016-8-19	Marcos Rigol	The Pennsylvania State University, USA 美国宾夕法尼亚州立大学	From Unitary Dynamics to Statistical Mechanics in Isolated Quantum Systems
267	2016-8-17	Ulrich Zuelicke	Victoria University of Wellington, New Zealand 新西兰惠灵顿维多利亚大学	Characterizing Topological Phases by Many-Particle Collective Properties
268	2016-8-17	Roland Winkler	Department of Physics, Northern Illinois University, USA 美国北伊利诺伊大学物理系	Effective Hamiltonian for Edge States in Graphene
269	2016-8-16	Yan-Li Wang 王艳丽	Institute of Biophysics, CAS 中科院生物物理研究所	How Does the CRISPR-Cas System Defend Against the Invasive Nucleic Acids?
270	2016-8-16	Hong Qian 钱　紘	University of Washington, Seattle, USA 美国华盛顿大学	Mathematical Models and a Theory of Biological Population Dynamics: From Cells to Ecology, Small and Large Systems
271	2016-8-15	Xiu Yang 杨　修	Mathematics and Data Division, Physical and Computational Sciences Directorate, Pacific Northwest National Laboratory, USA 美国太平洋西北国家实验室	Enhancing Sparsity in Uncertainty Quantification Problems by Iterative Rotations

272	2016-8-15	Hai-Bo Dong 董海波	University of Virginia, USA 美国弗吉尼亚大学	An Integrated Study of Biological Fluid Dynamics in Nature
273	2016-8-1	Yan-Xiang Zhao 赵雁翔	George Washington University, USA 美国乔治华盛顿大学	A Phase Field Model on Cell Migration
274	2016-7-7	Ding-Sheng Wang 王鼎盛	Institute of Physics, CAS 中科院物理研究所	Research Integrity and Scientific Ethics
275	2016-7-7	Jian-Hua Xing 邢建华	Department of Computational and Systems Biology, University of Pittsburph, USA 美国匹兹堡大学计算与系统生物学系	TGF-β Signal Transduction and Cell Fate Decision
276	2016-7-7	Chun-Mei Wang 王春梅	Texas State University, USA 美国德克萨斯农工大学	Weak Galerkin Finite Element Methods for Partial Differential Equations
277	2016-7-5	Qing-Shuo Song 宋清硕	Department of Mathematics, City University of Hong Kong 香港城市大学数学系	Probabilistic Perspective for Dirichlet Problem Associated to Integro-Differential Operator
278	2016-7-29	Jing-Wei Hu 胡婧玮	Purdue University, USA 美国普渡大学	A Fast Spectral Method for the Boltzmann Collision Operator with General Collision Kernel
279	2016-7-22	Raghuvir Pai	Department of Mechanical and Manufacturing, Manipal University, India 印度马尼帕尔大学机械与制造系	Computational Modeling and Analysis in Engineering and Bioengineering
280	2016-7-22	Jian-Liang Qian	Department of Mathematics, Michigan State University, USA 美国密歇根州立大学数学系	Fast Huygens Sweeping Methods for Helmholtz Equations in Inhomogeneous Media in the High Frequency Regime
281	2016-7-21	Cheng 王　成	Department of Mathematics, University of Massachusetts Dartmouth, USA 马萨诸塞州大学达特茅斯分校数学系	"Energy-Stable Pseudo-Spectral Numerical Scheme for the Cahn-Hilliard Equation and the Linear Iteration Algorithm "
282	2016-7-19	Hai-Liang Li 李海梁	Capital Normal University 首都师范大学	Spectrum Structure and Behaviors of Kinetic Equations
283	2016-7-19	Xavier Antoine	Institut Elie Cartan de Lorraine, Université de Lorraine, France 法国洛林大学	Quasi-Optimal Domain Decomposition Methods for Wave Equations

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284	2016-7-19	Shu Wang 王 术	College of Applied Sciences, Beijing University of Technology 北京工业大学应用数理学院	Some Topics On Nonlinear Fluid-dynamical Equations
285	2016-7-15	Chi-Wang Shu 舒其望	Division of Applied Mathematics, Brown University, USA 美国布朗大学应用数学系	Bound-Preserving High Order Schemes for Convection-Dominated Problems
286	2016-7-14	Ionut Danaila	Laboratoire de Mathematiques Raphael Salem, University of Rouen, France 法国鲁昂大学数学学院	Newton and Sobolev Gradient Methods for Fluid Flow Problems
287	2016-7-14	Luminita Danaila	CORIA, University of Rouen, France 法国鲁昂大学	Similarity of Variable Viscosity Flows
288	2016-7-14	Jorge Zubelli	Instituto Nacional de Matemática Pura Aplicada (IMPA), Brazil 巴西国家普拉研究所	Estimation of the Local Volatility from Option Data in the Dupire PDE Model
289	2016-7-12	Xu-Hui Huang 黄旭辉	Hong Kong University of Scientific and Technology 香港科技大学	From Molecular Dynamics to Genomic Biology: Constructing Kinetic Network Models to Elucidate Transcriptional Fidelity of RNA Polymerase II
290	2016-7-12	Wei Zhang 张 巍	Department of Electronic Engineering, Tsinghua University 清华大学电子工程系	光通信波段的光量子技术
291	2016-7-12	Yu-Shun Wang 王雨顺	School of Mathematical Sciences, Nanjing Normal University 南京师范大学数学科学学院	Structure-Preserving Algorithms for Partial Differential Equations
292	2016-7-1	Sumit Mazumdar	Department of Physics, University of Arizona, USA 美国亚利桑那大学物理系	From Paired-Electron Crystal to Superconductivity in the Frustrated Quarter-Filled Band
293	2016-6-8	Shmuel Gurvitz	Weizmann Institute of Science, Israel 以色列魏兹曼科学研究所	Single-Electron Approach for Time-Dependent Transport under External Noise

294	2016-6-7	Naomichi Hatano	The University of Tokyo, Japan 日本东京大学	Chebyshev Polynomial Expansions for Localization Length of Hermitian and Non-Hermitian Chains
295	2016-6-30	Fu-Yang Tian 田付阳	Department of Physics, University of Science&Technology Beijing 北京科技大学物理系	高熵合金的原子级模拟
296	2016-6-3	Yu-Xin Ren 任玉新	School of Aerospace Engineering, Tsinghua University 清华大学航天航空学院	非结构网格紧致模板高精度有限体积方法的若干问题
297	2016-6-3	Hee-Dae Kwon	Department of Mathematics, Inha University, South Korea 韩国仁荷大学数学系	Feedback Control of an HBV Model Based on Ensemble Kalman Filter and Differential Evolution
298	2016-6-3	Sung-Dae Yang	Korea National Institute of Meteorological Research (NIMS) 韩国国立气象科学研究所	ROC Analysis for Rain/No-Rain Classification method for Brightness Temperature over the Korean Peninsula
299	2016-6-23	Ilya Kuprov	School of Chemistry, University of Southampton, UK 英国南安普敦大学化学学院	Quantum Mechanical NMR Simulations of Whole Proteins
300	2016-6-23	Gui-Ren Wang	Biomedical Engineering Program and Department of Mechanical Engineering, University of South Carolina, USA 美国南卡罗来纳大学生物医学工程计划和机械工程系	Ultrahigh Spatiotemporal Resolution Optical Measurement and Microfluidics Applications
301	2016-6-21	Wei-Ying Zheng	Academy of Mathematics and Systems Science, CAS 中科院数学与系统科学研究院	Perfectly Matched Layer Method for Electromagnetic Scattering Problems in Layered Media
302	2016-6-21	Rosario Fazio	Scuola Normale Superiore, Italy 意大利苏维奥高等师范学校	Critical Heat Engines
303	2016-6-21	Francois Dubois	University Paris-Sud, France 法国巴黎南大学	Bounce-Back Boundary Condition at First Order
304	2016-6-2	Jia-Chang Sun 孙家昶	Institute of Software, CAS 中科院软件所	Some New Mathematical and Computational Aspects on Iso-spectral Problems
305	2016-6-2	Peng-Tao Yue	Department of Mathematics, Virginia Tech, USA 美国弗吉尼亚理工大学数学系	ALE-Phase-Field Simulations of Moving Contact Lines on Moving Particles
306	2016-6-2	Xue-Dong Hu 胡学东	Department of Physics, University at Buffalo, USA 美国布法罗大学物理系	Decoherence of a Moving Spin Qubit

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307	2016-6-17	Peter Schwander	College of Letters & Science, University of Wisconsin-Milwaukee, USA 美国威斯康星州密尔沃基大学文理学院	Manifold Embedding - From Single-Particle Snapshots to Movies of Molecular Machines and Energy Landscapes
308	2016-6-17	Steve Wereley	School of Mechanical Engineering, Purdue University, USA 美国普渡大学机械工程学院	Droplet and Particle Technologies for Chemistry and Physics Applications
309	2016-6-16	Sheng-Jun Yuan 袁声军	Institute for Molecules and Materials, Radboud University, the Netherlands 荷兰拉德布德大学分子与材料研究所	A New Approach for the Mesoscopic and Macroscopic Modeling of Quantum Systems: Application in 2D Materials
310	2016-6-15	Amnon Aharony	Ben Gurion and Tel Aviv Universities, Israel 本·古里安和以色列特拉维夫大学	Spin Filtering: Writing Quantum Information on Mobile Qubits
311	2016-6-14	Yu ZhangYu Zhang	Department of Chemistry & Center for Bio-inspired Energy Science, Northwestern University, USA 美国西北大学化学系和生物激发能科学中心	Dissipative quantum transport and Energy Conversion in Nanoelectronics
312	2016-6-14	Can-Ming Hu 胡灿明	Department of Physics and Astronomy, University of Manitoba, Canada 加拿大曼尼托巴大学物理与天文学系	Cavity Spintronics
313	2016-6-13	Tie-Jun Li 李铁军	School of Mathematical Sciences, Peking University 北京大学数学科学学院	An Analysis of the Moment Closure for Spin-Boson Model in Quantum Open System
314	2016-6-1	Miroslav Grmela	Ecole Polytechnique de Montreal, Canada 加拿大蒙特利尔高等理工学院	Multiscale Thermodynamics
315	2016-6-1	Miroslav Grmela	Ecole Polytechnique de Montreal, Canada 加拿大蒙特利尔高等理工学院	A Possible Role of Multiscale Thermodynamics in Computation
316	2016-5-31	Yun-An Yan 严运安	Guizhou Education University, China 贵州师范学院	Stochastic Simulation of Quantum Dissipative Dynamics

317	2016-5-26	Zhu Wang 王　柱	Department of Mathematics University of South Carolina, USA 美国南卡罗来纳大学数学系	Exponential Time Differencing Gauge Method for Incompressible Viscous Flows
318	2016-5-20	Mei-Yong Liao 廖梅勇	National Institute for Materials Science (NIMS), Japan 日本国立材料科学研究所	Diamond as an Extreme Semiconductor for Optoelectronics and MEMS
319	2016-5-19	Xian-Tu He 贺贤土	Institute of Applied Physics and Computational Mathematics & Center for Applied Physics and Technology, Peking University 北京应用物理与计算数学研究所， 北京大学应用物理与技术中心	辐射流体力学系统的宏观参数研究
320	2016-4-7	Xiao-Feng Yang 杨霄锋	University of South Carolina, USA 美国南卡罗来纳大学	CQLM-A Novel Numerical Approach to Solve the Gradient Flow Problem
321	2016-4-25	Hao-Xiang Luo	Department of Mechanical Engineering, Vanderbilt University, USA 美国范德比尔特大学机械工程系	Recent Lessons from the Wings of Nature
322	2016-4-21	Hong-Jun Xiang 向红军	Department of Physics, Fudan University 复旦大学物理系	Understanding and Predicting Multiferroics
323	2016-4-18	Jooyoung Lee	Center for In Silico Protein Science and School of Computational Sciences, Korea Institute for Advanced Study 韩国高等研究院	A Review of AlphaGo and its Machine Learning Methods
324	2016-3-8	Antti Niemi	Uppsala University, Sweden & CNRS, France 瑞典乌普萨拉大学和法国国家科学研究中心	Folding Proteins at the Speed of Life
325	2016-3-8	Xiao-Feng Qian 钱晓峰	Institute of Optics, University of Rochester, USA 美国罗切斯特大学光学研究所	"Polarization" without Polarization – Introducing a Hidden Territory of Optical Coherence via Classical Entanglement
326	2016-3-4	Roya Zandi	Department of Physics & Astronomy, The University of California, Riverside, USA 美国加州大学河滨分校物理与天文学系	Physics of Viruses
327	2016-3-30	Yue Yang 杨　越	College of Engineering, Peking University 北京大学工学院	湍流燃烧中的大涡模拟/概率密度函数模型计算

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328	2016-3-23	Peter Milonni	Los Alamos National Laboratory (USA) , and University of Rochester (USA) 美国洛斯阿拉莫斯国家实验室和罗切斯特大学	Complementarity and Vacuum Fields in Spontaneous and Stimulated Parametric Downconversion
329	2016-3-22	Guang Feng 冯　光	Interface and transport phenomena Laboratory, Huazhong University of Science and Technology 华中科技大学能源与动力工程学院煤燃烧国家重点实验室	能源中微尺度界面与传输现象的分子动力学模拟研究
330	2016-3-21	Wen-An Guo 郭文安	Department of Physics, Beijing Normal University 北京师范大学物理学系	Quantum Criticality with Two Length Scales
331	2016-3-17	Sebastian Doniach	Department of Physics, Stanford University, USA 美国斯坦福大学物理系	Algorithms for Optical and X-Ray Imaging: from Biomolecules to Nanoparticles
332	2016-3-16	Cristian Micheletti	SISSA, International School for Advanced Studies, Italy 意大利国际高级研究学院	The Knotted Strands of Life
333	2016-3-10	Li-Jian Jiang 姜立建	College of Mathematics and Econometrics, Hunan University 湖南大学数学与计量经济学院	Multiscale Model Reduction Methods and Their Applications for Uncertainty Quantification
334	2016-2-3	Xian-Gang Wan 万贤纲	Department of Physics, Nanjing University 南京大学物理系	强自旋轨道耦合电子关联体系理论研究
335	2016-2-29	Qing-Hu Chen 陈庆虎	Department of Physics, Zhejiang University 浙江大学物理系	Solutions to the Rabi Model and Its Several Variants
336	2016-2-25	Xian-Tu He 贺贤土	Institute of Applied Physics and Computational Mathematics & Center for Applied Physics and Technology, Peking University 北京应用物理与计算数学研究所，北京大学应用物理与技术中心	Superconductivity in Complex Electronic Systems under Pressure
337	2016-2-25	Zi Cai 蔡　子	Institute for Quantum Optics and Quantum information , Austrian academy of sciences 奥地利科学院量子光学与量子信息研究所	Open Quantum Many-Body Systems - Interactions, Dissipations and Noises

338	2016-2-2	Si-Qi Shi 施思齐	School of Materials Science and Engineering, Shanghai University 上海大学材料科学与工程学院	若干锂离子固体电解质中的离子运输物理
339	2016-2-19	Xiao-Jia Chen 陈晓嘉	Center for High Pressure Science and Technology Advanced Research, Shanghai 上海高压科学研究中心	Superconductivity in Complex Electronic Systems under Pressure
340	2016-1-8	Xiao-Ping Wang 王筱平	Department of Mathematics, Hong Kong University of Science and Technology 香港科技大学数学系	An Efficient Threshold Dynamics Method for Wetting on Rough Surfaces
341	2016-1-8	Yang Wang 汪　洋	Department of Mathematics, Hong Kong University of Science and Technology 香港科技大学数学系	Sub-linear Algorithm for Recovering Sparse Fourier Series
342	2016-1-7	Si Wu 吴　思	School of Brain and Cognitive Sciences, Beijing Normal University 北京师范大学认知神经科学与学习国家重点实验室	Continuous Attractor Neural Network: A Cannonical Model for Neural Information Representation
343	2016-1-5	Yang Qi 戚　杨	Institute For Advanced Study, Tsinghua University 清华大学高等研究院	Classifying Symmetry Fractionalization in Gapped Z2 Spin Liquids
344	2016-1-5	Can Xie 谢　灿	School of Life Sciences, Peking University 北京大学生命科学学院	Homing Instinct: The story behind and beyond biocompass model
345	2016-1-4	Shao-Qiang Tang 唐少强	Department of Mechanics and Engineering Science, Peking University 北京大学力学与工程科学系	ALEX边界条件及其在薛定谔方程计算中的应用
346	2016-12-9	Zhang-Qi Yin 尹璋琦	Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University 清华大学交叉信息科学研究院	Torsional Optomechanics and Quantum Simulation of An Optically Levitated Nano-Diamond
347	2016-12-28	Zhe Qu 曲　哲	Institute of Engineering Mechanics, China Earthquake Administration 中国地震局工程力学研究所	What Structural Engineers Do to Protect Our Communities against Earthquakes
348	2016-12-26	Lei Xu 徐　磊	Physics Department, The Chinese University of Hong Kong 香港中文大学物理系	Mechanism of contact between a droplet and a smooth substrate

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349	2016-12-22	Jin-Wu Ye 叶锦武	Capital Normal University (China) and Mississippi State University (USA) 首都师范大学&美国密西西比州立大学	Strongly Interacting Spinor Bosons or Fermions with Spin Orbit Couplings in Lattice Systems
350	2016-12-22	Yong-Gang Yang 杨勇刚	College of Physics and Electronic Engineering , Shanxi University 山西大学物理与电子工程学院	小分子光谱与动力学行为的量子力学模拟
351	2016-12-20	Matthew Turner	Department of Physics, Warwick University, UK 英国华威大学物理系	Connecting Active Matter to Polymers, Motors and Membranes
352	2016-12-20	Ai-Hua Xie 谢爱华	Department of Physics, Oklahoma State University, USA 美国俄克拉荷马州立大学物理系	Principles of Proton Transfer in Proteins
353	2016-1-22	Jian-Xin Li 李建新	Department of Physics, Nanjing University 南京大学物理系	Quantum Phases Emerged from the Interplay between Mott Physics and Topology Band
354	2016-12-14	Cai-Zhuang Wang 王才壮	Ames Laboratory, US Department of Energy and Department of Physics, Iowa State University, USA 艾姆斯实验室-美国能源部，爱荷华州立大学物理与天文学系	Correlation Matrix Renormalization Method for Studying Correlated-Electron Materials
355	2016-1-21	Michal Krizek	Institute of Mathematics, Czech Academy of Sciences, Prague 捷克科学院数学研究所	Anitigravity - Its Origin and Manifestations
356	2016-11-28	Chao Zhang 张　超	Harbin Institute of Technology 哈尔滨工业大学	Gradient Estimates for the Non-Standard Quasilinear Elliptic and Parabolic Equations
357	2016-11-28	Shu-Lin Zhou 周蜀林	Peking University 北京大学	Entropy and Renormalized Solutions for Quasilinear Elliptic (Parabolic) Equations With L^1 Data
358	2016-11-25	Jun-Hong An 安均鸿	School of Physical Science and Technology, Lanzhou University 兰州大学物理科学与技术学院	Synthesizing Exotic Floquet Topological States of Matter by Periodic Driving

359	2016-11-21	Jian-Ming Liu 刘剑明	School of Mathematics and Statistics, Jiangsu Normal University 江苏师范大学数学与统计学院	The Study on Adaptive Cartesian Grid Methods for Compressible Flow and Their Applications
360	2016-10-27	Xiao-Dong Liu 刘晓东	Academy of Mathematics and Systems Science (AMSS), CAS 中科院数学与系统科学研究院	A Fast and Robust Sampling Method for Inverse Acoustic Scattering Problems
361	2016-10-25	Chao-Hong Li 李朝红	Institute of Astronomy and Space Science, Sun Yat-Sen University 中山大学天文与空间科学研究院	Topological phase transitions and Thouless pumping of light
362	2016-10-25	Can Huang 黄　灿	Xiamen University 厦门大学	Spectral Method for Maxwell Equations in Cole-Cole Dispersive Media
363	2016-10-24	Luo-Ding Zhu	Department of Mathematical Sciences, Indiana University-Purdue University Indianapolis 印第安纳大学-普渡大学印第安纳波利斯分校数学科学系	Interaction of a Deformable Plate with a Non-Newtonian Fluid Flow in Three Dimensions
364	2016-10-21	Bo Zhang	LSEC and Institute of Applied Mathematics, AMSS, Chinese Academy of Sciences 中国科学院应用数学研究所	Numerical Methods for Inverse Scattering problems with Phaseless Data
365	2016-10-21	Tian-Ying Yan 言天英	College of Material Science and Engineering, Nankai University 南开大学材料科学与工程学院	Molecular Dynamics Simulation of Ionic Liquids: The Effect of the Electronic Polarizability
366	2016-10-20	Matthew Fisher	Kavli Institute for Theoretical Physics, UC Santa Barbara, USA 美国加州圣塔芭芭拉分校	Can Thermalization Breakdown in Quantum Many-body Systems?
367	2016-10-18	Lev Shchur	Landau Institute for Theoretical Physics, Science Center in Chernogolovka 朗道理论物理研究所	Towards Exaflops Monte Carlo Computing
368	2016-10-18	Kim Ngan Le	University of New South Wales, Australia 澳大利亚新南威尔士大学	Finite Element Approximation of a Time-Fractional Diffusion Problem in a Non-Convex Polygonal Domain
369	2016-10-17	Alison Ramage	Department of Mathematics and Statistics, University of Strathclyde, UK 英国斯特拉斯克莱德大学数学与统计系	A Multilevel Preconditioner for Data Assimilation with 4d-Var

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370	2016-10-13	Shen-Bai Zhang 张绳百	Rensselaer Polytechnic Institute, USA 美国伦斯勒理工学院	Universal Stability of Two-Dimensional Traditional Semiconductors
371	2016-10-11	Xin Liu 刘　歆	Institute of Computational Mathematics and Scientific/ Engineering Computing, CAS 中国科学院计算数学与科学工程计算研究所	A New First-order Framework for Orthogonal Constrained Optimization Problems
372	2015-9-28	Qi-Hang Liu 刘奇航	University of Colorado, Boulder, Colorado, USA 美国科罗拉多大学	Hidden Spin Polarization in Materials with Inversion Symmetry: Causes and Consequences
373	2015-9-25	Jin Zhang 张　进	School of Mathematical Sciences, Shandong Normal University 山东师范大学数学科学学院	Recent Developments in Finite Element Methods on Triangular Meshes for Convection-dominated Problems
374	2015-9-25	Edward S. Fry	Department of Physics, Texas A&M University, USA 美国德克萨斯农工大学物理系	Integrating Cavities and Their Use in Ring-Down Spectroscopy – e.g. Ultra-Sensitive Absorption Spectroscopy of Biological Samples
375	2015-9-21	Gang Lu 吕　刚	Department of Physics and Astronomy, California State University Northridge (CSUN) 加利福尼亚州立大学北岭分校物理与天文学系	Electronic Excitations in Materials: From Photovoltaics to Plasmonics
376	2015-9-1	Rudolf A. Roemer	Department of Physics, University of Warwick, UK 英国华威大学物理系	Disordered Quantum Systems at the Warwick Centre for Scientific Computing
377	2015-8-9	Mark Sussman	Department of Mathematics, Florida State University, USA 美国佛罗里达州立大学数学系	Filament Capturing with the Multimaterial Moment-of-Fluid Method
378	2015-8-8	Mark Sussman	Department of Mathematics, Florida State University, USA 美国佛罗里达州立大学数学系	A Positivity Preserving All Speed Projection Method for Compressible, Multiphase Flow
379	2015-8-6	Xiao-Feng Yang 杨宵锋	Department of Mathematics, University of South Carolina 南卡罗来纳大学数学系	Some techniques to decouple the computations of phase field model of complex fluids

380	2015-8-4	Peter Alexander Markowich	Department of Applied Mathematics and Theoretical Physics, University of Cambridge and Faculty of Mathematics, University of Vienna 剑桥大学应用数学与理论物理系和维也纳大学数学系	Mathematical Analysis of a PDE System for Biological Network Formation
381	2015-8-4	Tzon-Tzer Lu 吕宗泽	National Sun Yat-sen University, Taiwan 国立台湾中山大学	Convergent Behaviors of Trefftz Method on Laplace BVPs with Singularities
382	2015-8-20	Ying Liu	Institute for Quantum Computing, University of Waterloo, CA 加州滑铁卢大学量子计算研究所	Atomic Scale Study of Dirac Materials: Graphene and Topological Insulator (Bi2Se3)
383	2015-8-18	Francisco José Gaspar	Department of Applied Mathematics, University of Zaragoza, Spain 西班牙萨拉戈萨大学应用数学系	Numerical Simulation of Flow in Deformable Porous Media
384	2015-8-18	Carmen Rodrigo	Department of Applied Mathematics, University of Zaragoza, Spain 西班牙萨拉戈萨大学应用数学系	Local Fourier Analysis based Design of Geometric Multigrid Methods on Semi-Structured Triangular Grids
385	2015-8-17	Gunar Matthies	Technical University of Dresden, Germany 德国德累斯顿工业大学	"Numerical Simulation of the Rosensweig Instability for Magnetic Liquid in the Static and Dynamic Cases "
386	2015-8-17	Dimitri Puhst	Technical University of Dresden, Germany 德国德累斯顿工业大学	Existence Results to the Nonlinear Peridynamic Model in Nonlocal Elastodynamics
387	2015-8-14	Hai-Tao Quan 全海涛	School of Physics, Peking University 北京大学物理学院	On the Competitions between Mechanical Work, Information, Temperature Gradient and Chemical Potentials in Stochastic Thermal Machines
388	2015-8-10	Leon Cohen	City University of New York, USA 美国纽约城市大学	Quantum Phase Space in Physics and Engineering
389	2015-7-9	Xiang-Jun Xing 邢向军	Institute of Natural Sciences, and Department of Physics and Astronomy, Shanghai Jiao Tong University 上海交通大学物理与天文系	Linear Response Theory of Dense Electrolytes, and Effective Interactions between Charged Objects
390	2015-7-7	Blair Blakie	Department of Physics, University of Otago, New Zealand 新西兰奥塔哥大学物理系	Ultra-Cool Matter Waves

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NO.	DATE 日期	SPEAKER 报告人	INSITUTE 单位	TITLE 报告题目
391	2015-7-30	Cheng Wang 王 成	Department of Mathematics, University of Massachusetts Dartmouth 马萨诸塞州大学达特茅斯分校数学系	The Convex Splitting Scheme for the Cahn-Hilliard Wilmore and Functionalized Cahn-Hilliard Models
392	2015-7-28	Florian Mehats	University of Rennes 1, France 法国雷恩第一大学	Uniformly Accurate (UA) Schemes for Highly Oscillatory Nonlinear Schrodinger Equations
393	2015-7-23	Zhi Wang 王 志	School of Physics and Engineering, Sun Yat-Sen University 中山大学物理与工程学院	Josephson Effect in Majorana Junctions
394	2015-7-22	Yan-Lai Chen 陈焱来	Department of Mathematics, University of Massachusetts Dartmouth 马萨诸塞州大学达特茅斯分校数学系	Reduced Basis Methods and Their Application in Data Science
395	2015-7-21	Zhu Wang 王 柱	University of South Carolina, USA 美国南卡罗来纳大学	Reduced-Order Modeling of Complex Fluid Flows
396	2015-7-20	Zong-Chao Yam 严宗朝	University of New Brunswick, Canada 加拿大布伦瑞克大学	H- , Critical Charge, and Shape Resonance
397	2015-7-15	Ying-Dan Wang 王颖丹	Institute of Theoretical Physics, Chinese Academy of Sciences, Kavli Institute of Theoretical Physics, China (KITPC) 中科院理论物理研究所	Entanglement generation in 3-mode optomechanical systems
398	2015-7-14	Jian-Sheng Wang	Department of Physics, National University of Singapore 新加坡国立大学物理系	Isn’t there a negative absolute temperature?
399	2015-7-14	Jian-Sheng Wang	Department of Physics, National University of Singapore 新加坡国立大学物理系	Phonon and electron transport in nanostructures and crystal solids: molecular dynamics approach
400	2015-7-10	Andriy Baumketner	Department for Computer Simulations of Many-Particle Systems, Institute for Condensed Matter Physics, National Academy of Sciences of Ukraine 乌克兰国家科学院凝聚态物理研究所	Factors that Define the Phase Behavior of Lysozyme Solutions: Role of Charge, Softness of Inter-Molecular Potential and Non-Spherical Shape of the Protein

401	2015-7-10	Baruch Rosenstein	Electrophysics Department, National Chiao Tung University, Taiwan 国立台湾交通大学电子物理系	Nontopological Triplet Superconductors and Their Core Majorana Band
402	2015-6-5	Chui-Ping Yang 杨垂平	Department of Physics, Hangzhou Normal University 杭州师范大学理学院物理系	Efficient scheme for generation of photonic NOON states in circuit QED
403	2015-6-5	Xiang-Fei Meng 孟祥飞	National Supercomputing Center, Tianjin (NSCC-TJ) 国家超算天津中心	Application Progress on Tianhe-1A & Technology Development at NSCC-TJ
404	2015-6-4	Ralf Hiptmair	Department of mathematics, ETH Zurich, Switzerland 瑞士苏黎世联邦理工学院数学系	Discretization of Advection-Diffusion of Magnetic Fields
405	2015-6-30	Alex Hansen	Department of Physics, Norwegian University of Science and Technology, Norway 挪威科技大学物理系	Statistical Mechanics of Flow in Porous Media
406	2015-6-30	Tie-Jun Li 李铁军	School of Mathematical Sciences , Peking University 北京大学数学科学学院	Quasi-Potential and Two-Scale Large Deviations for Chemical Kinetic Process
407	2015-6-26	Ping Yuan 袁　萍	Northwest Normal University, College of Physics and Electronic Engineering 西北师范大学物理与电子工程学院	球状闪电现象及研究概况
408	2015-6-23	Le-Tian Tao 陶乐天	Center for Bioinformatics, Life Science College , Peking University 北京大学生命科学学院生物信息中心	A Mechanism for Graded, Dynamically Routable Current Propagation in Pulse-Gated Feedforward Networks and Implications for Information Coding
409	2015-6-19	Baruch Rosenstein	Electrophysics Department, National Chiao Tung University, Taiwan 国立台湾交通大学电子物理系	Long Range Electron-Electron Interactions in Graphene and Other Weyl Semimetals Make Their Electrodynamics Nonlocal
410	2015-6-18	Renata Wentzcovitch	Department of Chemical Engineering and Materials Science, University of Minnesota, USA 美国明尼苏达大学化学工程与材料科学系	Modeling Earth’s Interior from Atomic to Global Scale
411	2015-6-16	Yan-Hui Liu 柳延辉	Department of Mechanical Engineering and Materials Science, Yale University, USA 耶鲁大学机械工程与材料科学系	高通量表征及其在非晶合金材料设计中的应用
412	2015-6-15	Hong-Wei Zheng 郑洪伟	Institute of Mechanics, CAS 中国科学院力学研究所	基于混合网格的高精准度高性能气动仿真平台的研究和开发

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413	2015-6-15	Xiong Zhang 张 雄	School of Aerospace Engineering, Tsinghua University 清华大学航天航空学院	物质点法的理论、程序及应用
414	2015-6-11	Ying-Jie Liu 刘英杰	Georgia Institute of Technology, USA 美国佐治亚理工学院	Central scheme, central DG on overlapping cells and a well balanced reformulation for solving the shallow water equation
415	2015-6-11	Katie Newhall	The University of North Carolina at Chapel Hill, USA 美国北卡罗来纳大学教堂山分校	Dynamics of Nanomagnets with Spin-transfer Torques
416	2015-6-11	Evert Jan Meijer	Amsterdam Center for Multiscale Modeling, University of Amsterdam, The Netherlands 荷兰阿姆斯特丹大学阿姆斯特丹多尺度建模中心	Modeling Transformations of Carbon Structures at Extreme Conditions
417	2015-5-29	Xin-You Lv 吕新友	School of Physics, Huazhong University of Science and Technology, China 华中科学技术大学物理学院	Squeezed Optomechanics with Phase-Matched Amplification and Dissipation
418	2015-5-26	Bei-Lok Hu 胡悲樂	Maryland Center for Fundamental Physics and Joint Quantum Institute, University of Maryland, USA 美国马里兰大学	Understanding Macroscopic Quantum Phenomena
419	2015-5-26	Jen-Tsung Hsiang 项人宗	Department of Physics, Fudan University 复旦大学物理系	Thermal Entanglement
420	2015-5-21	Hong-Bin Gu 顾洪斌	Institute of Mechanics, Chinese Academy of Sciences 中国科学院力学研究所	激励射流对超声速混合和燃烧的影响
421	2015-5-20	Qing-Shan Chen 陈青山	Department of Mathematical Sciences, Clemson University, USA 美国克莱姆森大学数学科学系	Mimetic and Convergent Discretization of Vector Fields on Unstructured Meshes
422	2015-5-19	Vladimir Chernyak	Department of Chemistry, Wayne State University, USA 美国韦恩州立大学化学系	Stochastic Currents and Algebraic Topology

423	2015-5-13	Vladimir Chernyak	Department of Chemistry, Wayne State University, USA 美国韦恩州立大学化学系	Characterization of Chemical Substituents in Organic Macro-Molecules Using Topology and Geometry
424	2015-5-12	Zuo-Qiang Shi 史作强	Mathematical Sciences Center, Tsinghua University 清华大学丘成桐数学科学中心	"Point Integral Method: a meshless approach for Poisson equation on point cloud with convergence guarantee "
425	2015-4-7	Wei-Feng Qiu 邱蔚峰	Department of Mathematics, City University of Hong Kong 香港城市大学数学系	First Order Least Squares Method for Convection Diffusion Problems
426	2015-4-3	Xi Chen 陈　玺	Department of Physics, Shanghai University 上海大学物理系	Quantum Simulations and Quantum Measurements via Quantum Walks
427	2015-4-28	Wei-Wei Zhang 张葳葳	China Agricultural University, College of Science 中国农业大学理学院	食盐的孪生兄弟—高压下Na, Cl间反常剂量比化合物探索
428	2015-4-23	Ying-Jer Kao 高英哲	Department of Physics, National Taiwan University 国立台湾大学物理系	Quantum Quench through a Topological Phase Transition
429	2015-4-2	Peng Xue 薛　鹏	Department of Physics, Southeast University 东南大学物理系	Shortcuts to Adiabaticity and Optimization
430	2015-4-15	Lin-Jun Wang 王林军	Department of Chemistry, University of Southern California, USA 美国南加州大学化学系	Can We Solve Complex Dynamics with Simple Schemes? — Recent Developments in Nonadiabatic Molecular Dynamics
431	2015-3-27	Zhi-Zhong Sun 孙志忠	Department of Mathematics, Southeast University 东南大学数学系	浅谈分数阶微分方程及其数值解
432	2015-3-25	Wei Cai 蔡　巍	Mechanical Engineering Department, Stanford University, USA 美国斯坦福大学机械工程系	3D Phase Field Modeling of Nanowire Growth by the Vapor-Liquid-Solid Mechanism
433	2015-3-2	Zhong-Yi Huang 黄忠亿	Department of Mathematical Sciences, Tsinghua University 清华大学数学科学系	An equation decomposition based tailored finite point method for Oseen flow
434	2015-2-4	Can Huang 黄　灿	School of Mathematical Sciences, Xiamen University 厦门大学数学科学学院	Spectral Method for Substantial Fractional Differential Equations
435	2015-2-10	Xue-Jun Xu 许学军	Academy of Mathematics and Systems Science, CAS 中科院数学与系统科学研究院	Fast Solvers for Wave Problems

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436	2015-2-10	Zhong-Zhi Bai 白中治	Academy of Mathematics and Systems Science, CAS 中科院数学与系统科学研究院	Two-Step Approximation Preconditioning Methods for Steady Incompressible Navier-Stokes Equations
437	2015-12-9	Xiang-Rong Wang 王向荣	Department of Physics, The Hong Kong University of Science and Technology 香港科技大学物理系	Notch-Boosted Domain Wall Propagation in Magnetic Nanowires
438	2015-12-9	Mogens H. Jensen	The Niels Bohr Institute, University of Copenhagen, Denmark 丹麦哥本哈根大学尼尔斯波尔研究所	Vorticity Patterns in Tissues induced by Cell Divisions
439	2015-1-23	Cheng-Jian Zhang 张诚坚	School of Mathematics and Statistics, Huazhong University of Science and Technology, China 华中科技大学数学与统计学院	Analytical and Numerical Stability of Volterra Delay-integro-differential Equations
440	2015-12-28	Lei Xu 徐　磊	Department of Physics, The Chinese University of Hong Kong 香港中文大学物理系	Visualizing Kinetic Pathways of Homogeneous Nucleation in Colloidal Crystallization
441	2015-12-25	Lin-Wang Wang	Lawrence Berkeley National Laboratory, USA 美国劳伦斯·伯克利国家实验室	Ab initio Calculations of Charge Transports and Dynamics in Nanosystems
442	2015-12-24	Cheng Wang 王　成	Department of Mathematics, University of Massachusetts Dartmouth 马萨诸塞州大学达特茅斯分校数学系	Higher Order Energy Stable Numerical Schemes for the Gradient Flows
443	2015-12-23	Ji-Chun Li 李继春	Department of Mathematical Sciences, University of Nevada Las Vegas, USA 美国内华达大学数学科学系	Mathematical Analysis and Time-Domain Finite Element Modeling of Invisibility Cloaks with Metamaterials
444	2015-12-23	Jing-Fang Huang 黄京芳	Department of Mathematics, University of North Carolina at Chapel Hill 北卡罗来纳大学教堂山分校数学系	Low-Rank Structures and Multi-Resolution Algorithms with Applications
445	2015-12-2	Jia-Wei Mei 梅佳伟	Perimeter Institute for Theoretical Physics, Canada 加拿大周边理论物理研究所	Fractionalized Spin-Wave Continuum in Kagome Spin Liquids

446	2015-12-18	Xiao-Long Yin	Petroleum Engineering, Colorado School of Mines 科罗拉多矿业学院	Phase Transition and Multiphase Flows in Low Permeability Geological Porous Media
447	2015-12-17	Tong Zhang 张　通	Climate system institute, Chinese Academy of Meteorological Sciences 中国气象科学研究院气候系统研究所	"Challenges of Ice Flow Modelings: from Alpine Glaciers on Tibet Plateau to Antarctic Ice Sheet "
448	2015-12-17	Hao-Wei Peng 彭浩为	Department of Physics, Temple University, USA 美国天普大学物理系	Design Principle Guided Computational Materials Discovery and Design
449	2015-12-10	Michael Mascagni	Florida State University, USA 美国佛罗里达州立大学	Random Number Generation Tools for Distributed Simulation on Modern HPC Architectures
450	2015-12-10	Jason Twamley	Department of Physics and Astronomy, Macquarie University, Australia 澳大利亚麦格理大学物理与天文学系	Hybrid Quantum Engineering for Quantum Sensing and Control
451	2015-1-19	Jun-Bo Cheng 程军波	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	A second-order cell-centered Lagrangian scheme for one-dimensional elastic-plastic problems
452	2015-1-16	Tie-Zheng Tie 钱铁铮	Department of Mathematics, Hong Kong University of Science and Technology 香港科技大学数学系	Anisotropic Particle in Viscous Shear Flow: Navier Slip, Reciprocal Symmetry, and Jeffery Orbit
453	2015-1-16	Wang Yao 姚　望	Department of Physics, The University of Hong Kong 香港大学物理系	Valley and Spin Physics in 2D Transition Metal Dichalcogenides
454	2015-1-16	Hai-Jun Wu 武海军	Department of Mathematics, Nanjing University 南京大学数学系	An adaptive finite element method with truncated DtN boundary condition for the diffraction grating problem
455	2015-11-6	Jian-Guo Wang 王建国	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Challenges and Opportunities for Computational Sciences -- Theoretical and Numerical Simulations
456	2015-11-5	Wei-Hua Deng 邓伟华	School of Mathematics and Statistics, Lanzhou University 兰州大学数理统计学院	Functional Distribution of the Tempered Anomalous Diffusion and Its Numerical Simulations
457	2015-11-5	Gotthard Seifert	Theoretische Chemie, Technische Universitaet Dresden, Germany 德累斯顿工业大学化学理论系	Isoelectronicity to Phosphorus a Potential for Electronic Applications

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458	2015-1-13	Fa-Wang Liu 刘发旺	Queensland University of Technology, Australia 澳大利亚昆士兰科技大学	分数阶计算系列讲座
459	2015-11-3	Gotthard Seifert	Theoretische Chemie, Technische Universitaet Dresden, Germany 德累斯顿工业大学化学理论系	Tight-Binding Density Functional Theory (DFTB) – An Approximate Kohn-Sham DFT Scheme
460	2015-11-27	Hong-Rong Liu 刘红荣	College of Physics and Information Science, Hunan Normal University 湖南师范大学物理与信息科学学院	Symmetry-Mismatch Reconstruction of Icosahedral Virus by Cryo-EM
461	2015-11-20	Chong-Yu Wang 王崇愚	Department of Physics, Tsinghua University 清华大学物理系	探讨"材料基因组"的科学内涵
462	2015-11-19	John S. Tse 谢　硕	University of Saskatchewan, Canada; Jilin University, China 加拿大萨斯喀彻温大学； 吉林大学	Phase Transitions, Devitrification and Scaling Law in Metallic Glasses
463	2015-11-19	Thomas Frauenheim	Bremen Center for Computational Materials Science, University of Bremen 德国不来梅大学不来梅计算材料科学中心	"Recent DFTB Extension for Improving Accuracy and Boosting the Efficiency for Computational Applications to Nanomaterials "
464	2015-11-18	Gang Chen 陈　钢	Physics Deparment, Fudan University 复旦大学物理系	Magnetic Monopole Condensation Transition out of Quantum Spin Ice
465	2015-11-17	Jun Zhang 张　骏	Department of Physics & Mathematics and Courant institute, New York University, USA 美国纽约大学物理与数学与库恩研究所	生物飞行与游弋中的流体力学机制
466	2015-11-10	Jun Hu 胡　俊	School of Mathematical Sciences, Peking University 北京大学数学科学学院	Challenges and Opportunities for Computational Sciences -- Theoretical and Numerical Simulations
467	2015-10-30	David P. Landau	Clausthal University of Technology, Germany 德国克劳斯塔尔科技大学	III-V Semiconductor Materials and Devices for Application in Photovoltaics, Optoelectronics, Spintronics and UV Detection

468	2015-10-26	Yan Liu 刘　岩	School of Aerospace Engineering, Tsinghua University 清华大学航天航空学院	光滑分子动力学：一种高效的分子模拟方法
469	2015-10-21	Daniel Schaadt	Clausthal University of Technology, Germany 德国克劳斯塔尔科技大学	III-V Semiconductor Materials and Devices for Application in Photovoltaics, Optoelectronics, Spintronics and UV Detection
470	2015-10-19	Chin-Kun Hu 胡进锟	Institute of Physics, Academia Sinica, Taipei 11529, Taiwan 中国台湾中央研究院物理研究所	Proteins Aggregation and Human Diseases
471	2015-10-13	Hong-Bao Zhang 张宏宝	Vrije Universiteit Brussel and The International Solvay Institutes 布鲁塞尔自由大学和国际索尔维研究所	Computational Holography with Its Applications
472	2014-9-9	Ming Yu 虞　明	Department of Physics and Astronomy, University of Louisville, USA 美国路易斯维尔大学物理与天文学系	Materials Modeling via a Robust Semi-empirical Hamiltonian: SCED-LCAO
473	2014-9-4	Bing-Hai Yan 颜丙海	Max Planck Institute for Chemical Physics of Solids, Max Planck Institute for the Physics of Complex Systems 马克斯·普朗克固体化学物理研究所，马克斯·普朗克复杂系统物理研究所	Topological Insulator Materials in the Honeycomb Lattice
474	2014-9-26	Evert Jan Meijer	Amsterdam Center for Multiscale Modeling, University of Amsterdam, the Netherlands 荷兰阿姆斯特丹大学阿姆斯特丹多尺度建模中心	Ab Initio Modeling of Complex Chemical Processes
475	2014-9-24	Yi Zhou 周　毅	Department of Mechanical Science and Engineering, Nagoya University, Japan 日本名古屋大学机械科学与工程学系	On the evolution of turbulent flowgenerated by single/fractal-square grid
476	2014-9-18	Dong-Zhuo Zhou 周栋焯	Department of Mathematics and Institute of Natural Sciences, Shanghai Jiao Tong University 上海交通大学数学系、自然科学研究院	Causal and Structural Connectivity of Neuronal Networks
477	2014-9-18	Qiang Xiao 肖　强	Department of Physics and Astronomy, University of Delaware, USA 美国特拉华大学物理与天文学系	Quantifying Spin Hall and Rashba Effect Contributions to Spin-Orbit Toque in Magnetic Bilayers
478	2014-9-18	Yan Chen 陈　焱	Department of Physics, Fudan University 复旦大学物理系	Chiral Spin Liquid in Spin-1/2 Kagome Antiferromagnets

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479	2014-9-17	Peng Wang 王 鹏	School of Mathematics and Systems Science of Beijing University of Aeronautics and Astronautics 北京航空航天大学, 数学与系统科学学院	不确定性量化与概率风险分析
480	2014-9-12	Jing-Zhi Li 李景治	Department of financial mathematics and engineering, South University of Science and Technology of China 南方科技大学金融数学与工程系	Shape Calculus in Differential Forms: Ideas and Applications
481	2014-9-11	Shao-Liang Zhang 张绍良	Department of Computational Science and Engineering, Graduate School of Engineering, Nagoya University, Japan 日本名古屋大学工学研究科计算科学与工程学系	Look–Back GMRES(m) for Solving Large Nonsysmmetric Linear Systems
482	2014-9-1	Hai-Peng Gong 龚海鹏	School of Life Sciences, Tsinghua University 清华大学生命科学学院	Exploring the Ph-Dependent Substrate Transport of Foca Using Molecular Dynamics Simulation
483	2014-8-5	Jun Zou 邹 军	Department of Mathematics, The Chinese University of Hong Kong 香港中文大学数学系	Indirect and Direct Sampling-Type Reconstruction Methods for Inverse Scattering Problems
484	2014-8-27	Fu-Guo Deng 邓富国	Department of Physics, Beijing Normal University 北京师范大学物理系	量子通信系列讲座
485	2014-8-26	Jiu-Shu Shao 邵久书	Beijing Normal University 北京师范大学	Nonequilibrium Quantum Dynamics Based on Complex Brownian Motion
486	2014-8-21	Gang Qi 齐 刚	Department of Mechanical Engineering, University of Memphis, Memphis, USA 美国孟菲斯大学机械工程系	A Framework of Data-Enabled Science to the Evaluation of Material Failure
487	2014-8-18	Ning Xu 徐 宁	Department of Physics, University of Science and Technology of China 中国科学技术大学物理系	Criticality of the Jamming Transition at Zero Temperature and Zero Shear Stress
488	2014-8-18	Hai-Jun Wu 武海军	Department of Mathematics, Nanjing University 南京大学数学系	Preasymptotic Error Analysis of Higher Order Fem and Cip-Fem for Helmholtz Equation with High Wave Number

489	2014-8-15	Pornpan Pungpo	Department of Chemistry, Faculty of Science, Ubonratchathani University, Thailand 泰国乌汶叻大学理学院化学系	Rational Design of Anti-Tb Agent Based on Computer Aided Molecular Design
490	2014-8-14	Lin Tian	School of Natural Sciences, University of California, Merced, USA 美国加州大学默塞德分校自然科学学院	Multi-Connected Superconducting Jaynes-Cummings Model
491	2014-8-13	Feng-Chuan Chuang 庄丰权	Department of Physics,National Sun Yat-Sen University, Taiwan, China 国立中山大学物理系	Prediction of Large-Gap Two-Dimensional Topological Insulators Consisting of Bilayers of Group III Elements with Bi
492	2014-7-8	Long Chen	Department of Mathematics, University of California at Irvine, USA 美国加州大学尔湾分校数学系	A Posterior Error Estimator and Multigrid Methods for Weak Galerkin Methods
493	2014-7-8	David J. Srolovitz	Departments of Materials Science and Engineering&Mechanical Engineering and Applied Mechanics, University of Pennsylvania, USA 美国宾夕法尼亚大学	A Few Outstanding Questions in Grain Boundary Dynamics
494	2014-7-30	Bill CoishBill Coish	Department of Physics, McGill University 麦吉尔大学物理系	Quantum Dynamics of Spin Qubits: Electron Spins, Hole Spins, and Defect Centers
495	2014-7-3	Xing Zhang 张　星	Institute of Mechanics, Chinese Academy of Sciences 中国科学院力学研究所	Effects of Flexibility on the Hydrodynamics of a Self-Propelled Plunging Foil
496	2014-7-29	Jian-Feng Lu 鲁剑锋	Mathematics Department, Duke University, USA 美国杜克大学数学系	Reactive Trajectories and Transition Path Theory
497	2014-7-28	Bei Zeng 曾　蓓	Department of Mathematics & Statistics, University of Guelph, Canada 加拿大圭尔夫大学数学与统计系	Microscopic Theory of Quantum Phase: An Information-Theoretic Approach
498	2014-7-23	Mark Friesen	Physics Department, University of Wisconsin-Madison, USA 美国威斯康星大学麦迪逊分校物理系	Quantum Dot Hybrid Qubit
499	2014-7-23	Xue-Dong Hu 胡学东	Department of Physics, University at Buffalo, USA 美国布法罗大学物理系	Explorations on the Quantum Communications for Spin Qubits
500	2014-7-22	Tian-Yu Zhang 张天宇	Department of Mathematical Sciences, Montana State University 美国蒙大拿州立大学数学科学系	General Theory for Integrated Analysis of Growth, Gene, and Protein Expression in Biofilms

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NO.	DATE 日期	SPEAKER 报告人	INSITUTE 单位	TITLE 报告题目
501	2014-7-21	Xin Wang	Condensed Matter Theory Center, University of Maryland, College Park, USA 美国马里兰大学	Dancing on the Bloch Sphere: Robust Quantum Gates for Spin Qubits Using Composite Pulses
502	2014-7-21	Duck-Young Kim	Geophysical Laboratory, Carnegie Institution of Washington, USA 美国华盛顿卡内基研究所地球物理实验室	High Pressure Route to Energy Frontier Research: Quantum Computational Prediction and Experimental Synthesis
503	2014-7-2	Zheng-Fu Xu 徐正富	Department of Mathematical Sciences, Michigan Technological University, USA 美国密歇根理工大学数学科学系	Maximum Principle Preserving Flux Limiters for High Order Schemes Solving Hyperbolic Conservation Laws
504	2014-7-2	Feng-Li Lin 林豊利	Department of Mathematical Sciences, Michigan Technological University, USA 美国密歇根理工大学数学科学系	Decoherence Patterns of Topological Qubits from Majorana Modes
505	2014-7-18	Hai-Dong Yuan 袁海东	Department of Applied Mathematics, The Hong Kong Polytechnic University 香港理工大学应用数学系	Optimal Control of Spin Systems
506	2014-7-18	Lukasz Cywinski	Institute of Physics,Polish Academy of Sciences, Poland 波兰科学院物理研究所	Decoherence of a Localized Electron Spin Interacting with a Nuclear Bath
507	2014-7-14	Jun-Hong An 安钧鸿	School of Physical Science and Technology, Lanzhou University 兰州大学物理科学与技术学院	Non-Equilibrium Quantum Phase Transition Induced by Periodic Driving
508	2014-7-10	Lukasz Cywinski	Institute of Physics,Polish Academy of Sciences, Poland 波兰科学院物理研究所	Qubit as a Spectrometer of Environmental Noise
509	2014-7-10	Li-Bin Fu 傅立斌	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Anomalous Fano Resonance of Massive Dirac Particle through a Time-Dependent Barrier
510	2014-7-10	Manual D. Salas	Retired（退休）	On High Dispersion Traveling Wave Solutions of the Korteweg-de Vries Burgers Equation; The Curious Events Leading to the Theory of Shock Waves

511	2014-6-5	Xin Zhou 周　昕	School of Physics, University of Chinese Academy of Sciences, Beijing 中国科学院大学物理学院	Enhanced Sampling and Metastable State Analysis of Biologic Molecules
512	2014-6-4	Shun-Qing Shen 沈顺清	Department of Physics, The University of Hong Kong 香港大学物理系	Localization of Surface Electrons in Topological Insulators
513	2014-6-30	Geoff Thornton	London Centre for Nanotechnology and Chemistry Department, University College London, UK 英国伦敦大学	Engineering Polarons at an Oxide Surface
514	2014-6-3	Hai-Liang Liu 刘海亮	Department of Mathematics, Iowa State University, USA 美国爱荷华州立大学数学系	Structure Preserving Methods for Fokker-Planck-Type Equations
515	2014-6-27	Shi-Dong Jiang	Department of Mathematical Sciences, New Jersey Institute of Technology 美国新泽西理工学院数学科学系	An Introduction to the Fast Multipole Method
516	2014-6-27	Taku Ohwada 大和田 拓	Department of Aeronautics and Astronautics, Kyoto University, Japan 日本京都大学航空航天系	Does Kinetic Theory Really Contribute to Shock-Capturing Schemes for Compressible Flows?
517	2014-6-26	Long-Hua Zhao	Department of Mathematics, Applied Mathematics and Statistics, Case Western Reserve University, Ohio, USA 美国俄亥俄州凯斯西储大学数学	Flow Generated by Rotating Helical Flagella at Low Reynolds Numbers
518	2014-6-26	Jing-Fang Huang 黄京芳	Department of Mathematics, University of North Carolina at Chapel Hill 北卡罗来纳大学教堂山分校数学系	Fast Algorithms for Dynamic Simulations
519	2014-6-23	Tamiki Komatsuzaki	Research Center for Integrative Mathematics, Hokkaido University, Japan 日本北海道大学综合数学研究中心	Theories Should Meet Experiments: What Can We Extract From Time Series Data?
520	2014-6-19	Frédéric Poitevin	IPhT, CEA Saclay, France 法国原子能和替代能源委员会	Structure and Dynamics of a Ligand-Gated Ion Channel
521	2014-6-18	Xiao-Ying Dai 戴小英	Academy of Mathematics and Systems Science, Chinese Academy of Sciences (CAS) 中国科学院数学与系统科学研究院	A Parallel Orbital-Updating Approach for Electronic Structure Calculations

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522	2014-6-12	Andrew Belmonte	Dept of Mathematics / Dept of Materials Science & Engineering, Pennsylvania State University, USA 美国宾夕法尼亚州立大学	Instabilities of a Viscoelastic Fluid Interface in Special Geometrie
523	2014-6-11	James J. Feng	Canada Research Chair in Complex Fluids and Interfaces, University of British Columbia (UBC), Canada 加拿大不列颠哥伦比亚大学	Moving Contact Lines: Diffuse-Interface Model and Applications
524	2014-5-8	Yong-De Zhang 张永德	Deparment of Modern Physics, University of Science and Technology of China 中国科学技术大学, 近代物理系	超冷全同原子Bose-Einstein 凝聚体的Feshbach共振
525	2014-5-21	Cheng Wang 王 成	University of Massachusetts Dartmouth 美国马萨诸塞大学达特茅斯分校	Theoretical and Numerical Analysis for Cahn-Hilliard-Flow Model
526	2014-5-15	Dieter Jaksch	Department of Physics, University of Oxford 牛津大学物理系	Dipole-Dipole Bound Rydberg Molecules
527	2014-5-13	Hou-De Han 韩厚德	Department of mathematical sciences, Tsinghua University 清华大学数学科学系	Tailored Finite Point Method
528	2014-4-28	Yi Ding 丁 轶	School of Chemistry and Chemical Engineering, Shandong University 山东大学化学与化工学院	纳米多孔金属功能材料
529	2014-4-18	Jer-Lai Kuo 郭哲来	Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan 台湾中央研究院原子与分子研究所	2D Materials: Graphene, BN, TMD and Beyond
530	2014-4-17	Jun-Yi Zhu 朱骏宜	Department of Physics, The Chinese University of Hong Kong 香港中文大学物理系	DFT Calculations of Strains and Surfactants Tuned Doping and Defects in Semiconductors
531	2014-4-17	Kun Xu 徐 昆	Department of Mathematics, Hong Kong University of Science and Technology 香港科技大学数学系	Direct Modeling for Computational Fluid Dynamics

532	2014-4-10	Yong-De Zhang 张永德	Deparment of Modern Physics, University of Science and Technology of China 中国科学技术大学, 近代物理系	Quantum-Teleportation实验-4代量子态超空间传送实验评述
533	2014-3-6	Yong-De Zhang 张永德	Deparment of Modern Physics, University of Science and Technology of China 中国科学技术大学, 近代物理系	量子非破坏测量与弱测量
534	2014-3-5	Da-Wei Zhang 张大为	Division of Chemistry and Biological Chemistry, Nanyang Technological University, Singapore 新加坡南洋理工大学化学与生物化学系	Application of Conventional Molecular Dynamics Simulation in Evaluating the Stability of Apomyoglobin in Urea Solution
535	2014-3-28	Cai-Zhuang Wang 王才壮	Ames Laboratory - US DOE, Department of Physics and Astronomy, Iowa State University, Ames, USA 艾姆斯实验室-美国能源部，爱荷华州立大学物理与天文学系	How to Characterize Orders in Metallic Liquids and Glasses
536	2014-3-26	Aart W. Kleijn	"Center of Interface Dynamics for Sustainability, CDCST, CAEP, Chengdu, China 可持续发展接口动力学中心，中国农业科学研究院疾病预防控制中心"	Dynamics of Molecular Interactions at Surfaces: Eley-Rideal Reactions with Hyperthermal N Atoms
537	2014-3-25	Qing A 徐辛亮	Department of Chemistry, Massachusetts Institute of Technology 麻省理工学院化学系	Modeling Mechanical Properties of DNA: Allosteric Protein Binding, Loop Formation, and Longitudinal Fluctuations
538	2014-3-24	Qing Ai 艾　清	Department of Chemistry, National Taiwan University 国立台湾大学化学系	Quantum Invisible Cloak by Metal-String Complexes
539	2014-3-24	Marcin J. Skwark	"The Finnish Centre of Excellence in Computational Inference Research (COIN), Aalto University, Finland 芬兰卓越中心和芬兰阿尔托大学"	Protein Structure Prediction
540	2014-3-20	Ying-Long Miao 缪应龙	Howard Hughes Medical Institute, University of California, San Die 加利福尼亚大学圣地亚哥分校	Activation Mechanisms of a Muscarinic G-protein Coupled Receptor and Design of Allosteric Drugs
541	2014-3-19	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences 中科院武汉物理与数学研究所	New Trends with Exactly Solvable Models

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542	2014-3-12	Thomas Frauenheim	Bremen Center for Computational Materials Science, University of Bremen 德国不来梅大学不来梅计算材料科学中心	New Density Matrix DFTB Formalism beyond the Mulliken Approach
543	2014-3-12	Shan Zhao 赵　山	Department of Mathematics, University of Alabama 阿拉巴马大学数学系	New Developments of Alternating Direction Implicit (ADI) Algorithm for Biomolecular Solvation Analysis
544	2014-1-9	Guo-Ying Gao 高国英	Condensed matter physics, Chemistry and Chemical Biology, Cornell University 康奈尔大学	Novel Si Networks in Ca/Si Phase Diagram under Pressure
545	2014-1-9	Jing Cheng 程　静	Physics Department, South China University of Technology 华南理工大学物理系	An Introduction to Quantum Metrology
546	2014-1-9	Qi-Bing Li 李启兵	School of Aerospace, Tsinghua University 清华大学航天航空学院	气体动理学格式研究进展(III)
547	2014-1-8	Peng Zhang 张　芃	Physics Department, Renmin University of China 中国人民大学物理系	量子散射的物理原理(II)
548	2014-1-8	Peng Zhang 张　芃	Physics Department, Renmin University of China 中国人民大学物理系	量子散射的物理原理(III)
549	2014-1-7	Dong-Jun Ma 马东军	The National Space Science Center, CAS 中国科学院空间科学与应用研究中心	High-Fidelity Modelling & Simulation of Multiphase Flow and Combustion
550	2014-1-7	Wei-Hua Deng 邓伟华	School of Mathematics and Statistics, Lanzhou University 兰州大学数理统计学院	Fractional Calculus, Fractional Substantial Calculus, and Their Applications and High Order Discretizations
551	2014-1-6	Peng Zhang 张　芃	Physics Department, Renmin University of China 中国人民大学物理系	量子散射的物理原理(I)
552	2014-12-8	Wei Ji 季　威	Department of Physics, Renmin University of China 中国人民大学物理系	Accurate Modeling of Surface and Interface

553	2014-12-5	Yutaka Shikano	Institute for Molecular Science, National Institutes of Natural Science 日本国立自然科学研究院分子科学研究所	The Quantum Bell-Ziv-Zakai Bounds and Heisenberg Limits for Waveform Estimation
554	2014-12-30	Zhang-Hai Chen 陈张海	Department of Physics, Fudan University 复旦大学物理系	Evaporative Cooling Induced Exciton Polariton Condensate in a ZnO Microcavity
555	2014-12-3	Ye-Fei Li 李晔飞	Department of Chemistry, Fudan University 复旦大学化学系	TiO2表面光催化机理及其电子转移过程
556	2014-12-29	Cheng Wang 王　成	Department of Mathematics, University of Massachusetts Dartmouth 中国科学院计算数学与科学工程计算研究所，中科院数学与系统科学研究院	Global in Time Numerical Stability for Nonlinear PDEs
557	2014-12-29	Chun-Lin Wu 吴春林	School of Mathematical Sciences, Nankai University 南开大学数学科学学院	Augmented Lagrangian Method for Total Variation Image Restoration
558	2014-12-26	Jia-Lin Hong 洪佳林	Institute of Computational Mathematics and Scientific/ Engineering Computing, Academy of Mathematics and Systems Science, CAS 中国科学院计算数学与科学工程计算研究所，中科院数学与系统科学研究院	Fundamental Convergence of Numerical Methods for Stochastic Differential Equations
559	2014-12-26	Sen Yang 杨　森	3rd institute of physics, University of Stuttgart 斯图加特大学第三物理研究所	Quantum Photon Storage in Single Nuclear Spin in Nitrogen Vacancy in Diamond
560	2014-12-26	Hong Wang 王　宏	Shandong University and University of South Carolina 山东大学和美国南卡罗来纳大学	Recent Developments of Fast and Accurate Numerical Methods and Mathematical Analysis of Space-Fractional Diffusion Equations
561	2014-12-23	Kensuke Yokoi	School of Engineering, Cardiff University 卡迪夫大学工程学院	Density-Scaled Balanced Continuum Surface Force Models with a Level Set Based Curvature Interpolation Technique
562	2014-12-22	Xiang Cheng 程　翔	Department of Chemical Engineering and Materials Science, University of Minnesota, USA 美国明尼苏达大学化学工程与材料科学系	Through Thick and Thin – Imaging the Microscopic Structure of Shear Thinning and Thickening Colloidal Suspensions
563	2014-12-22	Kensuke Yokoi	School of Engineering, Cardiff University 卡迪夫大学工程学院	Numerical Simulations of Free Surface Flows Based On CLSVOF Method, Multi-Moment Methods and Density-Scaled CSF Model

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564	2014-12-2	Anders W. Sandvik	Department of Physics, Boston University 波士顿大学物理系	Quantum and Classical Annealing in Spin Glasses and Quantum Computing
565	2014-12-19	Shu-Jie Li 李书杰	Institute of High Performance Computing (IHPC), Agency for Science, Technology and Research (A*STAR), Singapore 新加坡科学技术研究局高性能计算研究所	Towards the Development of a Scalable, Very High-order Discontinuous Galerkin Flow Solver on 3D Hybrid Curved Elements
566	2014-12-18	Ding Pan 潘　鼎	Institute for Molecular Engineering, The University of Chicago, USA 美国芝加哥大学分子工程研究所	Dielectric Properties of Water under Extreme Conditions
567	2014-12-16	Xiao-Yang Xu 许晓阳	School of Mathematics and Computer Science, Shaanxi University of Technology 数学与计算机科学学院，陕西理工学院	三维聚合物自由面流动问题的宏介观数值模拟研究
568	2014-12-11	Ji-Chen Li	Department of Physics and Astronomy, The University of Manchester, UK 英国曼彻斯特大学物理与天文学系	Water around Biomolecules
569	2014-12-11	Dimitrie Culcer	School of Physics, University of New South Wales, Australia 澳大利亚新南威尔士大学物理学院	Charge Noise, Spin-Orbit Coupling and Dephasing of Single-Spin Qubits
570	2014-12-10	Yi-Fan Sun 孙怡帆	School of Statistics, Renmin University of China 中国人民大学统计学院	Probabilistic reconstruction and optimal matrix design in compressed sensing
571	2014-1-21	Su-Huai Wei 魏苏淮	National Renewable Energy Laboratory, Golden, USA 美国金州国家可再生能源实验室	First-Principles Design of Materials for Energy Applications
572	2014-1-14	Zu-Jian Ying 应祖建	ISC-CNR and Physics Department, University of Rome "La Sapienza", Italy 意大利罗马大学	Interplay of Spin Imbalance and Pairing Correlation in Trapped Cold Atomic Fermi Gases
573	2014-11-4	Hua-Zhong Tang 汤华中	School of Mathematical Sciences, Peking University 北京大学数学科学学院	双曲守恒律的激波捕捉方法

574	2014-11-3	Dominic Berry	Department of Physics and Astronomy, Macquarie University, Australia 澳大利亚麦格理大学物理与天文学系	The Quantum Bell-Ziv-Zakai Bounds and Heisenberg Limits for Waveform Estimation
575	2014-11-20	Yu-Xiang Xing 刑宇翔	Department of Engineering Physics, Tsinghua University 清华大学工程物理系	Imaging in PIAP laboratory
576	2014-11-19	Giulio Chiribella	Institute for Interdisciplinary Information Sciences (IIIS), Tsinghua University 清华大学交叉信息科学研究院	Quantum Replication at the Heisenberg Limit
577	2014-10-28	Ming-Wen Zhao 赵明文	School of Physics, Shandong University 山东大学物理学院	半导体中缺陷电子态的设计及调控
578	2014-10-22	Guo-Ping Guo 郭国平	Department of Physics, Key Lab of Quantum Information, CAS, University of Science and Technology of China 中国科学技术大学物理系	Circuit QED with Graphene Double Quantum Dots and Superconductor Resonator
579	2014-10-18	Guang Feng 冯　光	School of Energy and Power Engineering, Huazhong University of Science and Technology 华中科技大学能源与动力工程学院，煤燃烧国家重点实验室	离子液体超级电容器中微尺度界面现象的研究
580	2014-10-13	Jun-Jie Guo 郭俊杰	Oak Ridge National Laboratory, USA美国橡树岭国家实验室	结构缺陷对石墨烯类材料功能化的影响
581	2013-9-6	Debra Bernhardt	School of Chemistry and Molecular Biosciences, The University of Queensland, Australia 澳大利亚昆士兰大学化学与分子生物科学学院	Nanoscale Computational Science: From Materials Design to Flow and Fluctuations
582	2013-9-5	Zhan-Chun Tu 涂展春	Department of Physics, Beijing Normal University 北京师范大学物理学系	加权温度与加权热流及其在有限时间热力学中的应用
583	2013-9-4	Xiao-Min Tong 仝晓民	Institute of Materials Science & Center for computational Sciences, University of Tsukuba, Japan 日本筑波大学材料科学研究所和计算科学中心	Large Scale Simulation on a GPU Cluster
584	2013-9-25	Guo-Feng Zhang 张国锋	Department of Physics, Beijing University of Aeronautics and Astronautics 北京航空航天大学 物理系	两自旋耦合体系量子纠缠和量子关联的理论研究
585	2013-9-24	Matthias Krack	Paul Scherrer Institute, Switzerland 瑞士保罗·谢勒学院	Simulation of Uranium Dioxide Fuel with CP2K

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586	2013-9-23	John S. Tse 谢 硕	Department of Physics and Engineering Physics University of Saskatchewan, Canada 加拿大萨斯喀彻温大学	Band Gap of Materials at High Pressure
587	2013-9-18	Zhi-Qiang Xu 许志强	Institute of Computational Mathematics, Academy of Mathematics and Systems Science, CAS 中科院数学与系统科学研究院	An Introduction to Compressed Sensing
588	2013-9-16	Bing-Bing Suo 索兵兵	Institute of Modern Physics, Northwest University 西北大学现代物理研究所	Domain Decomposition and Multilevel Methods for Linear and Nonlinear Inverse Problems
589	2013-9-16	Guang-Yu Guo 郭光宇	Department of Physics, National Taiwan University 国立台湾大学物理系	Plasmon Excitations in Na Nanoparticles and Graphene Studied by Time-Dependent Density Functional Calculations
590	2013-9-12	Hong-Xing Lei 雷红星	Beijing Institute of Genomics, CAS 中国科学院北京基因组研究	Insight from Systems Network Analyses of Alzheimer's Disease
591	2013-8-7	Ting-Kuo Lee 李定国	Institute of Physics, Academia Sinica, Taipei, Taiwan 中国台湾中央研究院物理研究所	Recent New Progress on Variational Approach for Strongly Correlated t-J model
592	2013-8-30	Fan Yang 杨 帆	School of Physics, Beijing Institute of Technology 北京理工大学物理学院	Possible Exotic Superconductivity in the Single Layer and Bilayer Silicene
593	2013-8-21	Ku Wei 顾 威	Brookhaven National Laboratory, Upton, USA 美国阿普顿布鲁克海文国家实验室	Disordered Impurities and Strong Pairing Limit of High-Tc: Opportunities and Potential Collaborations
594	2013-8-15	Jin Jiang 姜 晶	University of Western Ontario, Canada 加拿大西安大略大学	Roles and Importance of Computational Science and Simulations in R&D of Nuclear Safety
595	2013-8-14	Yan Xu 徐 岩	School of Mathematical Sciences, University of Science and Technology of China 中国科学技术大学数学科学学院	A Dissipation-rate Reserving DG Method for Wave Catching-up Phenomena in a Nonlinearly Elastic Composite Bar
596	2013-8-14	Alejandro Muramatsu	Institute for Theoretical Physics III, Universitaet Stuttgart 斯图加特大学理论物理第三研究所	Phases of Correlated Fermions on Graphene-like Lattices

597	2013-8-14	Cai-Zhuang Wang 王才壮	Ames Laboratory - US DOE, Department of Physics and Astronomy, Iowa State University, Ames, USA 艾姆斯实验室-美国能源部，爱荷华州立大学物理与天文学系	Gutzwiller Density Functional Theory for Correlated Electron Calculation
598	2013-8-13	Jun Zou 邹　军	Department of Mathematics, The Chinese University of Hong Kong 香港中文大学数学系	Domain Decomposition and Multilevel Methods for Linear and Nonlinear Inverse Problems
599	2013-8-13	Xiang Zhou 周　翔	Department of Mathematics, City University of Hong Kong 香港城市大学数学系	An Explicit Cross Entropy Scheme for Mixtures
600	2013-8-12	Lu-Yan Ma 马旅雁	The Institute of Microbiology, Chinese Academy of Sciences 中国科学院微生物研究所	A Spider Web Strategy of Type IV Pili-mediated Migration to Build a Fiber-like Psl Polysaccharide Matrix in Pseudomonas Aeruginosa
601	2013-8-12	De-Feng Xing邢德峰	School of Municipal and Environmental Engineering, Harbin Institute of Technology 市政环境工程学院，哈尔滨工业大学	微生物电化学系统与厌氧发酵技术实现污水定向处理与能源回收
602	2013-8-12	Ya Shen 沈　雅	Department of Oral Biological & Medical Sciences, The University of British Columbia, Canada 加拿大不列颠哥伦比亚大学	Biofilm Development and Maturation
603	2013-8-1	Kirone Mallick	Institutde Physique Théorique, CEA Saclay, France 法国原子能和替代能源委员会	Modern Concepts in Nonequilibrium Statistical Physics
604	2013-7-8	Christopher Jarzynski	Department of Chemistry&Biochemistry, University of Maryland, USA 美国马里兰大学化学与生物化学系	Irreversibility and the Second Law of Thermodynamics at the Nanoscale
605	2013-7-8	Henk van Beijeren	Institute for Theoretical Physics, Utrecht University 荷兰乌得勒支大学理论物理所	KPZ-behavior of hydrodynamics in one dimension
606	2013-7-5	Qiang Sun 孙　强	Department of Advanced Materials and Nanotechnology College of Engineering, Peking University 北京大学工学院材料系	各向异性Janus纳米结构的模拟设计-特性-应用
607	2013-7-3	Bo SunBo Sun	Department of Physics, Oregon State University, USA 俄勒冈州立大学物理学系	On the Self-organization in Collective Chemosensing
608	2013-7-29	Hildegard Meyer-Ortmanns	School of Engineering & Science, Jacobs University, Bremen, Germany 德国不来梅雅各布斯大学工程与科学学院	On the Dynamics of a Typical Motif in Genetic Networks

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NO.	DATE 日期	SPEAKER 报告人	INSITUTE 单位	TITLE 报告题目
609	2013-7-26	José Manuel Pereira Carmelo	Center of Physics, University of Minho, Portugal 葡萄牙米尼奥大学物理中心	Exotic Finite-temperature Charge Transport Properties of the 1D Half-filled Hubbard Model
610	2013-7-24	Jun-Hua Yuan 袁军华	Department of Physics, University of Science and Technology of China 中国科学技术大学物理系	Bacterial Motile Behavior: From Single Motor to Signaling Network
611	2013-7-24	Eduardo V. Castro	Department of Physics, Instituto Superior Técnico, Portugal 葡萄牙特里科尼科学院物理系	Topological Phases in the Honeycomb Lattice from Fermion Interactions: Robustness Considerations
612	2013-7-23	Zhi-Pan Liu 刘智攀	Department of Chemistry, Fudan University 复旦大学化学系	Stochastic Surface Walking Method for Theoretical Electro-Photo Catalysis
613	2013-7-22	You-Jin Deng 邓友金	Department of Physics, University of Science and Technology of China 中国科学技术大学物理系	Antiferromagnetic Potts Models in Two Dimensions: Examples of Entropy-driven Phase Transitions
614	2013-7-2	Gang Lu	Department of Physics & Astronomy, California State University, Northridge 加州州立大学物理与北岭分校物理与天文学系	Quantum Simulations of Materials for Renewable Energy
615	2013-7-19	You-Jin Deng 邓友金	Department of Physics, University of Science and Technology of China 中国科学技术大学物理系	Worm Algorithm and Its Applications to Classical and Quantum Lattice Models
616	2013-7-18	You-Jin Deng 邓友金	Department of Physics, University of Science and Technology of China 中国科学技术大学物理系	Higgs Resonance in the Two-dimensional Bose-Hubbard Model
617	2013-7-17	You-Jin Deng 邓友金	Department of Physics, University of Science and Technology of China 中国科学技术大学物理系	Bold Diagrammatic Monte Carlo Simulation of the Fermi-Hubbard Model
618	2013-7-17	Miguel António da Nova Araújo	Department of Physics, University of Évora, Portugal 葡萄牙埃武拉大学物理系	Topological Transitions in Insulators and Superconductors

619	2013-7-16	Jia-Chang Sun 孙家昶	Institute of Software, Chinese Academy of Sciences 中科院软件研究所	On Approximation Problems Arisen from PDE Eigen-Computation
620	2013-7-16	Yan-Ping Chen 陈艳萍	School of Mathematical Sciences, South China Normal University华南师范大学数学科学学院	Error Estimates and Superconvergence of Mixed Finite Element Methods for Bilinear Optimal Control Problems
621	2013-7-15	Jian-Jun Dong	Department of Physics, Auburn University 美国奥本大学物理系	Synergy between Computational Solid-state Physics and Laboratory Mineral Physics: Understanding Properties of Earth Minerals at High Pressure and High Temperature Conditions
622	2013-7-12	Xi-Liang Lu 吕锡亮	School of Mathematics and Statistics,Wuhan University 武汉大学数学与统计学院	Primal Dual Active Set Algorithm for Compressive Sensing
623	2013-7-1	Ji-Jun Zhao 赵纪军	Key Laboratory of Materials Modification by Laser, Ion and Electron Beams (Dalian University of Technology) 大连理工大学	含能材料高温高压特性的第一性原理模拟
624	2013-6-7	Chang-Song Zhou 周昌松	Department of Physics, Hong Kong Baptist University 香港浸会大学物理系	Cost-efficiency Trade-off in the Connectivity and Activity of Neural Networks
625	2013-6-7	Yong He 贺　永	National Key Laboratory of Cognitive Neuroscience and Learning, Beijing Normal University 北京师范大学认知神经科学与学习国家重点实验室	Towards Human Brain Connectomics: Prospects and Challenges
626	2013-6-3	Xiao-Feng Yang 杨宵锋	Department of Mathematics, University of South Carolina 美国南卡罗莱纳大学数学系	Some New Advances on Modeling and Algorithms Development of Multiphase Complex Fluid System Using the Phase Field Method
627	2013-6-3	Shu-Bin Liu 刘述斌	Solar Energy Research Center, University of North Carolina 美国北卡罗莱纳大学太阳能研究中心	Density Functional Reactivity Theory – A New Framework to Understand Molecular Structure and Chemical Reactivity
628	2013-6-3	Qing Nie 聂　青	Departments of Mathematics and Biomedical Engineering, University of California, Irvine 加州大学河湾分校数学与生物医学工程系	Robust and Stochastic Dynamics in Signal Transduction, Stem Cells, and Development Patterning
629	2013-6-27	Jian-Fu Zhao 赵建福	The Institute of Mechanics, Chinese Academy of Sciences 中国科学院力学研究所国家微重力实验室	微重力多相热流体动力学研究
630	2013-6-27	Li-Lian Wang 王立联	School of Physical & Mathematical Sciences Nanyang Technological University 新加坡南洋理工大学物理与数学科学学院	Some New Perspectives on Spectral and Triangular Spectral-element Methods

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631	2013-6-26	Jie Li 李 杰	Department of Engineering, University of Cambridge, UK 英国剑桥大学工程系	Numerical Methods for Multiphase Flows
632	2013-6-26	Wen-Jun Zhang 郑文隽	Department of Physics, University at Buffalo,NY 纽约州立大学布法罗分校物理系	Recent Development in Coarse-grained and All-atom Modeling/Simulation of Protein Structures and Dynamics
633	2013-6-26	Jian-Hua Xing 邢建华	Department of Biological Sciences, Virginia Tech 弗吉尼亚理工大学生物科学系	Application of Statistical and Chemical Physics in Cell Biology
634	2013-6-25	Wei-Zhang Huang 黄维章	Department of Mathematics, University of Kansas 美国堪萨斯大学数学系	Adaptive Moving Mesh Methods for the Numerical Solution of Partial Differential Equations
635	2013-6-24	Xian-Min Xu 许先民	Institute of Computational Mathematics, Chinese Academy of Sciences 中科院计算数学与科学工程计算研究所	Wetting: Analysis and Numerical Simulations
636	2013-6-24	Shi-Dong Jiang	Department of Mathematical Sciences, New Jersey Institute of Technology 美国新泽西理工学院数学科学系	Integral Equation Methods for Unsteady Stokes Flow
637	2013-6-21	Avy Soffer	Department of Mathematics, Rutgers University 美国罗格斯大学数学系	Soliton and Vortex Dynamics and Tunneling-Hydrodynamic Analysis
638	2013-6-21	Gérard Labrosse	University Paris, Sub-11 法国巴黎南大学	From the Spectral Stokes Solvers to the Stokes Eigenmodes in Square/cube, until Questions in Fluid Dynamics
639	2013-6-17	Dao-Yun Ji 纪道云	Department of Molecular and Cellular Biology, Baylor College of Medicine, USA 美国贝勒医学院分子与细胞生物学系	Understanding How the Brain Encodes and Stores Memory and Why it Needs Computational Scientists
640	2013-6-14	Da-Wei Zhang 张大为	Division of Chemistry and Biological Chemistry, Nanyang Technological University, Singapore 新加坡南洋理工大学化学与生化部门	Ab initio Folding of Helical Peptides based on Charge Variation Scheme

641	2013-5-8	Bo-Bo We i魏勃勃	Department of Physics, The Chinese University of Hong Kong 香港中文大学物理系	Probing Lee-Yang Zeros and Time-domain Phase Transitions
642	2013-5-7	Hong-Wei Zheng 郑洪伟	Institute of Mechanics, Chinese Academy of Sciences 中国科学院力学研究所	可压缩多介质流体的非结构化自适应求解方法
643	2013-5-16	Tie-Gang Liu 刘铁钢	School of Mathematics and Systems Science, Beihang University 北京航空航天大学数学与系统科学学院	MGFM Applied to Fluid-structure Interaction with Cavitation
644	2013-5-15	Hong Wang 王　宏	Department of Mathematics, University of South Carolina 美国南卡罗莱纳大学数学系	Variable-coefficient Space-fractional Diffusion Equations: Mathematical Analysis and Fast Numerical Solution
645	2013-5-13	Xin-Feng Liu 刘新锋	Department of Mathematics, University of South Carolina 美国南卡罗莱纳大学数学系	Computational Studies for Cancer Cell Lineage Models and Cell Signaling
646	2013-5-13	Can Huang 黄　灿	Department of Mathematics, Michigan State University 美国密歇根州立大学数学系	A Nested Stochastic Simulation Algorithm for an Insulin-Signaling Network
647	2013-4-9	Feng-Yan Li	Department of Mathematical Sciences, Rensselaer Polytechnic Institute 伦斯勒理工学院数学科学系	Structure-Preserving Discontinuous Galerkin Methods for Ideal MHD Simulation
648	2013-4-3	Hans Herrmann	ETH Zürich, Switzerland 瑞士苏黎世联邦理工学院	Packing of Wires in Cavities and Growing Surfaces
649	2013-4-26	Zhong-Yi Huang 黄忠亿	Department of Mathematical Sciences, Tsinghua University 清华大学数学科学学院	Tailored Finite Point Method for Numerical Simulation of Partial Differential Equations
650	2013-4-25	Henri Orland	Institut de Physique Théorique, CEA Saclay, France 法国原子能和替代能源委员会	Prediction of RNA structures with Pseudoknots
651	2013-4-18	Zhen-Yu Zhang 张振宇	University of Science and Technology of China 中国科学技术大学	Atomistic Formation Mechanisms and Functionalization of Epitaxial Graphene on Transition Metal Substrates
652	2013-3-8	Xia-Ji Liu 刘夏姬	Centre for Atom Optics and Ultrafast Spectroscopy, Swinburne University of Technology, Melbourne, Australia 澳大利亚斯威本科技大学原子光学和超快光谱学中心	Spin-orbit-coupled Ultracold Atomic Gases

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653	2013-3-28	Ruo Li 李 若	School of Mathematical Science, Peking University 北京大学数学科学学院	From Discrete Velocity Model to Moment Method
654	2013-3-12	Wei-Ying Zheng 郑伟英	The Institute of Computational Mathematics and Scientific/ Engineering Computing of Chinese Academy of Sciences 中科院数学与系统科学研究院,计算数学与科学工程计算研究所	非线性多尺度电磁学涡流问题的建模和计算
655	2013-1-9	Peng Zhang 张 芃	Physics Department, Renmin University of China 中国人民大学物理系	The Scattering between Ultracold Atoms with Spin-orbit Coupling
656	2013-1-8	Ming-Liang Hu 胡明亮	School of Science, Xi’ an University of Posts and Telecommunications 西安邮电大学理学院	Quantum-memory-assisted Entropic Uncertainty Relation and Beyond
657	2013-1-30	Jian-Lan Wu 吴建澜	Department of Physics, Zhejiang University 浙江大学物理系	Efficient Energy Transfer in Light-harvesting Systems: Optimization, Mechanism, and Nontrivial Quantum Effects
658	2013-1-29	Zhang-Qi Yin 尹章琦	Center for Quantum Information, Institute for Interdisciplinary Information Sciences, Tsinghua University 清华大学量子信息中心	Space Time Crystals of Trapped Ions
659	2013-1-24	Hui Zhang 张 辉	School of Mathematical Sciences, Beijing Normal University 北京师范大学数学科学学院	The Micro-structure and Phase Transition Process of Macromolecular Microsphere Composite (MMC) Hydrogel
660	2013-12-27	Lei Gao 高 雷	School of Physical Science and Technology School of Energy, Soochow University 苏州大学物理科学与能源技术学院	Nonlocal Plasmonics
661	2013-12-26	Qi-Bing Li 李启兵	School of Aerospace, Tsinghua University 清华大学航天航空学院	气体动理学格式研究进展(II)
662	2013-12-23	Han-Quan Wang 王汉权	School of Statistics and Mathematics, Yunnan University of Finance and Economics 云南财经大学统计与数学学院	Projection Gradient Method for Computing the Ground State of Spin-2 Bose-Einstein Condensates

663	2013-12-23	Ting-Chun Wang 王廷春	School of Statistics & Mathematics, Nanjing University of Information Science & Technology 南京信息工程大学数学与统计学院信息与计算科学系	Optimal H^{2} Error Estimates of Finite Difference Methods for the Klein-Gordon-Schrdinger Equations in High Dimensions
664	2013-12-20	Yi-Bing Shan 单一兵	Senior Research Scientist, D. E. Shaw Research, New York, Beijing Computational Science Research Center 纽约D. E. Shaw Research和北京计算科学研究中心	An Investigation Enabled by Supercomputing: Putative Architectures of the EGF Receptor and the Molecular Effects of Oncogenic Mutations
665	2013-12-19	Qi-Bing Li 李启兵	School of Aerospace, Tsinghua University 清华大学航天航空学院	气体动理学格式研究进展
666	2013-12-10	Chen Hong 陈　鸿	Department of Physics, Tongji University 同济大学物理学院	光子人工微结构材料中的Fano共振及类量子现象研究
667	2013-12-10	Wei Zhang 张　伟	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Fano Effects in Nanostructures
668	2013-11-7	Hai-Jun Yu 于海军	Institute of Computational Mathematics, CAS 中国科学院计算数学与科学工程计算研究所	Numerical Study of Global Stability of Plane Shear Flow
669	2013-11-7	Zi-Qing Xie 谢资清	College of Mathematics and Computer Science, Hunan Normal University 湖南师范大学数学与计算机科学学院	An Augmented Partial Newton Method for Finding Multiple Solutions
670	2013-1-14	Zhi-Jian Yang 杨志坚	School of Mathematics and Statistics, Wuhan University 武汉大学数学与统计学院	Coupled Atomistic and Continuum Modeling and Simulation
671	2013-11-28	Si-Yuan Han 韩思远	Department of Physics and Astronomy, University of Kansas, USA 美国堪萨斯大学物理与天文学系	Anomalous Landau-Zener Oscillation and Its Impact on Superconducting Quantum Computing
672	2013-11-21	Xiao-Bo Zhu 朱晓波	Insititute of Physics, CAS 中科院物理研究所	超导量子比特及其量子杂化系统
673	2013-11-20	Jin-Lan Wang 王金兰	Department of Physics, Southeast University 东南大学物理系	Theoretical Studies of Graphene: from Growth Mechanism to Application
674	2013-11-18	Xiao Zheng 郑　晓	Hefei National Laboratory for Physical Sciences at the Microscale, University of Science and Technology of China 中国科学技术大学，合肥微尺度物质科学国家实验室	A Hierarchical Dynamics Approach for Open Quantum Systems, and Its Application to Strongly Correlated Electronic Systems

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675	2013-11-13	Wen-Jun Ying 应文俊	Department of Mathematics, Shanghai Jiao Tong University 上海交通大学数学系	A Structured Grid Method for a Singularly Perturbed Reaction-Diffusion Equation from Computational Cardiology
676	2013-1-10	Shmuel Gurvitz	Weizmann Institute of Science, Israel 以色列魏兹曼科学研究所	Decoherence and Measurement in Quantum Systems
677	2013-10-30	David P. Landau	Center for Simulational Physics, The University of Georgia 美国佐治亚大学模拟物理中心	A New Paradigm for Petascale Monte Carlo Simulation
678	2012-9-27	Yong-De Zhang 张永德	University of Science and Technology of China 近代物理系,中国科学技术大学	现代量子理论中疑难争论问题评述
679	2012-9-18	Li-Xin He 何力新	Department of Optics and Optical Engineering, University of Science and Technology of China 中国科学技术大学物理学院	Massive Electronic Simulation based on Systematically Improvable Atomic Bases (MESIA)
680	2012-9-14	Ralf Röhlsberger	Deutsches Elektronen-Synchrotron 德国DESY中心	Nuclear Quantum Optics in a Cavity: EIT and related Phenomena
681	2012-8-9	Ching-Yuen Loh 罗征援	Retirement（退休）	Computation of Nozzle Flows/Aeroacoustics with Finite Volume Methods
682	2012-8-8	Guo-Wei Wei 魏国卫	Department of Mathematics,Michigan State University, USA 美国密歇根州立大学数学系	Challenges and Opportunities in Mathematical Molecular Biology
683	2012-8-31	Niu Huang 黄　牛	National Institute of Biological Sciences (NIBS), Beijing 北京生命科学研究所	Marrying Physics to Biology
684	2012-8-29	Michal Křížek	Institute of Mathematics, Academy of Sciences of the Czech Republic 捷克共和国科学院数学研究所	On Angle Conditions in the Finite Element Method
685	2012-8-22	Ji-Chun Li 李继春	Department of Mathematical Science, University of Nevada Las Vegas, USA 美国内华达大学	Finite Element Modeling of Electromagnetic Cloaking Structures

686	2012-8-17	Jeffrey R. Reimers	School of Chemistry F11, The University of Sydney 悉尼大学化学系	Challenges for the Accurate Simulation of Anisotropic Charge Mobilities through Organic Molecular Crystals: The β Phase of mer-Tris(8-hydroxyquinolinato) aluminum(III) (Alq3) Crystal
687	2012-8-16	Jie Shen 沈　捷	Purdue University and Xiamen University 美国普渡大学和厦门大学	Some Recent Advances on Phase-field Models for Multiphase Complex Fluids
688	2012-8-1	Chih-Hao Chang 张智豪	University of California, Santa Barbara 加州大学圣塔芭芭拉分校	Numerical Prediction of Interfacial Instabilities: A Consistent, Conservative, All-Speed Sharp-Interface Method
689	2012-7-9	Chuan-Feng Li 李传锋	University of Science and Technology of China 中国科学技术大学	量子纠缠网络的实验研究
690	2012-7-4	Wen-Jin Li 李文金	CAS-MPG Partner Institute for Computational Biology, Shanghai Institutes for Biological Sciences, CAS 中国科学院-马普学会计算生物学伙伴研究所 中科院上海生命科学研究院	Theoretical Studies on Mechanochemistry: How Force Affects Chemical Bonds
691	2012-7-31	Xiao-Feng Yang 杨宵锋	Department of Mathematics, University of South Carolina 南卡罗来纳大学数学系	Energy Stable Numerical Schemes and Simulations of Two Phase Complex Fluids on Phase Field Method
692	2012-7-31	Klaus Hermann	Fritz-Haber-Institut der MPG, Berlin (Germany) 德国Fritz-Haber-MPG研究所	Theoretical X-ray Spectroscopy: DFT Cluster Studies for Systems of Catalytic Relevance
693	2012-7-26	Sheng-Bai Zhang 张绳百	Rensselaer Polytechnic Institute, Troy, New York 美国伦斯勒理工学院	Materials Physics for Dirac Fermions
694	2012-7-26	Mao-Sheng Miao 苗茂生	Materials Research Laboratory, University of California (Santa Barbara) 加州大学圣塔芭芭拉分校	From topological insulator to high oxidation state: how stresses alter physics and chemistry of matter
695	2012-7-2	David J. Srolovitz	Scientific Director, Science & Engineering Research Council, A*STAR Institute of High Performance Computing 高性能计算研究所	Grain Growth, Foam Coarsening, and Cellular Structures:Computational, Geometric and Topological Considerations
696	2012-7-12	Wei-Qun Peng 彭卫群	Department of Physics, The George Washington University 乔治华盛顿大学	Computational Study of Genomics and Epigenomics: from statistical analysis to biology
697	2012-7-10	Jean-Claude Saut	Department of Mathematics, University of Paris-Sud 11, France 法国巴黎南十一大学数学系	Dissipative effects of the boundary conditions for the Zakharov-Kuznetsov equation

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698	2012-6-4	Xin-Feng Liu 刘新锋	University of South Carolina, USA 美国南卡罗来纳大学	Operator Splitting Methods for Stiff Convection-Reaction-Diffusion Equations
699	2012-6-4	M.Suhail Zubairy	Texas A&M University, USA 美国德克萨斯农工大学	Quantum Computation and Communication: New Frontiers
700	2012-6-13	Hong-Wei Li 李宏伟	Department of Mathematics, Capital Normal University 首都师范大学	A non-convex relaxation approach to the Potts model for multiphase image segmentation
701	2012-6-13	Wei-Dong Zhao 赵卫东	School of Mathematics, Shandong University 山东大学数学学院	Discretization Methods for Solving Forward-Backward Stochastic Differential Equations
702	2012-6-11	Javier Carrasco	Institute of Catalysis and Petrochemistry, Spanish National Research Council 西班牙国家研究理事会催化与石化研究所	A Molecular Perspective of Water at Metal Interfaces
703	2012-5-30	Xian-Tu He 贺贤土	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Some Aspects in the Field of High Energy Density Physics (III)
704	2012-5-24	Xing-Hong Peng 彭细洪	Arizona State University, USA 美国亚利桑那州立大学	Predictive Modeling for Nanoscale System Using First-principles Calculations
705	2012-5-21	Guang Lin 林广	Pacific Northwest National Laboratory,USA 美国太平洋西北国家实验室	Uncertainty Quantification Algorithms and Analysis for Stochastic PDE Systems and Applications in Complex Energy & Environmental Problem
706	2012-5-17	Mou-Bin Liu 刘谋斌	中国科学院力学研究所	粒子方法 - 基础算法与工程应用研究进展
707	2012-4-9	Xian-Tu He 贺贤土	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Some Aspects in the Field of High Energy Density Physics (I)
708	2012-4-26	Hong Chen 陈　鸿	Tongji University 同济大学	光子人工微结构中驻波场诱导的类量子干涉现象

709	2012-4-25	Guang-Ri Jin 金光日	Beijing Jiaotong University 北京交通大学	Spin squeezing and its potential applications in quantum metrology
710	2012-4-24	Gang Liu 刘　岗	Shenyang National Laboratory for Materials Science, Institute of Metal Research, Chinese Academy of Sciences 中国科学院金属研究所沈阳材料科学国家（联合）实验室	Doping, Shaping and Heterostructuring Photocatalysts for More Efficient Solar Energy Conversion
711	2012-4-17	Ji-Jun Zhao 赵纪军	Dalian University of Technology大 连理工大学	Computational Exploration of New Energy Materials
712	2012-4-17	Xian-Tu He 贺贤土	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Some Aspects in the Field of High Energy Density Physics (II)
713	2012-3-28	Chin-Kun Hu 胡进锟	Institute of Physics, Academia Sinica, Taipei 11529, Taiwan 中国台湾中央研究院物理研究所	Numerical Approach to Structure, Folding and Aggregation of Proteins
714	2012-3-28	Yong-Jin Jiang 蒋永进	Zhejiang Normal University 浙江师范大学物理系	Electron Pumping in Graphene Mechanical Resonator
715	2012-3-23	Guo-Zhen Yang 杨国桢	Chinese Academy of Sciences 中国科学院院士	用于太阳能分色聚焦系统设计的初步探索
716	2012-3-23	Chuang-Tian Chen 陈创天	Chinese Academy of Sciences 中国科学院院士	Super-NLO Crystal — KBe2BO3F2 (KBBF)
717	2012-3-22	Henri Orland	Institut de Physique Théorique, CEA Saclay, France 法国原子能和替代能源委员会	CSRC Lectures on Statistical Physics - Elements of Non-Equilibrium Statistical Physics (III)
718	2012-3-14	Henri Orland	Institut de Physique Théorique, CEA Saclay, France 法国原子能和替代能源委员会	CSRC Lectures on Statistical Physics - Elements of Non-Equilibrium Statistical Physics (II)
719	2012-3-12	Henri Orland	Institut de Physique Théorique, CEA Saclay, France 法国原子能和替代能源委员会	CSRC Lectures on Statistical Physics - Elements of Non-Equilibrium Statistical Physics (I)
720	2012-2-7	Hao Li李浩	Department of Biochemistry and Biophysics, University of California San Francisco 加利福尼亚大学旧金山分校生物化学与生物物理系	Understanding the Mechanisms of Aging: Modern Approaches to an Ancient Problem

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NO.	DATE 日期	SPEAKER 报告人	INSITUTE 单位	TITLE 报告题目
721	2012-2-23	Abhinav Sarje	Computational Research Division, Lawrence Berkeley Laboratory 劳伦斯伯克利实验室计算研究部	Next-Generation Scientific Computing with Graphics Processors
722	2012-2-21	Yue-Heng Lan 兰岳恒	Tsinghua University 清华大学物理系	Bridging the Steady States with the Renormalization Group Analysis
723	2012-2-16	Fan Bai 白　凡	Biodynamic Optical Imaging Center, BIOPIC 北京大学生物动态光学成像中心	Theoretical and Experimental Approaches to Analyze the Mechanism of Rotational Switching in Bacterial Flagellar Motor
724	2012-2-14	John S. Tse	Department of Physics and Engineering Physics, University of Saskatchewan 加拿大萨省大学物理与工程物理系	Electron Correlation in the Electronic Structure and Excitation Spectra of Materials at High Pressure
725	2012-1-6	Shao-Gui Wu 伍绍贵	Sichuan Normal University 四川师范大学化学与材料科学学院	Study of Self-assembly Behavior of Phospholipid Using Coarse Grained Models
726	2012-1-5	Da-Dong Yan 严大东	Department of Physice, Beijing Normal University 北京师范大学物理学系	From Nucleus to Phase: Growing Dynamics of Critical Nucleus in Polymer Blends
727	2012-12-5	Pei-Hong Zhang 张培鸿	Department of Physics, University at Buffalo, SUNY 纽约州立大学布法罗分校物理系	Entropically Dominant State of Proteins
728	2012-12-4	Pu Tian 田　圃	The School of Life Sciences, Jilin University 吉林大学生命科学学院	Solid State Quasiparticle Calculations
729	2012-12-28	Xiang-Jun Xing 邢向军	Institute of Natural Sciences and Department of Physics, Shanghai Jiao Tong University 上海交通大学物理系	Morphology of Nematic and Smectic Vesicles
730	2012-12-26	Xiao-Ming He 何晓明	Department of Mathematics and Statistics, Missouri University of Science and Technology 美国密苏里科学技术大学数理统计学院	Multi-physics Domain Decomposition Methods for Stokes-Darcy Model

731	2012-12-26	Ji-Jun Zhao 赵纪军	Key Laboratory of Materials Modification by Laser, Ion and Electron Beams (Dalian University of Technology) 大连理工大学	Initial Growth Behavior and Interaction Mechanism of Silicene on Substrates
732	2012-12-26	Ming-Yu Zhang 章明宇	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Simulation of Surface-tension-driven Interfacial Flow by Smoothed Particle Hydrodynamics
733	2012-12-20	Wei-Dong Zhao 赵卫东	School of Mathematics, Shandong University 山东大学数学学院	Multi-step Methods for Solving Decoupled FBSDEs
734	2012-12-19	Zhong-Quan Zheng 郑钟泉	Aerospace Engineering Department, University of Kansas, USA 美国堪萨斯州立大学航空工程系	Development and Applications of Immersed-Boundary Methods
735	2012-12-18	Wei-Dong Zhao 赵卫东	School of Mathematics, Shandong University 山东大学数学学院	Numerical Methods for Forward Backward Stochastic Differential Equations
736	2012-12-18	Chung-Pin Chou 周崇斌	Condensed Matter Theory Group, Brookhaven National Laboratory, USA 美国布鲁克海文国家实验室凝聚态物理与材料科学实验室	Feasible Representation of Quantum Many-body Ground States: Tensor-product-based Projected States Ansatz
737	2012-12-17	Mou-Bin Liu 刘谋斌	Institute of Mechanics, Chinese Academy of Sciences 中国科学院力学研究所	SPH与DPD方法研究进展 - 基础算法与工程应用
738	2012-12-17	Yong-Liang Yu 余永亮	School of Physics, University of Chinese Academy of Sciences 中国科学院大学物理学院	动物飞行和游动的流体力学推进机理研究
739	2012-12-13	Wei Ku 顾　威	Condensed Matter Theory Group, Brookhaven National Laboratory, USA 美国布鲁克海文国家实验室凝聚态物理与材料科学实验室	Physical Effects of Impurities on Electronic Structure of Fe-based Superconductors
740	2012-12-11	Jia-Lin Hong 洪佳林	Institute of Computational Mathematics and Scientific/Engineering Computing, Academy of Mathematics and Systems Science, CAS 中国科学院计算数学与科学工程计算研究所，中科院数学与系统科学研究院	Structure-Preserving Algorithms of Stochastic Differential Equations
741	2012-1-17	Kai Chang 常　凯	Institute of Semiconductors, CAS 中国科学院半导体研究所	Harmonic Generation in Topological Insulator Quantum Dots

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NO.	DATE 日期	SPEAKER 报告人	INSITUTE 单位	TITLE 报告题目
742	2012-1-16	Jing Zhang 张 靖	Shanxi University 山西大学光电研究所，量子光学与量子器件国家重点实验室	超冷玻色-费米混合气体的实验研究
743	2012-11-6	Tie-Jun Li 李铁军	School of Mathematical Sciences, Peking University 北京大学数学科学学院	Understanding the Metastability in Gene Expression
744	2012-1-15	Hang Zheng 郑 杭	Shanghai Jiao Tong University 上海交通大学物理系	Effects of Counter-rotating Interaction on Driven Dynamics:Bloch-Siegert Shift and Coherent Destruction of Tunneling
745	2012-11-5	Goong Chen 陈 巩	Department of Mathematics and Institute for Quantum Science and Engineering, Texas A&M University 德克萨斯农工大学	Progress in the Mathematical Study of Wind Turbine Flows and Wind Energy
746	2012-11-30	Fei Liu 柳 飞	Beijing University of Aeronautics and Astronautics 北京航空航天大学，物理工程与核能工程学院	不可逆、时间反演和涨落关系
747	2012-11-29	Bao-Lin Tian 田保林	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	可压缩多介质流动的整体ALE方法及其应用
748	2012-11-27	Jian Zhang 张 鉴	Supercomputing Center, Computer Network Information Center, CAS 中科院计算机网络信息中心	Adaptive Algorithm and Phase Field Simulations of Equilibrium and Transition Shapes for Vesicle Membrane
749	2012-11-26	Li-Lian Wang 王立联	School of Physical & Mathematical Sciences, Nanyang Technological University 新加坡南洋理工大学	Fast High-Order Methods for Time-Domain Wave Scattering Problems
750	2012-11-26	Wei Ku 顾 威	Condensed Matter Theory Group, Brookhaven National Laboratory, USA 美国布鲁克海文国家实验室凝聚态物理与材料科学实验室	Kinetics-Driven Superconducting Gap in Underdoped Cuprate Superconductors within the Strong-Coupling Limit
751	2012-11-20	Wei-Wei Sun 孙伟伟	Department of Mathematics, City University of Hong Kong 香港城市大学数学系	A New Approach to Error Analysis of Linearized Galerkin FEMs for Nonlinear Parabolic PDEs

752	2012-11-20	Xiao-Bing Feng 凤小兵	Department of Mathematics, The University of Tennessee,USA 美国田纳西大学数学系	Absolutely Stable Discontinuous Galerkin Methods for Maxwell Equations with Large Wave Number
753	2012-11-2	Yu-Jie Sun 孙育杰	Biodynamic Optical Imaging Center, Peking University 北京大学生物动态光学成像中心	Probing Allostery through DNA
754	2012-1-10	Yi Zhou 周　毅	Zhejiang University 浙江大学物理系	Spin S=1 Quantum Spin Liquids with Fermionic Spinons
755	2012-10-9	Martin Stynes	School of Mathematical Sciences, University College Cork 爱尔兰科克大学数学科学学院	Numerical Methods for Steady-state Singularly Perturbed Convection-diffusion Problems
756	2012-10-8	Martin Stynes	School of Mathematical Sciences, University College Cork 爱尔兰科克大学数学科学学院	Numerical Methods for Steady-state Singularly Perturbed Convection-diffusion Problems
757	2012-10-30	Cheng Wang 王　成	Beijing Institute of Technology 北京理工大学	爆炸与冲击问题中的高精度计算
758	2012-10-29	Hong-Chen Fu 付洪忱	College of Physics Science & Technology, Shenzhen University 深圳大学物理科学与技术学院	Control Protocol of Finite Dimensional Quantum System
759	2012-10-24	Peng Xue 薛　鹏	Department of Physics, Southeast University 东南大学物理系	Implementation of Quantum Walks
760	2012-10-19	Jian-Hua Xing 邢建华	Department of Biological Sciences, Virginia Tech 弗吉尼亚理工大学生物科学系	Extending the Horizon of Chemical Physics to Cell Biology
761	2012-10-16	Hang Ding 丁　航	University of Science and Technology of China 中国科学技术大学, 近代力学系	多相流的数值模拟和动力学研究
762	2012-10-15	Tu-Zhan Chun 涂展春	Department of Physics, Beijing Normal University 北京师范大学,物理学系	费曼棘轮与分子马达最大功率对应的效率问题
763	2012-10-11	Martin Stynes	School of Mathematical Sciences, University College Cork 爱尔兰科克大学数学科学学院	Numerical Methods for Steady-state Singularly Perturbed Convection-diffusion Problems

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764	2012-10-10	Martin Stynes	School of Mathematical Sciences, University College Cork 爱尔兰科克大学数学科学学院	Numerical Methods for Steady-state Singularly Perturbed Convection-diffusion Problems
765	2011-9-9	José Manuel Pereira Carmelo	University of Minho, Portugal 葡萄牙米尼奥大学	The Hubbard Model on a Bipartite Lattice Extended Global SO(3) x SO(3) x U(1) Symmetry: The 1D case
766	2011-9-29	Xihua Yang 杨希华	Shanghai University 上海大学	Coherent control of population transfer and multi-field intensities via quantum coherence
767	2011-9-27	Ziting Chen 陈子亭	The Hong Kong University of Science and Technology 香港科技大学	Dirac Cone Dispersions in Classical Wave Systems
768	2011-9-20	Nuno Miguel M. R. Peres	University of Minho, Portugal 葡萄牙米尼奥大学	Optical Properties of Graphene
769	2011-9-11	Avadh B. Saxena	Los Alamos National Lab, USA 美国洛斯阿拉莫斯国家实验室	Phase Transitions in Ferroic and Multiferroic Materials
770	2011-8-9	Peiqing Tong 童培庆	Nanjing Normal University 南京师范大学	Hyperdiffusion and diffusion-nondiffusion transition of an electron in nonuniform lattices
771	2011-8-25	Liangjian Zou 邹良剑	中科院合肥固体所	Numerical Algorithm for Multi-orbital Slave-boson Solutions in Correlated Electron Systems
772	2011-8-25	Zidan Wang 汪子丹	The University of Hong Kong 香港大学	Spin-orbit Coupled Condensates: Exact Results
773	2011-8-24	Libin Fu 傅立斌	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Nonlocal effect of a bipartite system induced by local cyclic operation

774	2011-8-19	Mario Pimenta	Director of the Laboratory for Instrumentation and experimental Particle physics (LIP) 仪器与实验粒子物理学实验室	Experimental particle and astroparticle physics in Portugal
775	2011-8-18	Enrico Arrigoni	Graz University of Technology, Graz, Austria 格拉茨工业大学	Variational cluster approach for correlated fermions and bosons: equilibrium, superfluidity and nonequilibrium
776	2011-8-15	Feng Ding 丁　峰	Hong Kong Polytechnic University 香港理工大学	Theory of Dislocation in Carbon Nanotubes
777	2011-8-12	Traian Dumitrica	University of Minnesota 美国明尼苏达大学	Mechanics at the Nanoscale: From Physics to Engineering
778	2011-8-11	Hong Zhao 赵　鸿	Xiamen University 厦门大学	Transport and diffusion behaviors in low-D systems
779	2011-8-11	Feiming Hu 胡飞鸣	Aalto University School of Science and Technology 芬兰阿尔托大学科技学院	Magnetic Impurity in Graphene with Defects
780	2011-7-25	Yukun Huang 黄玉坤	Nan Jeon Institute of Technology, Tainan, Taiwan 中国台湾台南市南全工学院	Biorthonormal Matrix-Product-State Analysis for non-Hermitian Transfer-Matrix Renormalization-Group
781	2011-7-21	Henri Orland	Institut de Physique Théorique, CEA Saclay, France 法国原子能和替代能源委员会	Dynamics of Protein Folding
782	2011-7-19	Craig E. Tull	Lawrence Berkeley National Laboratory 美国劳伦斯·伯克利国家实验室	Advancing Light Source Science at the ALS with New Computing Techniques
783	2011-6-7	Zenghui Zhang 张增辉	East China Normal University 华东师范大学	Effect of Electrostatic Polarization on Structure, Dynamics and Interaction of Proteins
784	2011-6-28	Xianhua Shi 史砚华	University of Maryland Baltimore County 马里兰大学巴尔的摩分校	奇妙的光量子

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NO.	DATE 日期	SPEAKER 报告人	INSITUTE 单位	TITLE 报告题目
785	2011-6-27	Peihong Zhang 张培鸿	State University of New York at Buffalo 纽约州立大学布法罗分校	Dynamic Jahn-Teller Effect in the NV- Center in Diamond
786	2011-6-20	Meizhen Xiang 向美珍	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Coupled atomistic-continuum model for thermo-mechanical behaviors of materials and related multi-scale algorithms
787	2011-5-1	Yong Han 韩　勇	Institute for Physical Research and Technology Ames Laboratory, U. S. Department of Energy Iowa State University Ames 美国艾姆斯实验室，美国爱荷华州立大学	Physical Modeling and Computational Simulations of Metal Nanostructures on Material Surfaces
788	2011-4-29	J. E. Gubernatis	Los Alamos National Laboratory 美国洛斯阿拉莫斯国家实验室	Monte Carlo Computation of Multiple Extremal Eigenvalues: algorithms, results, and issues
789	2011-12-27	Meiyin Zhou 周美吟	Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan 台湾中央研究院原子与分子研究所所长，美国乔治亚理工学院教授	Physics of Few-Layer Graphene
790	2011-12-26	Gang Qin 秦刚	The National Space Science Center, CAS 中国科学院空间科学与应用研究中心，空间天气学国家重点实验室	行星际高能粒子的传播研究
791	2011-12-1	Ning Xu 徐　宁	University of Science and Technology of China 中国科学技术大学	Critical Scalings of Jammed Systems
792	2011-11-22	Yiqin Gao 高毅勤	Peking University 北京大学	Simulations Studies of Biological Structures in Aqueous Environment — Sampling Method Development and Study of Solvation Effects
793	2011-11-21	Yanming Ma 马琰铭	Jilin University 吉林大学，超硬材料国家重点实验室	卡里普索（CALYPSO）晶体结构预测技术及应用

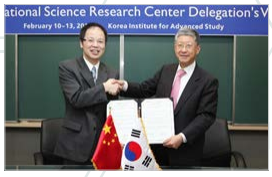
794	2011-11-18	Xiao Hu 胡　晓	WPI Center for Materials Nanoarchitectonics，National Institute for Materials Science, Tsukuba, Japan 日本国立材料科学研究所	Computer Simulations on Coupled Sine-Gordon Equations for THz Radiation based on Cuprate High-Tc Superconductors
795	2011-10-31	Tunan Zhang 张图南	University of Southern California 美国南卡罗来纳大学	Large Size Non-sparse Matrix in Atomic Structure Calculation
796	2011-10-20	Yang Wang 汪　洋	Carnegie Mellon University 卡内基·梅隆大学	Multiple Scattering Theory Approach to Ab Initio Electronic Structure Calculations
797	2010-9-15	Yuqiang Jiang 降雨强	Institute for Molecular Science (IMS), National Institutes of Natural Sciences (NINS) 国立自然科学研究院分子科学研究所	Optical micromanipulation with femtosecond laser
798	2010-8-26	Wei Zhang 张　伟	Institute of Applied Physics and Computational Mathematics 应用物理与计算数学研究所	Optical properties of hybrid nanocrystal complexes
799	2010-8-26	Peter	ARC Center of Excellence for Quantum-Atom Optics, Swinburne University of Technology Australia 澳大利亚斯威本科技大学ARC量子原子光学卓越中心	Computational quantum dynamics on an entangled phase-space
800	2010-8-18	Joerg Evers	Max-Planck-Institut für Kernphysik 马克斯·普朗克研究所	X-ray and gamma-ray quantum optics
801	2010-12-9	Xiantu He 贺贤土	Bejing Institute of Applied Physics and Computational Mathematics 北京应用物理与计算数学研究所	Condensed Physics and Matter Science under High Energy Density Regime
802	2010-12-7	Maxim Paily	The University of Western Ontario 加拿大西安大略大学	Coarse graining RNA nanostructures for the purpose of Molecular Dynamics simulations
803	2010-12-25	Zhanshan Wang 王占山	Tongji University 同济大学	X射线多层膜及其应用研究
804	2010-12-25	Hong Chen 陈　鸿	Tongji University 同济大学	光子人工微结构材料中的类量子现象
805	2010-10-29	John S. Tse	Department of Physics and Engineering Physics, University of Saskatchewan 加拿大萨省大学物理与工程物理系	Towards the design of a Superconductor

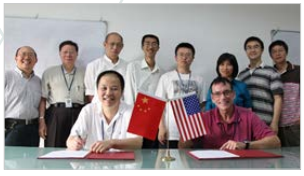
合作交流

COLLABORATIONS

To facilitate scientific interactions between CSRC scientists and scientists elsewhere, CSRC has developed partnerships with several universities and research institutions around the world. Besides engaging in long-term scientific collaborations, CSRC staff also host conferences, workshops, and seminars with collaborators. Through these activities, CSRC is working towards extending the frontier in computational science research and improving its competitive edge and prestige.

中心非常重视与科研机构及高校的合作，在积极组织承办国内外学术会议之时，也鼓励科研人员与国内外其他科研机构之间的互访交流，扩展学术视野和扩大学术影响。目前已与国际数所科研机构签署了合作协议，为打造中心作为国际一流的开展计算科学及相关学科交叉研究的综合平台而不断努力。





INTERNATIONAL PARTNERSHIP 国际及地区合作伙伴

INSTITUTE FOR QUANTUM COMPUTING, UNIVERSITY OF WATERLOO, CANADA
加拿大滑铁卢大学

UNIVERSITY OF GOTHENBURG, SWEDEN
瑞典哥德堡大学

NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, NORWAY
法国原子能与可替代能源委员会

THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY, CHINA
香港科技大学

UNIVERSITY OF WARWICK, UK
英国华威大学

UNIVERSITY OF OSLO, NORWAY
挪威奥斯陆大学

DEPARTMENT OF PHYSICS, THE CHINESE UNIVERSITY OF HONG KONG, CHINA
香港中文大学

DEPARTMENT OF PHYSICS, NATIONAL TAIWAN NORMAL UNIVERSITY, CHINA
国立台湾师范大学

CENTER FOR SIMULATIONAL PHYSICS, THE UNIVERSITY OF GEORGIA, USA
美国乔治亚大学

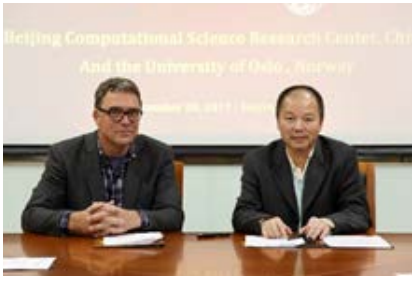
NORWEGIAN UNIVERSITY OF SCIENCE AND TECHNOLOGY, NORWAY
挪威科技大学

HEARNE INSTITUTE FOR THEORETICAL PHYSICS, LOUISIANA STATE UNIVERSITY, USA
美国路易斯安那州立大学

COLLEGE OF SCIENCES, OLD DOMINION UNIVERSITY, USA
美国奥多明尼昂大学

RIKAGAKU KENKYUSHO/ INSTITUTE OF PHYSICAL AND CHEMICAL RESEARCH, JAPAN
日本理化学研究所

KOREA INSTITUTE FOR ADVANCED STUDY, SOUTH KOREA
韩国高等科学院



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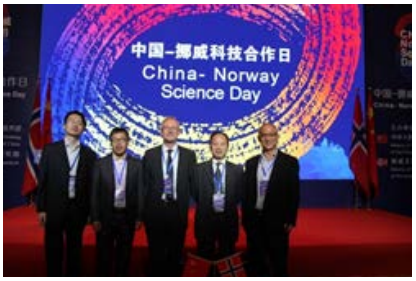
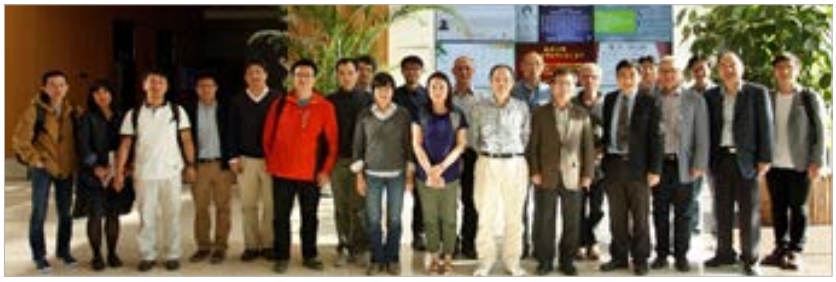
Physics The Chinese University of
Hong Kong to visit CSRC


中国-挪威科技合作日
China- Norway
Science Day



深圳京鲁计算科学应用研究院揭牌仪式
深圳京鲁计算科学应用研究院
SHENZHEN JL COMPUTATIONAL SCIENCE

学术访问

VISITING SCHOLARS

Since its establishment, more than 3000 visiting scholars from over 20 countries and regions have visited CSRC. CSRC faculty members went out for academic eschange for more than 2000 times. CSRC warmly welcomes scientists around the world to visit for collaboration and exchange. CSRC frequently hosts academic activities such as conferences, workshops, and seminars together with its counterparts. Living allowance and housing subsidies are provided during visitor's stay at CSRC.

中心在加强与科研机构及高校的合作交流，积极组织承办国内外学术会议之余，也鼓励科研人员与国内外其他科研机构之间的互访交流。成立至今，中心接待了来自20多个国家和地区的访问学者超过3000余人次，中心科研人员外出参加学术交流活动超过2000余人次。中心欢迎国内外各机构相关专业的科研人员和教师，以访问学者和客座研究人员的形式来访，进行短期或长期合作研究。中心也与同行们一起举办学术活动如会议、讲习班等。在中心访问期间，中心将提供一定的生活和住房补贴。

CSRC VISITING SCHOLARS (2018.08-2019.07)

NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
1	2019-07-30	2019-08-30	Hang Zheng 郑 杭	Shanghai Jiaotong University, China 上海交通大学	Professor 教 授	CSRC
2	2019-07-29	2019-08-17	Feng Liu 刘 锋	Utah State University, USA 美国犹他大学	Professor 教 授	CSRC
3	2019-07-27	2019-08-09	Masud Haque	Maynooth University, Ireland 爱尔兰梅努斯大学	Professor 教 授	Rubem Mondaini
4	2019-07-26	2019-08-01	Zhi-Gang Wang 王志刚	Jilin University, China 吉林大学	Professor 教 授	RQ Zhang
5	2019-07-25	2019-08-07	Dong-Fang Li 李东方	Huazhong University of Science and Technology, China 华中科技大学	Professor 教 授	ZM Zhang
6	2019-07-24	2019-08-18	Bing Wang 王 兵	Northwestern Polytechnical University, China 西北工业大学	Lecturer 讲 师	PF Guan
7	2019-07-23	2019-09-03	Rong-Guang Xu 徐荣广	The George Washington University, USA 美国乔治·华盛顿大学	Assistant Professor 助理教授	PF Guan
8	2019-07-22	2019-07-26	Hua-Dong Gao 高华东	Huazhong University of Science and Technology, China 华中科技大学	Associate Professor 副教授	ZM Zhang
9	2019-07-22	2019-07-26	Zhong-Yi Huang 黄忠亿	Tsinghua University, China 清华大学	Professor 教 授	ZM Zhang
10	2019-07-17	2019-08-15	Jiang-Xing Wang 王疆兴	Hunan Normal University, China 湖南师范大学	Associate Professor 副教授	ZM Zhang
11	2019-07-16	2019-08-05	Ricardo Guimaraes Dias	University of Aveiro, Portugal 葡萄牙阿威罗大学	Professor 教 授	CSRC
12	2019-07-16	2019-07-25	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教 授	HQ Lin

13	2019-07-15	2019-07-26	Wen-Jun Ying 应文俊	Shanghai Jiaotong University, China 上海交通大学	Professor 教 授	ZM Zhang
14	2019-07-15	2019-08-22	Xiao-Feng Yang 杨霄锋	University of South Carolina, USA 南卡罗莱纳大学	Professor 教 授	YY Cai
15	2019-07-15	2020-01-16	Hua Tian 田 华	Taiyuan University of Technology, USA 太原理工大学	Lecturer 讲 师	Ji-Jun Zhao
16	2019-07-14	2019-07-17	Shangyou Zhang 张上游	University of Delaware, USA 美国特拉华大学	Professor 教 授	ZM Zhang
17	2019-07-14	2019-07-16	Lili Ju 鞠立力	University of South Carolina, USA 美国南卡罗莱纳大学	Professor 教 授	SJ Li
18	2019-07-10	2019-08-09	Eduardo Castro	Faculty of Sciences of the University of Porto, Portugal 葡萄牙波尔图大学	Professor 教 授	CSRC
19	2019-07-09	2019-07-13	Tie-Zheng Qian 钱铁铮	Hong Kong University of Science and Technology, China 香港科技大学	Professor 教 授	ZM Zhang
20	2019-07-09	2020-01-10	Shuai-Wei Fan 樊帅伟	China Three Gorges University, China 三峡大学	Associate Professor 副教授	Suhuai Wei
21	2019-07-08	2019-08-08	Hong-Lin Liao 廖洪林	Nanjing University of Aeronautics and Astronautics, China 南京航空航天大学	Professor 教 授	ZM Zhang
22	2019-07-08	2019-07-10	Yang Liu 刘 洋	Inner Mongolia University, China 内蒙古大学	Professor 教 授	ZM Zhang
23	2019-07-08	2019-08-31	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教 授	HQ Lin
24	2019-07-07	2019-07-28	Miguel Araujo	University of Evora, Portugal 葡萄牙埃武拉大学	Professor 教 授	CSRC
25	2019-07-07	2019-08-07	Alex Hansen	Norwegian University of Science and Technology, Norway 挪威科技大学	Professor 教 授	CSRC
26	2019-07-05	2019-07-07	Hua-Dong Gao 高华东	Huazhong University of Science and Technology, China 华中科技大学	Associate Professor 副教授	ZM Zhang

CSRC VISITING SCHOLARS (2018.08-2019.07)

NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
27	2019-07-05	2019-09-05	Jie Ma 马　杰	Beijing Institute of Technology, China 北京理工大学	Professor 教　授	Shiwu Gao
28	2019-07-03	2019-12-31	Yue-Zheng Gong 龚跃政	Nanjing University of Aeronautics and Astronautics, China 南京航空航天大学	Associate Professor 副教授	Q Wang
29	2019-07-02	2019-07-13	Clenning Tong 董振宁	Clemson University, USA 美国克莱姆森大学	Professor 教　授	LS Luo
30	2019-07-02	2019-07-05	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
31	2019-07-01	2019-08-31	Xue-Hua Yang 杨雪花	Hunan University of Technology, China 湖南工业大学	Professor 教　授	ZM Zhang
32	2019-07-01	2019-07-29	Pedro Sacramento	IST, University of Lisbon, Portugal 葡萄牙里斯本大学	Professor 教　授	CSRC
33	2019-07-01	2019-07-07	Hua-Zhong Tang 汤华中	Peking University, Chian 北京大学	Professor 教　授	ZM Zhang
34	2019-07-01	2019-07-14	Jing-Run Chen 陈景润	Suzhou University, China 苏州大学	Professor 教　授	YY Cai
35	2019-06-29	2019-07-02	Jie LI 李　杰	University of Cambridge, UK 剑桥大学	Professor 教　授	LS Luo
36	2019-06-29	2019-07-06	Zhong-Jian Yang 杨中见	Central South University, China 中南大学	Associate Professor 副教授	HQ Lin
37	2019-06-27	2019-09-06	Pedro Ribeiro	IST, University of Lisbon, Portugal 葡萄牙里斯本大学	Researcher 研究员	CSRC

38	2019-06-27	2019-07-03	Ling-Xing Yao 姚凌星	University of Akron, USA 美国阿克伦大学	Assistant Professor 助理教授	Q Wang
39	2019-06-26	2019-07-06	Wing Chi Yu 余咏芝	City University of Hong Kong, China 香港城市大学	Assistant Professor 助理教授	CSRC/HQ Lin
40	2019-06-24	2019-07-08	Fang Zeng 曾　芳	Chongqing University, China 重庆大学	Associate Professor 副教授	JG Sun
41	2019-06-24	2019-06-26	Huai-Ming Guo 郭怀明	Beihang University, China 北京航空航天大学	Associate Professor 副教授	Rubem Mondaini
42	2019-06-21	2019-06-23	Jian Cai 蔡　健	Corning Research Center China 康宁中国研发中心	Senior Research Fellow 高级研究员	LS Luo
43	2019-06-20	2019-08-18	Maosheng Miao 苗茂生	California State University Northridge, USA 美国加州州立大学北岭分校	Assistant Professor 助理教授	CSRC
44	2019-06-20	2019-08-28	Jerry Zhijian Yang 杨志坚	Wuhan University, China 武汉大学	Professor 教　授	CSRC/HQ Lin
45	2019-06-17	2019-08-16	Wen-Cai Yi 易文才	Qufu Normal University, China 曲阜师范大学	Lecturer 讲　师	MS Miao
46	2019-06-17	2019-07-04	Ya-Min Quan 全亚民	The Institute of Solid State Physics (CAS), China 中科院固体物理研究所	Associate Researcher副研究员	HQ Lin
47	2019-06-16	2019-06-23	Zhenkun Tang 唐振坤	Hengyang Normal University， China 衡阳师范学院	Associate Professor 副教授	Limin Liu
48	2019-06-12	2019-06-20	Javier Prior Arce	Universidad Politécnica de Cartagena, Spain 西班牙卡塔赫纳理工大学	Professor 教　授	JS Cao
49	2019-06-11	2019-07-10	Ghassan Georges Batrouni	University of Nice-Sophia Antipolis, France 法国尼斯大学	Professor 教　授	CSRC
50	2019-06-11	2019-06-20	Erich Werner Thomas Frauenheim	University of Bremen, Germany 德国不来梅大学	Professor 教　授	CSRC
51	2019-06-11	2019-06-18	Shenh-Jun Yuan 袁声军	Wuhan University, China 武汉大学	Professor 教　授	CSRC

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
52	2019-06-11	2019-06-20	Kim Ngan LeKim Ngan Le	Monash University, Australia 澳大利亚蒙纳士大学	Researcher 研究员	Martin Stynes
53	2019-06-10	2019-06-12	Yang Yang 杨　扬	Michigan Technological University, USA 密歇根理工大学	Associate Professor 副教授	ZM Zhang
54	2019-06-10	2019-06-23	Jie LI 李　杰	University of Cambridge, UK 剑桥大学	Professor 教　授	LS Luo
55	2019-06-07	2019-06-27	Pierre Lallemand	Université of Paris-Sud, France 法国巴黎南大学	Professor 教　授	LS Luo
56	2019-06-06	2019-06-08	Li Mao 毛　力	Wuhan University, China 武汉大学	Professor 教　授	HQ Lin
57	2019-06-06	2019-06-09	Ji-Jun Zhao 赵纪军	Dalian University of Technology, China 大连理工大学	Professor 教　授	CSRC
58	2019-06-06	2019-06-11	Qing-Lin Tang 唐庆斌	Sichuan University, China 四川大学	Researcher 研究员	WZ Bao
59	2019-06-05	2019-06-17	Gen Nakamura	Hokkaido University, Japan 日本北海道大学	Professor 教　授	GH Hu
60	2019-06-04	2019-06-10	Wei Gong 龚　伟	Academy of Mathematics and Systems Science, Chinese Academy of Sciences中 国科学院数学与系统科学研究院	Associate Researcher 副研究员	JL Wang
61	2019-05-29	2019-08-31	Ching Yuen Loh 罗征援	National Aeronautics and Space Administration, USA 美国宇航局格伦研究中心	Senior Scientist 资深科学家	LS Luo
62	2019-05-28	2019-11-28	Rui Su 苏　锐	Hangzhou Dianzi University, China 杭州电子科技大学	Lecturer 讲　师	PF Guan

63	2019-05-27	2019-06-22	Hao-Bin Wang 王浩斌	University of Colorado Denver, USA 美国科罗拉多大学丹佛分校	Professor 教　授	CSRC
64	2019-05-26	2019-05-31	Abraham Nitzan	University of Pennsylvania, USA 美国宾夕法尼亚大学	Professor 教　授	JS Cao
65	2019-05-26	2019-06-01	Jia-Qing Yang 杨家青	Xi’an Jiaotong University, China 西安交通大学	Associate Professor 副教授	GH Hu
66	2019-05-26	2019-05-28	Kia Ling Ngai 倪嘉陵	CNR-IPCF, Dipartimeto di Fisica, Universita di Pisa, Pisa, Italy 意大利比萨大学	Professor 教　授	PF Guan
67	2019-05-25	2019-05-28	Georgios Akrivis	University of Ioannina, Greece 希腊约阿尼纳大学	Professor 教　授	JL Wang
68	2019-05-25	2019-06-07	Bu-Yang Li 李步扬	Hong Kong Polytechnic University, China 香港理工大学	Associate Professor 副教授	ZM Zhang
69	2019-05-24	2019-06-12	Feng Liu 刘　锋	Utah State University, USA 美国犹他大学	Professor 教　授	CSRC
70	2019-05-13	2019-05-14	Zheng-Hua An 安正华	Fudan University, China 复旦大学	Professor 教　授	Suhuai Wei
71	2019-05-13	2019-05-18	Shenh-Jun Yuan 袁声军	Wuhan University, China 武汉大学	Professor 教　授	HQ Lin
72	2019-05-11	2019-05-18	Zhenkun Tang 唐振坤	Hengyang Normal University，China 衡阳师范学院	Associate Professor 副教授	Limin Liu
73	2019-05-10	2019-08-21	Jia Zhao 赵　佳	Utah State University, USA 美国犹他州立大学	Assistant Professor 助理教授	Q Wang
74	2019-05-09	2019-07-20	Ji-Guang Sun 孙继广	Michigan Technological University, USA 密歇根理工大学	Professor 教　授	ZM Zhang
75	2019-05-09	2019-05-20	Xiao-Feng Yang 杨霄锋	University of South Carolina, USA 南卡罗莱纳大学	Professor 教　授	YY Cai
76	2019-05-09	2019-05-14	Qing-Hai Zhang 张庆海	Zhejiang University, China 浙江大学	Professor 教　授	ZM Zhang

CSRC VISITING SCHOLARS (2018.08-2019.07)

NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
77	2019-05-07	2019-05-10	Chao-Yang Zhang 张朝阳	Institute of Chemical Materials, CAEP, China 中物院化工材料研究所	Researcher 研究员	CSRC
78	2019-05-06	2019-08-20	Chang-Hui Tan 谭昌汇	University of South Carolina, USA 美国南卡罗莱纳大学	Assistant Professor 助理教授	YY Cai
79	2019-05-05	2019-05-19	Bao-Ping Liu 刘保平	Peking University, Chian 北京大学	Associate Professor 副教授	YY Cai
80	2019-04-27	2019-05-04	Dimitrie Culcer	The University of New South Wales, Australia 澳大利亚新南威尔士大学	Professor 教　授	CSRC
81	2019-04-22	2019-04-28	Ya-Min Quan 全亚民	The Institute of Solid State Physics (CAS), China 中科院固体物理研究所	Associate Researcher 副研究员	HQ Lin
82	2019-04-20	2019-04-21	Ji-Jun Zhao 赵纪军	Dalian University of Technology, China 大连理工大学	Professor 教　授	CSRC
83	2019-04-15	2019-04-21	Maosheng Miao 苗茂生	California State University Northridge, USA 美国加州州立大学北岭分校	Assistant Professor 助理教授	CSRC
84	2019-04-15	2019-04-28	Feng Liu 刘　锋	The University of Utah, USA 美国犹他大学	Professor 教　授	CSRC
85	2019-04-06	2019-04-13	Peng Zhang 张　鹏	Shenzhen University, China 深圳大学	Lecturer 讲　师	Suhuai Wei
86	2019-04-01	2019-04-15	Can Huang 黄　灿	Xiamen University, China 厦门大学	Associate Professor 副教授	YY Cai
87	2019-03-27	2019-04-02	Tu-Nan Chang 张图南	University of Southern California 南加利福尼亚大学	Professor 教　授	Xiang Gao
88	2019-03-26	2019-03-29	Jing-Zhi Li 李景治	Southern University of Science and Technology, China 南方科学大学	Professor 教　授	GH Hu

89	2019-03-25	2019-03-31	Shenh-Jun Yuan 袁声军	Wuhan University, China 武汉大学	Professor 教 授	HQ Lin
90	2019-03-25	2019-03-31	Mikhail Katsnelson	Radboud University of Nijmegen, the Netherlands 荷兰内梅亨大学	Professor 教 授	HQ Lin
91	2019-03-24	2019-04-06	Christophe BESSE	Université Toulouse 3, France 图卢兹第三大学	Professor 教 授	YY Cai
92	2019-03-20	2019-03-22	Yu-Biao Zhang 张与彪	Tianjin University, China 天津大学	Lecturer 讲 师	GH Hu
93	2019-03-19	2019-04-04	Matthew Turner	University of Warwick, UK 英国华威大学	Professor 教 授	Hugues Chate
94	2019-03-19	2019-04-04	Xia-Qing Shi 施夏清	Suzhou University, China 苏州大学	Associate Professor 副教授	Hugues Chate
95	2019-03-18	2019-03-21	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教 授	HQ Lin
96	2019-03-17	2019-03-20	Wang-Tao Lu 鲁汪涛	Zhejiang University, China 浙江大学	Professor 教 授	GH Hu
97	2019-03-07	2019-03-10	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教 授	HQ Lin
98	2019-03-01	2019-08-30	Wei-Zhu Bao 包维柱	National University of Singapore, Singapore 新加坡国立大学	Professor 教 授	CSRC
99	2019-03-01	2019-03-20	Hong-Tao Chen 陈竑焘	Xiamen University, China 厦门大学	Associate Professor 副教授	ZM Zhang
100	2019-02-20	2020-02-20	Chul Hong PARK	Pusan National University, Korea 韩国釜山国立大学	Professor 教 授	Suhuai Wei
101	2019-02-15	2019-02-26	Thereza Paiva	Universidade Federal do Rio de Janeiro, Brazil 巴西里约热内卢联邦大学	Professor 教 授	Rubem Mondaini
102	2019-02-15	2019-02-26	Raimundo Rocha dos Santos	Universidade Federal do Rio de Janeiro, Brazil 巴西里约热内卢联邦大学	Professor 教 授	Rubem Mondaini

CSRC VISITING SCHOLARS (2018.08-2019.07)

NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
103	2019-02-07	2019-02-15	Eirik Grude Flekkøy	University of Oslo, Norway 挪威奥斯陆大学	Professor 教 授	CSRC
104	2019-01-31	2019-02-04	Hong-Gang Luo 罗洪刚	Lanzhou University, China 兰州大学	Professor 教 授	CSRC
105	2019-01-29	2019-02-02	Yu-Feng Nie 聂玉峰	Northwestern Polytechnical University, China 西北工业大学	Professor 教 授	ZM Zhang
106	2019-01-24	2019-02-11	Richard Scalettar	University of California, Davis, USA 美国加州大学戴维斯分校	Professor 教 授	Rubem Mondaini
107	2019-01-23	2019-01-30	Tao Ying 应 涛	Harbin Institute of Technology, China 哈尔滨工业大学	Lecturer 讲 师	Rubem Mondaini
108	2019-01-22	2019-01-31	Zhong-Jian Yang 杨中见	Central South University, China 中南大学	Associate Professor 副教授	HQ Lin
109	2019-01-22	2019-01-28	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教 授	HQ Lin
110	2019-01-22	2019-01-25	Ru-Lin Wang 王汝林	Qindao University 青岛大学	Lecture	CY Yam
111	2019-01-18	2019-01-30	Feng Liu 刘 锋	The University of Utah, USA 美国犹他大学	Professor 教 授	CSRC
112	2019-01-17	2019-01-27	Hang Zheng 郑 杭	Shanghai Jiaotong University, China 上海交通大学	Professor 教 授	CSRC
113	2019-01-16	2019-01-24	Yang Liu 刘 洋	Inner Mongolia University, China 内蒙古大学	Professor 教 授	ZM Zhang
114	2019-01-13	2019-01-25	Zhan-Wen Yang 杨占文	Harbin Institute of Technology, China 哈尔滨工业大学	Associate Professor 副教授	JW Zhang

115	2019-01-11	2019-01-31	Jerry Zhijian Yang 杨志坚	Wuhan University, China 武汉大学	Professor 教　授	CSRC/HQ Lin
116	2019-01-07	2019-02-02	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
117	2019-01-06	2019-01-10	Robert Patterson	School of Photovoltaic and Renewable Energy Engineering, UNSW Sydney, Australia 澳大利亚新南威尔士大学光伏与可再生能源学院	Assistant Professor 助理教授	Suhuai Wei
118	2019-01-06	2019-01-10	Ya-Min Quan 全亚民	The Institute of Solid State Physics (CAS), China 中科院固体物理研究所	Associate Researcher 副研究员	HQ Lin
119	2018-12-27	2019-01-02	Xiang Wang 王　翔	Jilin University, China 吉林大学	Lecturer 讲　师	ZM Zhang
120	2018-12-26	2019-01-01	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
121	2018-12-23	2018-12-27	Qing-Hu Chen 陈庆虎	Zhejiang University, China 浙江大学	Professor 教　授	JS Cao
122	2018-12-23	2018-12-29	Yang Liu 刘　洋	Inner Mongolia University, China 内蒙古大学	Professor 教　授	ZM Zhang
123	2018-12-21	2018-12-23	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教　授	HQ Lin
124	2018-12-20	2018-12-25	Gen Nakamura	Inha University, Korea 韩国仁荷大学	Professor 教　授	GH Hu
125	2018-12-20	2018-12-25	Eli Pollak	Weizmann Institute of Science, Israel 以色列魏茨曼科学研究所	Professor 教　授	JS Cao
126	2018-12-18	2019-01-09	Jia Zhao 赵　佳	Utah State University, USA 美国犹他州立大学	Associate Professor 副教授	Q Wang
127	2018-12-17	2018-12-24	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教　授	HQ Lin
128	2018-12-16	2018-12-24	Qing-Lin Tang 唐庆斌	Sichuan University, China 四川大学	Professor 教　授	YY Cai

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
129	2018-12-10	2018-12-15	Yu-Jun Zhao 赵宇军	South China University of Technology，China 华南理工大学	Professor 教 授	Suhuai Wei
130	2018-12-07	2018-12-30	Ji-Guang Sun 孙继广	Michigan Technological University, USA 密歇根理工大学	Professor 教 授	ZM Zhang
131	2018-12-04	2018-12-10	Asle Sudbø	Norwegian University of Science and Technology, Norway 挪威科技大学	Professor 教 授	CSRC
132	2018-12-04	2018-12-11	Shenh-Jun Yuan 袁声军	Wuhan University, China 武汉大学	Professor 教 授	HQ Lin
133	2018-12-01	2019-01-31	Chun-Xiao Zhang 张春小	Xiangtan University, China 湘潭大学	Associate Professor 副教授	Bing Huang
134	2018-12-01	2018-12-07	Erich Werner Thomas Frauenheim	University of Bremen, Germany 德国不来梅大学	Professor 教 授	CY Yam
135	2018-12-01	2018-12-31	Bo Long 龙 波	Guizhou Minzu University, China 贵州民族大学	Professor 教 授	Shu-Xian Hu
136	2018-11-30	2018-12-17	Alex Hansen	Norwegian University of Science and Technology, Norway 挪威科技大学	Professor 教 授	CSRC
137	2018-11-28	2018-12-10	Gilberto Teobaldi	University of Liverpool, UK 英国利物浦大学	Lecturer 讲 师	CSRC
138	2018-11-26	2018-12-26	Xiao-Dong Liu 刘晓东	Academy of Mathematics and Systems Science (CAS), China 中国科学院数学与系统科学研究院	Associate Professor 副教授	GH Hu
139	2018-11-25	2018-12-01	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教 授	HQ Lin

140	2018-11-23	2018-11-30	Ya-Min Quan 全亚民	The Institute of Solid State Physics (CAS), China 中科院固体物理研究所	Associate Researcher 副研究员	HQ Lin
141	2018-11-21	2019-01-22	Jooyoung Lee	Korea Institute for Advanced Study, Korea 韩国先进科技学院	Professor 教　授	HG Liu
142	2018-11-19	2018-11-23	Chang-Pin Li 李常品	Shanghai University, China 上海大学	Professor 教　授	Martin Stynes
143	2018-11-19	2018-12-19	Yong-Hong Zhao 赵永红	Sichuan Normal University, China 四川师范大学	Professor 教　授	HG Luo
144	2018-11-18	2018-11-19	Ji-Jun Zhao	Dalian University of Technology, China 大连理工大学	Professor 教　授	CSRC
145	2018-11-18	2018-12-20	Ghassan Georges Batrouni	University of Nice-Sophia Antipolis, France 法国尼斯大学	Professor 教　授	Rubem Mondaini
146	2018-11-16	2018-11-18	Shi-You Chen 陈时友	East China Normal University, China 华东师范大学	Professor 教　授	Suhuai Wei
147	2018-11-15	2018-12-01	Dimitrie Culcer	The University of New South Wales, Australia 澳大利亚新南威尔士大学	Professor 教　授	Wen Yang
148	2018-11-13	2018-11-30	Xiang Zhan 詹　翔	Nanjing University of Science and Technology 南京理工大学	Professor 教　授	Xue Peng
149	2018-11-08	2018-11-12	Han-Quan Wang 王汉权	Yunnan University of Finance and Economics, China 云南财经大学	Professor 教　授	YY Cai
150	2018-11-07	2018-11-09	Yan-Ling Li 李延龄	Jiangsu Normal University, China 江苏师范大学	Professor 教　授	HQ Lin
151	2018-10-31	2018-12-25	Wei-Zhu Bao 包维柱	National University of Singapore, Singapore 新加坡国立大学	Professor 教　授	CSRC
152	2018-10-29	2018-11-10	Sheng-Guo Li 李胜国	National University of Defense Technology 国防科技大学	Assistant Researcher 助理研究员	Shiwu Gao
153	2018-10-29	2018-11-06	John Spence	Arizona State University, USA 美国亚利桑那州立大学	Professor 教　授	HG Liu

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
154	2018-10-23	2018-10-26	Paul Erhart	Department of Physics Chalmers University of Technology, Gothenburg, Sweden 瑞典查尔姆斯理工大学	Professor 教 授	Shiwu Gao
155	2018-10-19	2018-10-28	Feng Tiger Liu 刘 锋	The University of Utah, USA 美国犹他大学	Professor 教 授	Bing Huang
156	2018-10-17	2018-10-18	David Keyes	King Abdullah University of Science and Technology, Kingdom of Saudi Arabia 阿卜杜拉国王科技大学	Professor 教 授	LS Luo
157	2018-10-16	2018-10-26	Rosario Fazio	The Abdus Salam International Centre for Theoretical Physics, Italy 意大利国际理论物理中心	Professor 教 授	Stefano Chesi
158	2018-10-16	2018-12-16	Xin-Zheng Li 李新征	School of Physics, Peking University, China 北京大学物理学院	Associate Professor 副教授	Shiwu Gao
159	2018-10-15	2018-11-02	Ya-Li Gao 高娅莉	Northwestern Polytechnical University, China 西北工业大学	Associate Professor 副教授	YY Cai
160	2018-10-15	2018-11-02	Johannes Elschner	Weierstrass Institute (WIAS), Berlin, Germany 德国维尔特斯拉斯研究所	Professor 教 授	GH Hu
161	2018-10-15	2018-11-15	Sheng Meng 孟 胜	Institute of Physics, CAS 中科院物理所	Professor 教 授	Shiwu Gao
162	2018-10-13	2018-10-15	Jean-Pierre Leburton	University of Illinois Urbana-Champaign, USA 美国伊利诺伊大学 厄班纳-香槟分校	Professor 教 授	RQ Zhang
163	2018-10-12	2018-12-12	Jian-Bo Zhang 张建波	University of Kansas, USA 美国堪萨斯大学	Associate Professor 副教授	Q Wang
164	2018-10-12	2018-11-12	Ke Liang 梁 科	Nankai University,China 南开大学	Professor 教 授	Q Wang

165	2018-09-25	2018-10-20	Guang-Hua Ji 纪光华	Beijing Normal University, China 北京师范大学	Associate Professor 副教授	Q Wang
166	2018-09-19	2018-09-22	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教　授	HQ Lin
167	2018-09-17	2019-03-17	Zhen-Wei Wu 武振伟	Beijing Normal University, China 北京师范大学	Lecturer 讲　师	PF Guan
168	2018-09-03	2018-10-31	Gayanath Fernando	University of Connecticut, USA 美国康涅狄格大学	Professor 教　授	CSRC/HQ Lin
169	2018-09-01	2018-09-10	Ya-Min Quan 全亚民	The Institute of Solid State Physics (CAS), China 中科院固体物理研究所	Associate Researcher 副研究员	HQ Lin
170	2018-09-01	2018-11-30	Jie Ma 马　杰	Beijing Institute of Technology, China 北京理工大学	Professor 教　授	Shiwu Gao
171	2018-08-30	2018-09-03	Arun Bansil	Northeastern University, USA 美国东北大学	Professor 教　授	HQ Lin
172	2018-08-27	2018-08-29	Jian-Jun Chen 陈建军	Zhejiang University, China 浙江大学	Professor 教　授	SJ Li
173	2018-08-24	2018-09-28	Henrik Johannesson	University of Gothenburg, Sweden 瑞典哥德堡大学	Professor 教　授	CSRC
174	2018-08-22	2018-08-22	Hua-Jie Chen 陈华杰	Beijing Normal University, China 北京师范大学	Professor 教　授	ZM Zhang
175	2018-08-22	2018-09-01	Alexis Markovits	Sorbonne University, France 法国索邦大学	Professor 教　授	RQ Zhang
176	2018-08-20	2018-08-24	Shu-Yang Dai 戴书洋	Wuhan University, China 武汉大学	Associate Professor 副教授	YY Cai
177	2018-08-20	2018-08-24	Wen-Ming He 何文明	Lingnan Normal University, China 岭南师范学院	Professor 教　授	ZM Zhang

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
178	2018-08-20	2018-08-24	Qiu-Mei Huang 黄秋梅	Beijing University of Technology, China 北京工业大学	Associate Professor 副教授	ZM Zhang
179	2018-08-20	2018-08-25	Han-Quan Wang 王汉权	Yunnan University of Finance and Economics, China 云南财经大学	Professor 教　授	YY Cai
180	2018-08-20	2018-08-27	Jun-Hong An 安钧鸿	Lanzhou University, China 兰州大学	Professor 教　授	HQ Lin
181	2018-08-19	2018-08-24	Guo-Hua Zhong 钟国华	Shenzhen Institute of Advanced Technology (CAS), China 中科院深圳先进技术研究员	Associate Researcher 副研究员	HQ Lin
182	2018-08-15	2018-08-31	Hang Zheng 郑　杭	Shanghai Jiaotong University, China 上海交通大学	Professor 教　授	CSRC/HQ Lin
183	2018-08-14	2018-08-23	Xue-Feng Zhang 张学锋	Chongqing University, China 重庆大学	Professor 教　授	XQ Wang
184	2018-08-13	2018-08-20	Zhen Wang 王　震	School of Mathematical Sciences and Chemical Engineering 常州工学院数理与化工学院	Associate Professor 副教授	Yong Li
185	2018-08-13	2018-08-18	Jie-Qiao Liao 廖洁桥	Hunan Normal University, China 湖南师范大学	Associate Professor 副教授	CP Sun
186	2018-08-13	2018-08-22	Dong-Dong Li 李冬冬	HeFei University of Technology, China 合肥工业大学	Lecturer 讲　师	PF Guan
187	2018-08-12	2018-08-19	Stefan Kirchner	Zhejiang University, China 浙江大学	Professor 教　授	Rubem Mondaini

188	2018-08-12	2018-09-11	Jun Li 李　俊	Xiamen University, China 厦门大学	Assistant Professor 助理教授	W Yang
189	2018-08-09	2018-08-31	Yan Xue 薛　艳	Jilin University, China 吉林大学	Associate Professor 副教授	CP Sun
190	2018-08-08	2018-08-31	Zhong-Jian Yang 杨中见	Central South University, China 中南大学	Associate Professor 副教授	HQ Lin
191	2018-08-08	2018-08-10	Chao Zhang 张　超	Yantai University, China 烟台大学	Associate Professor 副教授	HQ Lin
192	2018-08-06	2018-08-14	Da-Dong Yan 严大东	Beijing Normal University, China 北京师范大学	Professor 教　授	MS Miao
193	2018-08-06	2018-08-25	Chang-Hui Yao 姚昌辉	Zhengzhou University, China 郑州大学	Professor 教　授	ZM Zhang
194	2018-08-05	2018-08-12	Wen-Xiong Song 宋文雄	Shanghai Institute of Microsystem and Information Technology (SIMIT), CAS, China 中国科学院上海微系统与信息技术研究所	Lecturer 讲　师	PF Guan/Limin Liu
195	2018-08-05	2018-08-13	Liang Luo 罗　亮	Huazhong Agricultural University, China 华中农业大学	Lecturer 讲　师	LH Tang
196	2018-08-02	2018-08-17	Rui Su 苏　锐	Hangzhou Dianzi University, China 杭州电子科技大学	Lecturer 讲　师	PF Guan
197	2018-08-02	2018-08-24	Dong-Fang Li 李东方	Huazhong University of Science and Technology, China 华中科技大学	Professor 教　授	ZM Zhang
198	2018-08-01	2018-08-10	Hang Zheng 郑　杭	Shanghai Jiaotong University, China 上海交通大学	Professor 教　授	CSRC/HQ Lin
199	2018-08-01	2018-08-31	Hong-Wei Zhou 周宏威	Northeast Forestry University, China 东北林业大学	Associate Professor 副教授	GH Hu
200	2018-08-01	2018-08-31	Yao Ma 马　遥	Xian University of Technology, China 西安理工大学	Lecturer 讲　师	W Yang

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
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201	2018-07-30	2018-08-20	Yan-Ling Li 李延龄	Jiangsu Normal University, China 江苏师范大学	Professor 教 授	HQ Lin
202	2018-07-27	2018-08-24	Yue-Zheng Gong 龚跃政	Nanjing University of Aeronautics and Astronautics, China 南京航空航天大学	Lecturer 讲 师	Q Wang
203	2018-07-26	2018-08-11	Li-Shi Luo 罗礼诗	Old Dominion University, USA 美国欧道明大学	Professor 教 授	CSRC
204	2018-07-23	2018-08-02	Hang Si 斯 杭	Weierstrass Institute, Germany 德国维尔特斯拉斯研究所	Professor 教 授	GH Hu
205	2018-07-23	2018-08-05	Xiang Wang 王 翔	Jilin University, China 吉林大学	Lecturer 讲 师	ZM Zhang
206	2018-07-22	2018-07-27	Ke-Ji Liu 刘可伋	Shanghai University of Finance and Economics, China 上海财经大学	Associate Professor 副教授	GH Hu
207	2018-07-22	2018-07-27	Jin Cheng 程 晋	Fudan University, China 复旦大学	Professor 教 授	GH Hu
208	2018-07-20	2018-08-30	Jerry Zhijian Yang 杨志坚	Wuhan University, China 武汉大学	Professor 教 授	CSRC/HQ Lin
209	2018-07-20	2018-07-30	Jie LI 李 杰	University of Cambridge, UK 剑桥大学	Professor 教 授	LS Luo
210	2018-07-19	2018-08-31	Yong-Jun Yuan 袁永军	Hunan Normal University, China 湖南师范大学	Lecturer 讲 师	YY Cai
211	2018-07-18	2018-07-20	Takahiro Sagawa	The University of Tokyo, Japan 日本东京大学	Associate Professor 副教授	LH Tang
212	2018-07-17	2018-07-21	Wang-Tao Lu 鲁汪涛	Zhejiang University, China 浙江大学	Professor 教 授	GH Hu

213	2018-07-17	2018-08-28	Yi Yang 杨　懿	Jiangxi University of Science and Technology, China 江西理工大学	Lecturer 讲　师	Shiwu Gao
214	2018-07-16	2018-07-28	Gilberto Teobaldi	University of Liverpool，UK 英国利物浦大学	Lecturer 讲　师	CSRC
215	2018-07-16	2018-07-19	Jooyoung Lee	Korea Institute for Advanced Study, Korea 韩国先进科技学院	Professor 教　授	LH Tang
216	2018-07-16	2018-09-16	Hua Tian 田　华	Taiyuan University of Technology, China 太原理工大学	Lecturer 讲　师	Ji-Jun Zhao
217	2018-07-15	2018-07-19	Ping Ao 敖　平	Shanghai University, China 上海大学	Professor 教　授	HQ Lin
218	2018-07-12	2018-07-26	Ming Li 李　明	China University of Petroleum, China 中国石油大学（华东）	Associate Professor 副教授	CP Sun
219	2018-07-12	2018-09-10	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
220	2018-07-11	2018-08-08	Eduardo Castro	Faculty of Sciences of the University of Porto, Portugal 葡萄牙波尔图大学	Professor 教　授	CSRC
221	2018-07-09	2018-09-02	Zhifeng Liu 刘志锋	Inner Mongolia University, China 内蒙古大学	Associate Professor 副教授	Shiwu Gao / JJ Zhao
222	2018-07-07	2018-08-05	Pedro Sacramento	IST, University of Lisbon, Portugal 葡萄牙里斯本大学	Professor 教　授	CSRC
223	2018-07-05	2018-08-10	Xin-Min Wu 吴新明	Fudan University, China 复旦大学	Associate Professor 副教授	YY Cai
224	2018-07-04	2018-07-07	Rui-Qing Zhang 张瑞勤	City University of HongKong, HK 香港城市大学	Professor 教　授	CSRC
225	2018-07-03	2018-07-17	Dimitrie Culcer	The University of New South Wales, Australia 澳大利亚新南威尔士大学	Professor 教　授	CSRC
226	2018-07-02	2018-07-07	Yu-Han Chen 陈育涵	Beijing Normal University, China 北京师范大学	Assistant Professor 助理教授	CS Zhou

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
227	2018-07-01	2018-07-14	Yu Du 杜　宇	Xiangtan University, China 湘潭大学	Lecturer 讲　师	ZM Zhamg
228	2018-07-01	2018-07-15	Xian-Min Xu 许现民	Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China 中国科学院数学与系统科学研究院	Associate Professor 副教授	WZ Bao
229	2018-06-22	2018-06-27	Stefan Kirchner	Zhejiang University, China 浙江大学	Professor 教　授	Stefano Chesi
230	2018-06-22	2018-07-31	Yan Xue 薛　艳	Jilin University, China 吉林大学	Associate Professor 副教授	CP Sun
231	2018-06-17	2018-06-23	Elijah Flenner	Colorado State University, USA 美国科罗拉多州立大学	Professor 教　授	PF Guan
232	2018-06-15	2018-08-05	Wei-Zhu Bao 包维柱	National University of Singapore, Singapore 新加坡国立大学	Professor 教　授	CSRC
233	2018-06-15	2018-06-24	Sheng-Jun Wang 王圣军	Shaanxi Normal University, China 陕西师范大学	Associate Professor 副教授	CS Zhou
234	2018-06-14	2018-07-21	Chang-Song Zhou 周昌松	Hong Kong Baptist University, China 香港浸会大学	Associate Professor 副教授	CSRC
235	2018-06-13	2018-06-15	Kah Chun Lau	California State University Northridge, USA 美国加州州立大学北岭分校	Assistant Professor 助理教授	HQ Lin
236	2018-06-11	2018-06-18	Shaohao Chen 陈少豪	Boston University, USA 美国波士顿大学	Senior Scientific Computing Consultant 高级顾问	Xiang Gao
237	2018-06-11	2018-06-15	Run-Chang Lin 林润昶	Texas A & M University, USA 美国得克萨斯农工大学	Associate Professor 副教授	ZM Zhang

238	2018-06-10	2018-06-26	Michael L. Falk	Johns Hopkins University, USA 美国约翰霍普金斯大学	Professor 教　授	PF Guan
239	2018-06-10	2018-06-16	Gang Lu 吕　刚	California State University Northridge, USA 美国加州州立大学北岭分校	Professor 教　授	CSRC/HQ Lin
240	2018-06-10	2018-08-18	Pedro Ribeiro	IST, University of Lisbon, Portugal 葡萄牙里斯本大学	Researcher 研究员	CSRC
241	2018-06-01	2018-07-31	Peng-Fei Liu 刘鹏飞	The Institute of High Energy Physics of the Chinese Academy of Sciences, China 中国科学院高能物理研究所东莞分部	Lecturer 讲　师	Ji-Jun Zhao
242	2018-05-30	2018-07-04	Jia-An Yan 严家安	Towson University, USA 美国陶森大学	Associate Professor 副教授	PF Guan
243	2018-05-28	2018-06-22	Yanxiang Zhao 赵雁翔	The George Washington University, USA 美国乔治华盛顿大学	Associate Professor 副教授	Q Du
244	2018-05-28	2018-06-22	Yanping Ma 马艳平	Loyola Marymount University, USA 美国洛约拉马利蒙特大学	Associate Professor 副教授	Q Du
245	2018-05-26	2018-06-02	Tu-Nan Zhang 张图南	University of Southern California 美国南加州大学	Professor 教　授	Xiang Gao
246	2018-05-26	2018-06-02	Tu-Nan Zhang 张图南	Sourthern California, USA 南加利福尼亚大学	Professor 教　授	Xiang Gao
247	2018-05-21	2018-05-24	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教　授	HQ Lin
248	2018-05-21	2018-05-23	Jia-Sen Jin 金家森	Dalian University of Technology, China 大连理工大学	Associate Professor 副教授	Stefano Chesi
249	2018-05-21	2018-08-18	Maosheng Miao 苗茂生	California State University Northridge, USA 美国加州州立大学北岭分校	Assistant Professor 助理教授	CSRC
250	2018-05-20	2018-08-25	Jia Zhao 赵　佳	Utah State University, USA 美国犹他州立大学	Assistant Professor 助理教授	Q Wang
251	2018-05-20	2018-06-20	Wei-Qing Ren 任维清	National University of Singapore ,Singapore 新加坡国立大学	Associate Professor 副教授	CSRC

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
252	2018-05-14	2018-06-09	Hao-Bin Wang 王浩斌	University of Colorado Denver, USA 美国科罗拉多大学丹佛分校	Professor 教 授	CY Yam
253	2018-05-11	2018-05-13	Xiao-Jia Chen 陈晓嘉	Center for High Pressure Science & Technology Advanced Research (HPStar), China 北京高压科学研究中心	Professor 教 授	HQ Lin
254	2018-05-11	2018-05-13	Guo-Hua Zhong 钟国华	Shenzhen Institute of Advanced Technology (CAS), China 中科院深圳先进技术研究员	Associate Researcher 副研究员	HQ Lin
255	2018-05-11	2018-05-25	Robert Shekhter	Theoretical Physics at the University of Gothenburg, Sweden	Professor 教 授	Shiwu Gao
256	2018-05-10	2018-05-19	Naomichi Hatano	Tokyo University, Japan 东京大学	Professor 教 授	JQ You
257	2018-05-10	2018-05-24	Ora Entin	Ben Gurion University, Israel 本古里安大学	Professor 教 授	CSRC
258	2018-05-10	2018-05-01	Amnon Aharony	Ben Gurion University, Israel 本古里安大学	Professor 教 授	CSRC
259	2018-05-07	2018-06-01	Wolfgang Bangerth	Colorado State University, USA 美国科罗拉多州立大学	Professor 教 授	YY Cai
260	2018-05-07	2018-07-03	Shmuel Gurvitz	Weizmann Institute, Israel 以色列魏茨曼研究所	Professor 教 授	JQ You & Stefano Chesi
261	2018-05-03	2018-08-31	Jun Zhang 张 俊	GuiZhou University of Finance and Economics, China 贵州财经大学	Associate Professor 副教授	ZM Zhamg
262	2018-05-03	2018-06-02	Pierre Lallemand	Université of Paris-Sud, France 法国巴黎南大学	Professor 教 授	LS Luo

263	2018-05-03	2018-05-06	Wei-Xiao Ji 纪维霄	University of Jinan，China 济南大学	Associate Professor 副教授	RQ Zhang
264	2018-05-03	2018-05-06	Bao-Min Zhang 张保敏	University of Jinan，China 济南大学	Associate Professor 副教授	RQ Zhang
265	2018-04-25	2018-04-26	Liang-Jian Zou 邹良剑	The Institute of Solid State Physics, CAS, China 中科院固体物理所	Researcher 研究员	HQ Lin
266	2018-04-23	2018-04-27	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教　授	HQ Lin
267	2018-04-11	2018-04-26	Yavar Kian	University of Aix-Marseille, France 法国艾克斯-马赛大学	Assistant Professor 助理教授	GH Hu
268	2018-04-11	2018-04-22	Alex Hansen	Norwegian University of Science and Technology, Norway 挪威科技大学	Professor 教　授	CSRC
269	2018-04-11	2018-04-16	Huai-Ming Guo 郭怀明	Beihang University, China 北京航空航天大学	Associate Professor 副教授	Wen Yang
270	2018-04-11	2018-04-16	Bangti Jin	University College London, UK 英国伦敦大学学院	Professor 教　授	Martin Stynes
271	2018-04-11	2018-04-25	Natalia Kopteva	University of Limerick, Ireland 爱尔兰利默里克大学	Professor 教　授	Martin Stynes
272	2018-04-10	2018-05-31	Zheng-Yuan Luo 罗征援	National Aeronautics and Space Administration, USA 美国宇航局格伦研究中心	Senior Scientist 资深科学家	LS Luo
273	2018-04-09	2018-04-21	Jose Luis Gracia	University of Zaragoza, Spain 西班牙萨拉戈萨大学	Professor 教　授	Martin Stynes
274	2018-04-09	2018-04-15	Eugene O'Riordan	Dublin City University, Ireland 爱尔兰都柏林城市大学	Professor 教　授	Martin Stynes
275	2018-04-04	2018-04-08	Tao Ying 应　涛	Harbin Institute of Technology, China 哈尔滨工业大学	Lecturer 讲　师	Rubem Mondaini
276	2018-04-04	2018-04-13	Zhi-Rui Gong 龚志瑞	Shenzhen University 深圳大学	Lecturer 讲　师	Nan Zhao

CSRC VISITING SCHOLARS (2017.08-2018.07)

NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
277	2018-03-25	2018-04-29	Ghassan Georges Batrouni	University of Nice-Sophia Antipolis, France 法国尼斯大学	Professor 教 授	Rubem Mondaini
278	2018-03-14	2018-03-21	Ya-Min Quan 全亚民	The Institute of Solid State Physics (CAS), China 中科院固体物理研究所	Associate Researcher 副研究员	HQ Lin
279	2018-03-12	2018-03-16	Hang Si 斯 杭	Weierstrass Institute, Germany 德国维尔特斯拉斯研究所	Professor 教 授	SJ Li
280	2018-03-11	2018-03-17	Niall English	University College Dublin, Ireland 爱尔兰国立都柏林大学	Professor 教 授	Sateesh
281	2018-02-25	2018-03-02	Hao Fu 付 号	Wuhan Institute of Physics and Mathematics (WIPM) of Chinese Academy of Sciences, China 中国科学院武汉物理与数学研究所	Associate Researcher 副研究员	Yong Li
282	2018-02-24	2018-03-05	Can Huang 黄 灿	Xiamen University, China 厦门大学	Associate Researcher 副研究员	ZM Zhang/YY Cai
283	2018-02-17	2018-03-02	Gerard LabrosseGerard Labrosse	Université of Paris-Sud, France 法国巴黎第十一大学	Professor 教 授	LZ Chen
284	2018-02-05	2018-02-09	Xian-Gang Wan 万贤纲	Nanjing University, China 南京大学	Professor 教 授	HQ Lin
285	2018-02-04	2018-02-09	Hang Zheng 郑 杭	Shanghai Jiaotong University, China 上海交通大学	Professor 教 授	HQ Lin
286	2018-02-01	2018-02-04	Guo-Zheng Yan 严国政	Central China Normal University, China 华中师范大学	Professor 教 授	GH Hu
287	2018-01-29	2018-02-09	Xian-Fang Yue 岳现房	Jining University, China 济宁学院	Associate Professor 副教授	Xiang Gao

288	2018-01-29	2018-01-30	Bu-Yang Li 李步扬	The Hong Kong Polytechnic University, China 香港理工大学	Associate Professor 副教授	ZM Zhamg
289	2018-01-27	2018-02-27	Su-Fu Yu 玉素甫	Xinjiang Normal University 新疆师范大学	Lecturer 讲　师	
290	2018-01-24	2018-01-30	Jie-Qiao Liao 廖洁桥	Hunan Normal University, China 湖南师范大学	Associate Professor 副教授	CP Sun
291	2018-01-24	2018-02-02	Ming Li 李　明	China University of Petroleum, China 中国石油大学（华东）	Associate Professor 副教授	CP Sun
292	2018-01-24	2018-02-10	Da-Hai He 贺达海	Xiamen University, China 厦门大学	Associate Professor 副教授	JS Cao
293	2018-01-23	2018-01-26	Shan-He Su 苏山河	Xiamen University, China 厦门大学	Associate Professor 副教授	CP Sun
294	2018-01-23	2018-03-12	Jerry Zhijian Yan g杨志坚	Wuhan University, China 武汉大学	Professor 教　授	CSRC/HQ Lin
295	2018-01-23	2018-01-29	Liang-Jian Zou 邹良剑	The Institute of Solid State Physics (CAS), China 中科院固体物理研究所	Researcher 研究员	HQ Lin
296	2018-01-23	2018-01-29	Ya-Min Quan 全亚民	The Institute of Solid State Physics (CAS), China 中科院固体物理研究所	Associate Researcher 副研究员	HQ Lin
297	2018-01-23	2018-02-09	Junhong An 安钧鸿	Lanzhou University, China 兰州大学	Professor 教　授	HQ Lin
298	2018-01-23	2018-06-30	Wei Jiang 蒋　维	Wuhan University, China 武汉大学	Associate Professor 副教授	WZ Bao
299	2018-01-22	2018-02-13	Zhi-Hai Wang 王治海	Northeast Normal University, China 东北师范大学	Associate Professor 副教授	Yong Li
300	2018-01-22	2018-02-01	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教　授	HQ Lin
301	2018-01-22	2018-02-04	Wai-Xiang Cao 曹外香	Beijing Normal University, China 北京师范大学	Associate Professor 副教授	ZM Zhamg

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
302	2018-01-19	2018-01-21	Ke Yao 姚　科	Fudan University, China 复旦大学	Associate Professor 副教授	Xiang Gao
303	2018-01-19	2018-01-21	Zhi-Min Hu 胡智民	中物院八所	Associate Researcher 副研究员	Xiang Gao
304	2018-01-19	2018-01-21	Jia-Min Yang 杨家敏	中物院八所	Researcher 研究员	Xiang Gao
305	2018-01-16	2018-01-31	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
306	2018-01-15	2018-01-21	Zhan-Wen Yang 杨占文	Harbin Institute of Technology, China 哈尔滨工业大学	Associate Professor 副教授	JW Zhang
307	2018-01-14	2018-01-20	Niall Madden	National University of Ireland Galway, Ireland 爱尔兰国立高威大学	Lecturer 讲　师	Martin Stynes
308	2018-01-14	2018-02-02	Lili Ju 鞠立力	University of South Carolina, USA 美国南卡罗来纳大学	Professor 教　授	CSRC
309	2017-12-28	2018-01-16	Wei-Qing Ren 任维清	National University of Singapore ,Singapore 新加坡国立大学	Professor 教　授	CSRC
310	2017-12-27	2018-01-04	Hao-Bin Wang 王浩斌	University of Colorado Denver, USA 美国科罗拉多大学丹佛分校	Professor 教　授	CSRC
311	2017-12-25	2018-02-04	Yao Ma 马　遥	Xian University of Technology, China 西安理工大学	Lecturer 讲　师	W Yang
312	2017-12-24	2017-12-29	Yong-Hyun Kim	Korea Advanced Institute of Science and Technology, Korea 韩国高等科学技术研究所	Professor 教　授	SH Wei
313	2017-12-21	2018-02-21	Peng-Fei Lu 芦鹏飞	Beijing University of Posts and Telecommunications, China 北京邮电大学	Professor 教　授	PF Guan

314	2017-12-17	2017-12-24	Oleg Prezhdo	University of Southern California, USA 美国南加州大学	Professor 教 授	LM Liu
315	2017-12-16	2017-12-30	Xue-Cheng Tai 台雪成	University of Bergen, Norway 挪威卑尔根大学	Professor 教 授	CSRC
316	2017-12-15	2018-01-15	Yue-Zheng Gong 龚跃政	Nanjing University of Aeronautics and Astronautics, China 南京航空航天大学	Lecturer 讲 师	Q Wang
317	2017-12-15	2017-12-24	Jing-Run Chen 陈景润	Soochow University, China 苏州大学	Professor 教 授	YY Cai
318	2017-12-12	2017-12-19	Li Huang 黄 丽	Southern University of Science and Technology, China 南方科技大学	Associate Professor 副教授	SH Wei
319	2017-12-12	2017-12-19	Wan-Jian Yin 尹万健	Soochow University, China 苏州大学	Professor 教 授	SH Wei
320	2017-12-11	2017-12-15	Chu- Chu Chen 陈楚楚	Academy of Mathematics and Systems Science (CAS), China 中国科学院数学与系统科学研究院	Lecturer 讲 师	GH Hu
321	2017-12-11	2018-01-10	Xiao-Feng Yang 杨霄锋	University of South Carolina, USA 南卡罗莱纳大学	Professor 教 授	Q Wang
322	2017-12-10	2018-01-08	Jia Zhao 赵 佳	Utah State University, USA 美国犹他州立大学	Assistant Professor 助理教授	Q Wang
323	2017-12-10	2017-12-13	Zhi Zeng 曾 雉	The Institute of Solid State Physics (CAS), China 中科院固体物理研究所	Researcher 研究员	CSRC/HQ Lin
324	2017-12-10	2017-12-23	Xin-You Lv 吕新友	Huazhong University of Science and Technology, China 华中科技大学	Associate Professor 副教授	JQ You
325	2017-12-10	2018-01-08	Jia Zhao 赵 佳	Utah State University, USA 美国犹他州立大学	Assistant Professor 助理教授	Q Wang
326	2017-12-10	2017-12-15	Yu-Liang Wang 王玉亮	Hongkong Baptist University, China 香港浸会大学	Assistant Professor 助理教授	YY Cai
327	2017-12-01	2017-12-31	Na Liu 刘 娜	Hebei GEO University, China 河北地质大学	Associate Professor 副教授	CY Yam

CSRC VISITING SCHOLARS (2017.08-2018.07)

NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
328	2017-11-28	2017-12-03	Xiao-Jia Chen 陈晓嘉	Center for High Pressure Science & Technology Advanced Research (HPStar), China 北京高压科学研究中心	Professor 教 授	HQ Lin
329	2017-11-28	2017-12-02	Ya-Min Quan 全亚民	The Institute of Solid State Physics (CAS), China 中科院固体物理研究所所	Associate Researcher 副研究员	HQ Lin
330	2017-11-19	2017-12-27	Xiang-Rong Wang 王向荣	The Hong Kong University of Science and Technology, China 香港科技大学	Professor 教 授	HQ Lin
331	2017-11-19	2017-12-31	Cheng-Shi Liu 刘承师	Yanshan University, China 燕山大学	Professor 教 授	Rui Li
332	2017-11-18	2017-11-21	Zhao-Li Guo 郭照立	Huazhong University of Science and Technology, China 华中科技大学	Professor 教 授	CSRC
333	2017-11-18	2017-12-02	Anders Sandvik	Boston University, USA 美国波士顿大学	Professor 教 授	CSRC/HQ Lin
334	2017-11-16	2017-11-16	Wayne Raskind	College of Liberal Arts and Sciences, Wayne State University, USA 美国维恩州立大学	Professor 教 授	HQ Lin/ZM Zhang
335	2017-11-16	2017-11-16	Claudio Verani	College of Liberal Arts and Sciences, Wayne State University, USA 美国维恩州立大学	Professor 教 授	HQ Lin/ZM Zhang
336	2017-11-15	2017-12-14	Ghassan Georges Batrouni	University of Nice-Sophia Antipolis, France 法国尼斯大学	Professor 教 授	Rubem Mondaini
337	2017-11-15	2017-11-16	Gang Lu 吕 刚	California State University Northridge, USA 美国加州州立大学北岭分校	Professor 教 授	CSRC/HQ Lin
338	2017-11-15	2017-11-26	Dimitrie Culcer	The University of New South Wales, Australia 澳大利亚新南威尔士大学	Professor 教 授	CSRC/HQ Lin

339	2017-11-15	2017-12-20	Alex Hansen	Norwegian University of Science and Technology, Norway 挪威科技大学	Professor 教 授	CSRC
340	2017-11-15	2017-11-24	Eirik Grude Flekkøy	University of Oslo, Norway 挪威奥斯陆大学	Professor 教 授	CSRC/HQ Lin
341	2017-11-14	2017-12-14	Sheng-Meng 孟 胜	Institute of Physics, CAS, China 中科院物理所	Professor 教 授	Shiwu Gao
342	2017-11-13	2017-11-18	Hong-Gang Luo 罗洪刚	Lanzhou University, China 兰州大学	Professor 教 授	CSRC/HQ Lin
343	2017-11-12	2017-11-16	Giuseppe Santoro	The International School for Advanced Studies, Italy 意大利国际高等研究院	Professor 教 授	Stefano Chesi
344	2017-11-12	2017-11-18	Daron Standley	Research Institute for Microbial Diseases, Osaka University, Japan 日本大阪大学微生物病研究所	Professor 教 授	YB Shan
345	2017-11-09	2017-11-16	Rosario Fazio	The Abdus Salam International Centre for Theoretical Physics, Italy 意大利国际理论物理中心	Professor 教 授	Stefano Chesi
346	2017-11-06	2017-11-10	Xiao-Dong Liu 刘晓东	Academy of Mathematics and Systems Science (CAS), China 中国科学院数学与系统科学研究院	Associate Professor 副教授	GH Hu
347	2017-11-05	2017-11-09	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教 授	HQ Lin
348	2017-11-02	2017-11-09	Chang-Song Zhou 周昌松	Hong Kong Baptist University, HK 香港浸会大学	Associate Professor 副教授	CSRC
349	2017-11-01	2017-11-30	Cristián Gabriel Sánchez	Universidad Nacional de Córdoba, Argentina 阿根廷科尔多瓦国立大学	Professor 教 授	CY Yam
350	2017-10-31	2017-11-10	Erich Werner Thomas Frauenheim	University of Bremen, Germany 德国不来梅大学	Professor 教 授	CY Yam
351	2017-10-30	2017-11-02	Wang-Tao Lu 鲁汪涛	Zhejiang University, China 浙江大学	Professor 教 授	GH Hu

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
352	2017-10-23	2017-11-06	Da-Dong Yan 严大东	Beijing Normal University 北京师范大学	Professor 教 授	MS Miao
353	2017-10-13	2017-10-25	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教 授	HQ Lin
354	2017-10-12	2017-12-31	Hai-Chao Li 李海超	China Three Gorges University, China 三峡大学	Lecturer 讲 师	JQ You
355	2017-10-09	2017-10-12	Dietmar Hoemberg	Weierstrass Institute, Germany 德国维尔特斯拉斯研究所	Professor 教 授	GH Hu
356	2017-09-19	2017-10-24	Tian-Yu Zhang 张天宇	Montana State University, USA 美国蒙大拿州立大学	Professor 教 授	Q Wang
357	2017-09-17	2017-09-22	Yan-Ling Li 李延龄	Jiangsu Normal University, China 江苏师范大学	Professor 教 授	HQ Lin
358	2017-09-17	2017-09-22	Ji-Jun Zhao 赵纪军	Dalian University of Technology, China 大连理工大学	Professor 客座教授	CSRC
359	2017-09-16	2017-09-21	Chao-Yang Zhang 张朝阳	Institute of Materials, CAEP, China 中物院化工材料研究所	Professor 教 授	CSRC
360	2017-09-14	2017-09-22	Matthew Turner	University of Warwick, UK 英国华威大学	Professor 教 授	Hugues Chate
361	2017-09-14	2017-10-27	Li-Li Ju 鞠立力	University of South Carolina, USA 美国南卡罗来纳大学	Professor 教 授	CSRC
362	2017-09-14	2017-09-15	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教 授	HQ Lin

363	2017-09-12	2017-09-22	Chate Hugues	Institut de Physique Théorique, CEA-Saclay, France 法国原子能机构	Professor 教　授	CSRC
364	2017-09-12	2017-09-22	Xia-Qing Shi 施夏清	Suzhou University, China 苏州大学	Associate Professor 副教授	Hugues Chate
365	2017-09-11	2017-10-11	Zai-Wen Wen 文再文	Peking University, China 北京大学	Professor 教　授	YY Cai
366	2017-09-10	2017-09-17	Erio Tosatti	International Center for Theoretical Physics (ICTP), Italy 意大利国际理论物理中心	Professor 教　授	CSRC
367	2017-09-10	2017-09-17	Xiao-Jia Chen 陈晓嘉	Center for High Pressure Science & Technology Advanced Research (HPStar), China 北京高压科学研究中心	Professor 教　授	HQ Lin
368	2017-09-10	2017-09-23	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教　授	HQ Lin
369	2017-09-10	2017-09-19	Guo-Hua Zhong 钟国华	Shenzhen Institute of Advanced Technology (CAS), China 中科院深圳先进技术研究员	Associate Researcher 副研究员	HQ Lin
370	2017-09-08	2017-09-18	Gilberto Teobaldi	University of Liverpool, UK 英国利物浦大学	Lecturer 讲　师	CSRC
371	2017-09-06	2017-09-09	Zhao-Li Guo 郭照立	Huazhong University of Science and Technology, China 华中科技大学	Professor 教　授	CSRC
372	2017-09-04	2017-10-15	Hong-Lin Liao 廖洪林	The Army Engineering University of PLA, China 中国人民解放军陆军工程大学	Associate Professor 副教授	JW Zhang
373	2017-09-01	2017-10-18	Henrik Johannesson	University of Gothenburg, Sweden 瑞典哥德堡大学	Professor 教　授	CSRC
374	2017-08-26	2017-08-29	Hiroshi Katayama-Yoshida	The University of Tokyo, Japan 东京大学	Professor 教　授	SH Wei
375	2017-08-26	2017-09-01	Ji-Jun Zhao 赵纪军	Dalian University of Technology, China 大连理工大学	Professor 客座教授	CSRC

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
376	2017-08-25	2017-08-29	Peter DeakPeter Deak	Bremen Center for Computational Materials Science, Germany 不来梅计算材料科学中心	Professor 教 授	SH Wei
377	2017-08-23	2017-08-28	Hong-Gang Luo 罗洪刚	Lanzhou University, China 兰州大学	Professor 教 授	CSRC
378	2017-08-17	2017-08-24	Xiao-Guang Wang 王晓光	Zhejiang University, China 浙江大学	Professor 教 授	CP Sun
379	2017-08-15	2017-08-18	Jie Peng 彭 洁	Jinan University, China 广州暨南大学	Lecturer 讲 师	CY Yam
380	2017-08-14	2017-08-28	Shi-Zheng Wen 温世正	Huaiyin Normal University, China 淮阴师范大学	Associate Professor 副教授	CY Yam
381	2017-08-10	2017-08-23	Lunji Song 宋伦继	Lanzhou University, China 兰州大学	Associate Professor 副教授	ZM Zhang
382	2017-08-10	2017-09-09	Zi-Qiang Wang 王自强	Guizhou Minzu University, China 贵州民族大学	Professor 教 授	LZ Chen
383	2017-08-10	2017-09-09	Jun-ying Cao 曹俊英	Guizhou Minzu University, China 贵州民族大学	Professor 教 授	LZ Chen
384	2017-08-07	2017-08-13	Peng Xue 薛 鹏	Southeast University, China 东南大学	Professor 教 授	HQ Lin
385	2017-08-07	2017-08-12	Jun Lai 赖 俊	Zhejiang University, China 浙江大学	Researcher 研究员	JW Zhang
386	2017-08-07	2017-09-05	Zhi-Zhong Sun 孙志忠	Southeast University, China 东南大学	Professor 教 授	JW Zhang
387	2017-08-01	2017-08-31	Zhiguo Xu 许志国	Jilin University, China 吉林大学	Associate Professor 副教授	WZ Bao

CSRC VISITING SCHOLARS (2016.08-2017.07)

NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
388	2017-07-31	2017-08-09	Tie-Gang Liu 刘铁钢	Beihang University, China 北京航空航天大学	Professor 教 授	WZ Bao
389	2017-07-31	2017-08-08	Ke Yin 殷 轲	Huazhong University of Science and Technology, China 华中科技大学	Associate Professor 副教授	HG Liu
390	2017-07-31	2016-09-15	Jun Li 李 俊	Xiamen Univeristy, China 厦门大学	Assistant Professor 助理教授	W Yang
391	2017-07-27	2017-08-11	Yin Zhong 钟 寅	Lanzhou University, China 兰州大学	Lecturer 讲 师	HG Luo
392	2017-07-26	2017-08-07	Zu-Jian Ying 应祖建	Sapienza University of Rome, Italy 意大利罗马大学	Senior Researcher 资深研究员	HG Luo
393	2017-07-25	2017-08-19	Changhui Yao 姚昌辉	Zhengzhou University, China 郑州大学	Professor 教 授	ZM Zhang
394	2017-07-24	2017-08-04	Wenxian Zhang 张文献	Wuhan University, China 武汉大学	Professor 教 授	TF Li
395	2017-07-24	2017-08-03	Hang Si 斯 杭	Weierstrass Institute, Germany 德国维尔特斯拉斯研究所	Professor 教 授	GH Hu
396	2017-07-21	2017-08-15	Pedro Sacramento	IST, University of Lisbon, Portugal 葡萄牙里斯本大学	Professor 教 授	CSRC
397	2017-07-20	2017-08-10	Dongfang Li 李东方	Huazhong University of Science and Technology, China 华中科技大学	Associate Professor 副教授	ZM Zhang
398	2017-07-19	2017-07-23	Zhi Zeng 曾 雉	Insitute of Solid State Physics, CAS, China 中科院固体物理研究所	Researcher 研究员	CSRC/HQ Lin
399	2017-07-18	2017-08-18	Xiao-Gang Yang 杨小刚	Wuhan Institute of Technology, China 武汉工程大学	Lecturer 讲 师	Q Wang

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
400	2017-07-18	2017-07-22	Cheng Wang 王　成	University of Massachusetts Dartmouth, USA 美国麻省大学达特茅斯分校	Associate Professor 副教授	LL Ju
401	2017-07-17	2017-07-19	Zhong-Hua Qiao 乔中华	The Hong Kong Polytechnic University, HK 香港理工大学	Associate Professor 副教授	LL Ju
402	2017-07-17	2017-07-31	Xiao-Ping Zhang 张晓平	Wuhan University, China 武汉大学	Associate Professor 副教授	LL Ju
403	2017-07-16	2017-07-17	Gang Yin 殷　刚	Wayne State University, USA 美国韦恩州立大学	Professor 教　授	ZM Zhang
404	2017-07-16	2017-07-21	Chang-Song Zhou 周昌松	Hong Kong Baptist University, HK 香港浸会大学	Associate Professor 副教授	CSRC
405	2017-07-16	2017-07-21	Do Young Kwak	Korea Advanced Institute of Science and Technology, Korea 韩国高等科学技术学院	Professor 教　授	ZM Zhang
406	2017-07-16	2017-07-29	Peihong Zhang 张培鸿	University of Buffalo,SUNY, USA 美国纽约州立大学布法罗分校	Associate Professor 副教授	CSRC
407	2017-07-16	2017-07-21	Qing Ji 纪　青	Hebei University Of Technology, China 河北工业大学	Professor 教　授	Ting Yu
408	2017-07-16	2017-07-21	Yong-Hong Ma 马永红	Inner Mongolia University of Science&Technology, China 内蒙古科技大学	Associate Professor 副教授	Ting Yu
409	2017-07-16	2017-08-22	Hong-Kai Zhao 赵宏凯	University of California, Irvine, USA 美国加利福尼亚大学欧文分校	Professor 教　授	ZM Zhang
410	2017-07-14	2017-08-03	Jose Carmelo	University of Minho, Portugal 葡萄牙米尼奥大学	Professor 教　授	CSRC

411	2017-07-14	2017-07-23	Gilberto Teobaldi	University of Liverpool, UK 英国利物浦大学	Lecturer 讲　师	CSRC
412	2017-07-13	2017-07-19	Jun Jing 景　俊	Zhejiang University, China 浙江大学	Professor 教　授	JQ You
413	2017-07-13	2017-08-31	Na Liu 刘　娜	Hebei GEO University, China 河北地质大学	Associate Professor 副教授	CY Yam
414	2017-07-13	2017-08-10	Lili Ju 鞠立力	University of South Carolina, USA 美国南卡罗来纳大学	Professor 教　授	CSRC
415	2017-07-12	2017-09-05	Jiang Wei 蒋　维	Wuhan University, China 武汉大学	Associate Professor 副教授	WZ Bao
416	2017-07-11	2017-07-14	Qin Lou 娄　钦	University of Shanghai for Science and Technology, China 上海理工大学	Lecturer 讲　师	XF Yang
417	2017-07-11	2017-08-11	Can Huang 黄　灿	Xiamen Univeristy, China 厦门大学	Lecturer 讲　师	ZM Zhang
418	2017-07-09	2017-08-09	Eduardo Castro	IST, University of Lisbon, Portugal 葡萄牙里斯本大学	Professor 教　授	CSRC
419	2017-07-07	2017-07-31	Ghassan Georges Batrouni	University of Nice-Sophia Antipolis, France 法国尼斯大学	Professor 教　授	Rubem Mondaini
420	2017-07-06	2017-07-28	Miguel Araujo	University of Evora, Portugal 葡萄牙埃武拉大学	Professor 教　授	CSRC
421	2017-07-05	2017-07-07	Wei-Guo Yin	Brookhaven National Laboratory, USA 美国布鲁克海文国家实验室	Professor 教　授	HQ Lin
422	2017-07-05	2017-07-10	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教　授	HQ Lin
423	2017-07-04	2017-07-31	Ting Yu 于　挺	Stevens Institute of Technology, USA 美国史蒂文斯理工学院	Professor 教　授	CSRC
424	2017-07-03	2017-09-03	Zhi-Feng Liu 刘志锋	Inner Mongolia University, China 内蒙古大学	Lecturer 讲　师	JJ Zhao

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
425	2017-07-03	2017-07-08	Stefan Kirchner	Zhejiang University, China 浙江大学	Professor 教 授	Stefano Chesi
426	2017-07-03	2017-08-07	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教 授	HQ Lin
427	2017-07-01	2017-07-03	Xiu Ye 叶 秀	University of Arkansas, USA 美国阿肯色大学	Professor 教 授	ZM Zhang
428	2017-07-01	2017-10-01	Hua Tian 田 华	Taiyuan University of Technology, China 太原理工大学	Lecturer 讲 师	JJ Zhao
429	2017-07-01	2017-12-31	Yu Yang 杨 宇	Institute of applied physics and computational mathematics, China 北京应用物理与计算数学研究所	Associate Researcher 副研究员	SX Hu
430	2017-07-01	2017-07-31	Yan-Xiang Zhao 赵雁翔	George Washington University, USA 美国乔治华盛顿大学	Associate Professor 副教授	YY Cai
431	2017-07-01	2017-07-31	Yan-Ping Ma 马艳平	Loyola Marymount University, USA 美国洛约拉马利蒙特大学	Associate Professor 副教授	YY Cai
432	2017-07-01	2017-07-31	Wei-Zhu Bao 包维柱	National University of Singapore, Singapore 新加坡国立大学	Professor 教 授	CSRC
433	2017-06-29	2017-08-10	Zhong-Jian Yang 杨中见	Central South University, China 中南大学	Lecturer 讲 师	HQ Lin
434	2017-06-27	2017-06-30	Jun Hu 胡 俊	Peking University, China 北京大学	Professor 教 授	ZM Zhang
435	2017-06-27	2017-06-30	Shangyou Zhang 张上游	University of Delaware, USA 美国特拉华大学	Associate Professor 副教授	ZM Zhang
436	2017-06-26	2017-07-07	Ehsan Khatami	San Jose State University, USA 美国圣何塞州立大学	Assistant Professor 助理教授	Rubem Mondaini

437	2017-06-26	2017-06-28	Rui-Qin Zhang 张瑞勤	City University of Hong Kong 香港城市大学	Professor 客座教授	CSRC
438	2017-06-26	2017-07-07	Yun-An Yan 严运安	Guizhou Normal College, China 贵州师范学院	Professor 教　授	JQ You
439	2017-06-26	2017-08-30	Xuan Zhao 赵　璇	Southeast University, China 东南大学	Assistant Professor 助理教授	ZM Zhang
440	2017-06-25	2017-06-27	Ji-Jun Zhao 赵纪军	Dalian University of Technology, China 大连理工大学	Professor 客座教授	CSRC
441	2017-06-24	2017-07-24	Pedro Ribeiro	IST, University of Lisbon, Portugal 葡萄牙里斯本大学	Researcher 研究员	CSRC
442	2017-06-22	2017-12-31	Haitao Liu 刘海涛	Institute of applied physics and computational mathematics, China 北京应用物理与计算数学研究所	Associate Researcher 副研究员	SX Hu
443	2017-06-21	2017-08-25	Maosheng Miao 苗茂生	California State University Northridge, USA 美国加州州立大学北岭分校	Assistant Professor 助理教授	CSRC
444	2017-06-19	2017-08-31	Jerry Zhijian Yang 杨志坚	Wuhan University, China 武汉大学	Professor 教　授	CSRC/HQ Lin
445	2017-06-19	2017-06-24	Gang Lu 吕　刚	California State University Northridge, USA 美国加州州立大学北岭分校	Professor 教　授	CSRC
446	2017-06-18	2017-06-27	Wei-Wei Sun 孙伟伟	City University of Hong Kong, China 香港城市大学	Professor 教　授	JW Zhang
447	2017-06-16	2017-07-02	Anders Sandvik	Boston University, USA 美国波士顿大学	Professor 教　授	HQ Lin
448	2017-06-15	2017-06-28	Cong-Hua Yan 闫从华	Sichuan Normal University, China 四川师范大学	Professor 教　授	Y Li
449	2017-06-14	2017-06-30	Peihong Zhang 张培鸿	University of Buffalo,SUNY, USA 美国纽约州立大学布法罗分校	Associate Professor 副教授	CSRC
450	2017-06-13	2017-06-18	Tie-Zheng Qian 钱铁铮	The Hong Kong University of Science and Technology, China 香港科技大学	Professor 教　授	LS Luo

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
451	2017-06-12	2017-06-27	Run-Chang Lin 林润昶	Texas A & M University, USA 美国得克萨斯农工大学	Associate Professor 副教授	ZM Zhang
452	2017-06-11	2017-06-17	Hong-Lin Liao 廖洪林	PLA University of Science and Technology, China 陆军工程大学	Associate Professor 副教授	Martin Stynes
453	2017-06-11	2017-06-17	K. SENTHILKUMAR	Bharathiar University, India 印度巴哈蒂尔大学	Assistant Professor 助理教授	Sateesh
454	2017-06-11	2017-06-18	Zhao-Li Guo 郭照立	Huazhong University of Science and Technology, China 华中科技大学	Professor 教　授	CSRC
455	2017-06-09	2017-06-18	Xue-Yu Song 宋学煜	Iowa State University, USA 美国爱荷华州立大学	Professor 教　授	CY Yam
456	2017-06-06	2017-06-11	Jing-Bo Xu 许晶波	Zhejiang University, China 浙江大学	Professor 教　授	HQ Lin
457	2017-06-05	2017-06-18	Karolina Kropielnicka	University of Gdańsk, Poland 波兰格但斯克大学	Professor 教　授	YY Cai
458	2017-06-05	2017-06-15	Wei-Zhu Bao 包维柱	National University of Singapore, Singapore 新加坡国立大学	Professor 教　授	CSRC
459	2017-06-01	2017-06-15	Feng Liu 刘　锋	University of Utah, USA 美国犹他大学	Professor 教　授	B Huang
460	2017-06-01	2017-06-15	Shochun Chen 陈绍春	Zhengzhou University, China 郑州大学	Professor 教　授	Martin Stynes
461	2017-05-31	2017-06-15	Alex Hansen	Norwegian University of Science and Technology, Norway 挪威科技大学	Professor 教　授	CSRC
462	2017-05-27	2017-06-17	Hao-Bin Wang 王浩斌	University of Colorado Denver, USA 美国科罗拉多大学丹佛分校	Professor 教　授	CSRC

463	2017-05-26	2017-06-23	Relja Vulanovic	Kent State University, USA 美国肯特州立大学	Professor 教　授	Martin Stynes
464	2017-05-25	2017-06-05	Francois.Dubois	Université Paris-Sud, France 法国巴黎十一大学	Professor 教　授	LS Luo
465	2017-05-25	2017-05-29	Wei-Zhu Bao 包维柱	National University of Singapore, Singapore 新加坡国立大学	Professor 教　授	CSRC
466	2017-05-24	2017-07-04	Shmuel Gurvitz	Weizmann Institute, Israel 以色列魏茨曼研究所	Professor 教　授	JQ You
467	2017-05-23	2017-05-31	Naomichi Hatano	University of Tokyo, Japan 日本东京大学	Associate Professor 副教授	JQ You
468	2017-05-23	2017-06-01	Chang-Song Zhou 周昌松	Hong Kong Baptist University, China 香港浸会大学	Associate Professor 副教授	CSRC
469	2017-05-22	2017-05-26	Katharina Schratz	Karlsruhe Institute of Technology, Germany 德国卡尔斯鲁厄理工大学	Professor 教　授	YY Cai
470	2017-05-22	2017-05-29	Yasuhiro Utsumi	Mie University, Japan 日本三重大学	Associate Professor 副教授	JQ You
471	2017-05-22	2017-06-04	Mats Jonson	University of Gothenburg, Sweden 瑞典哥德堡大学	Professor 教　授	JQ You
472	2017-05-22	2017-06-06	Dimitrie Culcer	The University of New South Wales, Australia 澳大利亚新南威尔士大学	Professor 教　授	JQ You/CSRC
473	2017-05-22	2017-06-11	Amnon Aharony	Ben Gurion University, Israel 以色列本古里安大学	Professor 教　授	JQ You
474	2017-05-22	2017-06-11	Ora Entin-Wohlman	Ben Gurion University & Tel Aviv University, Israel 以色列本古里安大学 & 以色列特拉维夫大学	Professor 教　授	JQ You
475	2017-05-21	2017-06-11	Robert Shekhter	University of Gothenburg, Sweden 瑞典哥德堡大学	Professor 教　授	JQ You
476	2017-05-17	2017-06-15	Pierre Lallemand	Université of Paris-Sud, France 法国巴黎南大学	Professor 教　授	LS Luo

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
477	2017-05-16	2017-05-16	Wei-Kun Ge 葛惟昆	Tsinghua University, China 清华大学	Professor 教 授	B Huang
478	2017-05-15	2017-05-20	Heng-Guang Li 李恒光	Wayne State University, USA 韦恩州立大学	Associate Professor 副教授	ZM Zhang
479	2017-05-10	2017-05-25	Xu Zhang 张 旭	Mississippi State University, USA 密西西比州立大学	Assistant Professor 助理教授	ZM Zhang
480	2017-05-09	2017-05-19	Volker John	Weierstrass Institute for Applied Analysis and Stochastics, Germany 德国维尔斯特拉斯研究所	Professor 教 授	Martin Stynes
481	2017-05-08	2017-05-29	Yavar Kian	University of Aix-Marseille, France 法国艾克斯-马赛大学	Assistant Professor 助理教授	GH Hu
482	2017-05-08	2017-06-08	Hui-Qing Zhu 朱慧卿	The University of Southern Mississippi, USA 美国南密西西比大学	Associate Professor 副教授	ZM Zhang
483	2017-05-07	2017-05-30	Lili Ju 鞠立力	University of South Carolina, USA 美国南卡罗来纳大学	Professor 教 授	CSRC
484	2017-05-07	2017-05-13	Garth Nathan WELLS	University of Cambridge, UK 英国剑桥大学	Professor 教 授	LS Luo
485	2017-05-07	2017-05-19	Wei-Qing Ren 任维清	National University of Singapore ,Singapore 新加坡国立大学	Associate Professor 副教授	CSRC
486	2017-05-04	2017-05-05	Jun Zhang 张 骏	New York University, USA 美国纽约大学	Professor 教 授	Y Ding
487	2017-04-26	2017-04-29	Rosario Fazio	The Abdus Salam International Centre for Theoretical Physics, Italy 意大利国际理论物理中心	Professor 教 授	CSRC/HQ Lin

488	2017-04-26	2017-05-04	Giuseppe Santoro	The International School for Advanced Studies, Italy 意大利国际高等研究院	Professor 教　授	CSRC/HQ Lin
489	2017-04-26	2017-05-01	Ali Hassanali	The Abdus Salam International Centre for Theoretical Physics, Italy 意大利国际理论物理中心	Junior Research Scientist	CSRC/HQ Lin
490	2017-04-25	2017-05-05	Benoit Mahault	Institut de Physique Théorique, CEA-Saclay, France 法国原子能机构	Doctor 博　士	Hugues Chate
491	2017-04-21	2017-04-26	Wei-Zhu Bao 包维柱	National University of Singapore, Singapore 新加坡国立大学	Professor 教　授	CSRC
492	2017-04-20	2017-12-31	Xiao-Gen Xiong 熊孝根	Shanghai Institute of Applied Physics, CAS, China 中国科学院上海应用物理研究所	Research Assistant 助理研究员	SH Hu
493	2017-04-19	2017-04-26	Raymond Dean Astumian	University of Maine, USA 美国缅因大学	Professor 教　授	J Yu， XL Xu
494	2017-04-18	2017-04-22	Peter A.Markowich	University of Cambridge, UK 英国牛津大学	Professor 教　授	CSRC
495	2017-04-17	2017-04-21	Xiao-Ting Wang 王晓霆	University of Electronic Science and Technology of China, China 电子科技大学	Professor 教　授	CP Sun
496	2017-04-17	2017-04-28	Xiao-Guang Wang 王晓光	Zhejiang University, China 浙江大学	Professor 教　授	CP Sun
497	2017-04-14	2017-04-24	Tu-nan Chang 张图南	University of Southern California, USA 美国南加利福尼亚州立大学	Professor 教　授	X Gao
498	2017-04-06	2017-04-26	Lian-Ao Wu 吴连坳	University of Basque, Spain 西班牙巴斯克大学	Professor 教　授	JQ You
499	2017-04-06	2017-04-11	Wen-Jun Ying 应文俊	Shanghai Jiao Tong University, China 上海交通大学	Professor 教　授	JW Zhang
500	2017-04-05	2017-04-05	Jian-Guo Yu 于建国	Tennessee State University, USA 美国田纳西中部州立大学	Professor 教　授	SX Hu
501	2017-04-05	2017-04-19	Xavier Antoine	University of Lonaine, France 法国洛林大学	Professor 教　授	JW Zhang

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
502	2017-04-02	2017-05-01	Henri Orland	CEA Saclay, France 法国原子能和替代能源委员会	Professor 教 授	CSRC
503	2017-03-29	2017-04-01	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教 授	HQ Lin
504	2017-03-28	2017-05-31	Blair Blakie	University of Otago, New Zealand 新西兰奥塔哥大学	Professor 教 授	YY Cai
505	2017-03-27	2017-03-28	Stefano Leoni	Cardiff University, UK 英国卡迪夫大学	Associate Professor 副教授	SH Wei
506	2017-03-23	2017-04-22	Xue-Dong Hu 胡学东	University at Buffalo, SUNY, USA 美国纽约州立大学布法罗分校	Professor 教 授	JQ You
507	2017-03-20	2017-03-26	Xue-Xi Yi 衣学喜	Northeast Normal University, China 东北师范大学	Professor 教 授	CP Sun
508	2017-03-14	2017-03-26	Xiao-Guang Wang 王晓光	Zhejiang University, China 浙江大学	Professor 教 授	CP Sun
509	2017-03-13	2017-03-17	Zhao-Li Guo 郭照立	Huazhong University of Science and Technology, China 华中科技大学	Professor 教 授	CSRC
510	2017-03-08	2017-03-12	Xiang-Rong Wang 王向荣	The Hong Kong University of Science and Technology, China 香港科技大学	Professor 教 授	HQ Lin
511	2017-03-02	2017-03-11	Gilberto Teobaldi	University of Liverpool, UK 英国利物浦大学	Lecturer 讲 师	W Cai
512	2017-02-19	2017-02-22	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教 授	HQ Lin

513	2017-02-19	2017-02-28	Hong-Gang Luo 罗洪刚	Lanzhou University, China 兰州大学	Professor 教　授	CSRC
514	2017-02-14	2017-02-17	Zhi Zeng 曾　雉	Insitute of Solid State Physics, CAS, China 中科院固体物理研究所	Researcher 研究员	CSRC/HQ Lin
515	2017-02-12	2017-03-04	Hui Liang 梁　慧	Heilongjiang University, China 黑龙江大学	Professor 教　授	Martin Stynes
516	2017-02-12	2017-02-19	Jing-Run Chen 陈景润	Suzhou University, China 苏州大学	Professor 教　授	YY Cai
517	2017-02-08	2017-02-18	Raimundo Rocha dos Santos	Universidade Federal do Rio de Janeiro, Brazil 巴西里约热内卢联邦大学	Professor 教　授	Rubem Mondaini
518	2017-02-07	2017-02-19	Xue-Dong Hu 胡学东	University at Buffalo, SUNY, USA 美国纽约州立大学布法罗分校	Professor 教　授	JQ You
519	2017-02-06	2017-02-12	Zheng-Yuan Xue 薛正远	South China Normal University 华南师范大学	Researcher 研究员	JQ You
520	2017-02-06	2017-06-15	Tao Ouyang 欧阳涛	Xiangtan University, China 湘潭大学	Associate Professor 副教授	SH Wei
521	2017-02-06	2017-02-21	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
522	2017-02-05	2017-02-19	Chia-Chen Chang	University of California, Davis, USA 美国加州大学戴维斯分校	Project Scientist	Rubem Mondaini
523	2017-01-17	2017-01-20	Avy SofferAvy Soffer	Rutgers University, USA 美国罗格斯大学	Professor 教　授	YY Cai
524	2017-01-16	2017-01-20	Zhi Zeng 曾　雉	Insitute of Solid State Physics, CAS, China 中科院固体物理研究所	Researcher 研究员	CSRC/HQ Lin
525	2017-01-15	2017-01-22	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
526	2017-01-12	2017-01-20	Zhi-Rui Gong 龚志瑞	Shenzhen University, China 深圳大学	Assistant Professor 助理教授	ZH Wang

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
527	2017-01-12	2017-01-19	Zuo-Qiang Shi 史作强	Tsinghua University, China 清华大学	Associate Professor 副教授	XC Tai
528	2017-01-11	2017-01-24	Xian-Fang Yue 岳现房	Jining University, China 济宁学院	Associate Professor 副教授	X Gao
529	2017-01-10	2017-01-22	Zhihai Wang 王治海	Northeast Normal University, China 东北师范大学	Lecturer 讲　师	Y Li
530	2017-01-09	2017-01-20	Hong-Lin Liao 廖洪林	PLA University of Science and Technology, China 解放军理工大学	Associate Professor 副教授	Martin Stynes
531	2017-01-08	2017-01-20	Xue-Dong Hu 胡学东	University at Buffalo, SUNY, USA 美国纽约州立大学布法罗分校	Professor 教　授	JQ You
532	2017-01-05	2017-01-12	Jin-Hui Wu 吴金辉	Northeast Normal University, China 东北师范大学	Professor 教　授	N Zhao
533	2017-01-04	2017-01-23	Pedro Sacramento	Technical University of Lisbon, Portugal 葡萄牙里斯本技术大学	Professor 教　授	CSRC
534	2017-01-03	2017-01-05	Wei-Min Han 韩渭敏	University of Iowa, USA 美国爱荷华大学	Professor 教　授	W Cai
535	2017-01-03	2017-01-06	Ruo Li 李　若	Peking University, China 北京大学	Professor 教　授	W Cai
536	2017-01-02	2017-01-15	Shi-Wei Zhang 张世伟	College of William and Mary, USA 美国威廉与玛丽学院	Professor 教　授	W Cai
537	2017-01-02	2017-01-06	Ji-Chun Li 李继春	University of Nevada - Las Vegas, USA 美国内华达大学拉斯维加斯分校	Professor 教　授	ZM Zhang
538	2017-01-01	2017-12-31	Shu-Lin Zhou 周蜀林	Peking University, China 北京大学	Professor 教　授	YY Cai

539	2017-01-01	2017-01-28	Lei Zhang 张　磊	Peking University, China 北京大学	Researcher 研究员	YY Cai
540	2017-01-01	2017-01-06	Xiang-Jun Xing 邢向军	Shanghai Jiao Tong University, China 上海交通大学	Professor 教　授	W Cai
541	2016-12-22	2017-01-09	Min Hyung Cho	University of Massachusetts Lowell, USA 美国麻省大学洛威尔分校	Assistant Professor 助理教授	W Cai
542	2016-12-22	2016-12-31	Lei Zhang 张　磊	Peking University, China 北京大学	Researcher 研究员	YY Cai
543	2016-12-22	2016-12-31	Zhong-Yi Huang 黄忠亿	Tsinghua University, China 清华大学	Professor 教　授	YY Cai
544	2016-12-22	2016-12-31	Han-Quan Wang 王汉权	Yunnan University of Finance and Economics, China 云南财经大学	Professor 教　授	YY Cai
545	2016-12-22	2016-12-31	Wen-Zai Wen 文再文	Peking University, China 北京大学	Professor 教　授	YY Cai
546	2016-12-21	2016-12-23	Zhen-Nan Zhou 周珍楠	Duke University, USA 美国杜克大学	Associate Professor 副教授	YY Cai
547	2016-12-21	2016-12-23	Jing-wei Hu 胡婧玮	Purdue University, USA 美国普渡大学	Assistant Professor 助理教授	YY Cai
548	2016-12-20	2016-12-25	Yong Lv 吕　勇	Nankai University, China 南开大学	Associate Professor 副教授	WZ Bao
549	2016-12-20	2016-12-30	Qiu-Mei Huang 黄秋梅	Beijing University of Technology, China 北京工业大学	Associate Professor 副教授	ZM Zhang
550	2016-12-19	2016-12-22	Matthew Turner	University of Warwick, UK 英国华威大学	Professor 教　授	LH Tang/CSRC
551	2016-12-19	2016-12-25	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教　授	HQ Lin
552	2016-12-19	2016-12-23	Liang-Jian Zou 邹良剑	The Institute of Solid State Physics, CAS, China 中科院固体物理所	Researcher 研究员	HQ Lin

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
553	2016-12-19	2016-12-23	Da-Yong Liu 刘大勇	The Institute of Solid State Physics, CAS, China 中科院固体物理所	Associate Researcher 副研究员	HQ Lin
554	2016-12-19	2016-12-30	He-Hu Xie 谢和虎	Institute of Computational Mathematics and Scientific/ Engineering Computing, CAS, China 中科院计算数学所	Researcher 研究员	ZM Zhang
555	2016-12-18	2017-01-04	Wei-Zhu Bao 包维柱	National University of Singapore, Singapore 新加坡国立大学	Professor 教授	CSRC
556	2016-12-18	2016-12-22	Chate Hugues	Institut de Physique Théorique, CEA-Saclay, France 法国原子能机构	Professor 教 授	CSRC
557	2016-12-18	2016-12-23	Xia-Qing Shi 施夏清	Suzhou University, China 苏州大学	Associate Professor 副教授	LH Tang
558	2016-12-18	2016-12-21	Zhong-Hua Qiao 乔中华	The Hong Kong Polytechnic University, China 香港理工大学	Associate Professor 副教授	LL Ju
559	2016-12-18	2017-01-04	Wei-Zhu Bao 包维柱	National University of Singapore, Singapore 新加坡国立大学	Professor 教 授	CSRC
560	2016-12-16	2016-12-18	Yan-Qiu Li 李艳秋	East China Normal University, China 华东师范大学	Associate Researcher 副研究员	HG Liu
561	2016-12-15	2017-01-11	Chun-Mei Wang 王春梅	Texas State University, USA 美国德克萨斯州立大学	Assistant Professor 助理教授	CSRC/HQ Lin
562	2016-12-15	2016-12-31	Jing-Fang Huang 黄京芳	University of North Carolina at Chapel Hill, USA 美国北卡罗来纳大学教堂山分校	Professor 教 授	W Cai
563	2016-12-15	2016-12-23	Tie-Jun Li 李铁军	Peking University, China 北京大学	Professor 教 授	WQ Ren
564	2016-12-14	2016-12-31	Shangyou Zhang 张上游	University of Delaware, USA 美国特拉华大学	Assistant Professor 助理教授	W Cai/ZM Zhang

565	2016-12-13	2016-12-27	Hong-Gang Luo 罗洪刚	Lanzhou University, China 兰州大学	Professor 教　授	CSRC
566	2016-12-12	2016-12-18	Yuping Duan 段玉萍	Tianjin University, China 天津大学	Professor 教　授	XC Tai
567	2016-12-12	2016-12-19	Yong Wang 王　永	Nankai University, China 南开大学	Associate Professor 副教授	Wen Yang
568	2016-12-09	2016-12-19	Cai-Zhuang Wang 王才壮	Ames Laboratory, Iowa State University, USA 美国爱荷华州立大学	Professor 教　授	HQ Lin
569	2016-12-09	2016-12-21	Graham Smith	Universidade Federal do Rio de Janeiro, Brazil 巴西里约热内卢联邦大学	Professor 教　授	Rubem Mondaini
570	2016-12-08	2016-12-30	Lili Ju 鞠立力	University of South Carolina, USA 美国南卡罗来纳州立大学	Professor 教　授	CSRC
571	2016-12-08	2016-12-31	Li-Gang Wang 王立刚	Zhejiang University, China 浙江大学	Professor 教　授	TX Ma
572	2016-12-08	2016-12-10	Wei-Tao Yang 杨伟涛	Duke University, USA 美国杜克大学	Professor 教　授	W Cai
573	2016-12-08	2016-12-18	Ke Yin 殷　钶	huazhong university of science and technology, China 华中科技大学	Associate Professor 副教授	XC Tai
574	2016-12-06	2017-01-08	Wei-Qing Ren 任维清	National University of Singapore, Singapore 新加坡国立大学	Professor 教　授	CSRC
575	2016-12-05	2016-12-19	Xiao-Jie Liu 刘晓洁	Northeast Normal University,, China 东北师范大学	Professor 教　授	HQ Lin
576	2016-12-04	2016-12-23	Jia-Qing Yang 杨家青	Xi'an Jiaotong University, China 西安交通大学	Associate Professor 副教授	GH Hu
577	2016-12-03	2016-12-15	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教　授	HQ Lin
578	2016-12-03	2016-12-15	Yun Gao 高　云	Hubei University, China 湖北大学	Professor 教　授	HQ Lin

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
579	2016-12-02	2016-12-26	Zhi Zeng 曾 雉	Insitute of Solid State Physics, CAS, China 中科院固体物理研究所	Researcher 研究员	CSRC/HQ Lin
580	2016-12-02	2016-12-12	Jun Jing 景 俊	Jilin University 吉林大学	Professor 教 授	JQ You
581	2016-12-01	2017-01-23	Xue-Cheng Tai 台雪成	University of Bergen, Norway 挪威卑尔根大学	Professor 教 授	CSRC
582	2016-12-01	2016-12-31	Guang-Ri Jin 金光日	Beijing Jiaotong University, China 北京交通大学	Professor 教 授	Wen Yang
583	2016-11-30	2016-12-31	Xian-Long Wang 王贤龙	Insitute of Solid State Physics, CAS, China 中科院固体物理研究所	Researcher 研究员	CSRC/HQ Lin
584	2016-11-30	2016-12-04	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教 授	HQ Lin
585	2016-11-29	2016-12-31	Shu-Lin Zhou 周蜀林	Peking University, China 北京大学	Professor 教 授	YY Cai
586	2016-11-29	2016-12-31	Hai-Jun Yu 于海军	Institute of Applied Mathematics, AMSS, CAS, China 中国科学院数学与系统科学研究院	Associate Professor 副教授	YY Cai
587	2016-11-28	2016-12-01	Hai-Wen Zhang 张海文	Institute of Applied Mathematics, AMSS, CAS, China 中国科学院应用数学研究所	Lecturer 讲 师	GH Hu
588	2016-11-21	2016-11-23	Jing-Ling Chen 陈景灵	Nankai University, China 南开大学	Professor 教 授	CP Sun
589	2016-11-20	2016-12-20	Alex Hansen	Norwegian University of Science and Technology, Norway 挪威科技大学	Professor 教 授	CSRC

590	2016-11-20	2016-11-27	Pinaki Sengupta	Nanyang Technological University, Singapore 新加坡南洋理工大学	Associate Professor 副教授	Ling Wang
591	2016-11-20	2016-11-27	Anders Sandvik	Boston University, USA 美国波士顿大学	Professor 教　授	Ling Wang
592	2016-11-17	2016-12-31	Chang-Feng Fang 房常峰	Jining University, China 济宁学院	Lecturer 讲　师	B Huang
593	2016-11-14	2016-11-16	Guo-Hua Zhong 钟国华	Shenzhen Insititutes of Advanced Technology (CAS), China 中科院深圳先进技术研究员	Associate Researcher 副研究员	HQ Lin
594	2016-11-13	2016-12-31	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
595	2016-11-11	2016-11-19	Thereza Paiva	Universidade Federal do Rio de Janeiro, Brazil 巴西里约热内卢联邦大学	Professor 教　授	Rubem Mondaini
596	2016-11-05	2016-11-17	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教　授	HQ Lin
597	2016-11-01	2016-11-30	Sheng Meng 孟　胜	Institute of Physics CAS, China 中科院物理研究所	Professor 教　授	SW Gao
598	2016-11-01	2016-12-31	Jun-Hyung Cho	Hanyang University, Korea 韩国汉阳大学	Professor 教　授	SH Wei
599	2016-11-01	2016-12-31	Wen-Hui Duan 段文晖	Tsinghua University, China 清华大学	Professor 教　授	B Huang
600	2016-10-31	2016-11-13	Yaroslav Tserkovnyak	University of California, Los Angeles, USA 美国加州大学洛杉矶分校	Professor 教　授	Stefano Chesi
601	2016-10-30	2016-11-13	Dimitrie Culcer	The University of New South Wales, Australia 澳大利亚新南威尔士大学	Professor 教　授	JQ You & Stefano Chesi
602	2016-10-30	2016-10-31	Hui Liang 梁　慧	Heilongjiang University, China 黑龙江大学	Professor 教　授	Martin Stynes
603	2016-10-26	2016-12-31	Xin Chen 陈　欣	Xi'an Jiaotong University，China 西安交通大学	Associate Professor 副教授	SW Gao

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
604	2016-10-26	2016-11-03	Guo-Hua Zhong 钟国华	Shenzhen Insititutes of Advanced Technology (CAS), China 中科院深圳先进技术研究员	Associate Researcher 副研究员	HQ Lin
605	2016-10-24	2016-10-28	Xiao-Dong Liu 刘晓东	Chinese Academy of Sciences, China 中国科学院	Associate Professor 副教授	GH Hu
606	2016-10-24	2016-10-28	Hong-Gang Luo 罗洪刚	Lanzhou University, China 兰州大学	Professor 教　授	CSRC
607	2016-10-20	2016-10-30	Ling-Yi Meng 孟令一	Xiamen Univeristy, China 厦门大学	Research Associate 助理研究员	CY Yam
608	2016-10-18	2016-10-21	Lev Shchur	Landau Institute for Theoretical Physics, Science Center in Chernogolovka, Russia 俄罗斯朗道理论物理研究所	Professor 教　授	CSRC/HQ Lin
609	2016-10-14	2016-11-14	Xiao-Feng Li 李晓凤	Luoyang Normal University, China 洛阳师范学院	Associate Professor 副教授	ZY Hu
610	2016-10-13	2016-10-20	Ke Yin 殷　钶	huazhong university of science and technology, China 华中科技大学	Associate Professor 副教授	HG Liu
611	2016-10-12	2016-10-16	Marlan Scully	Texas A&M University, USA 美国德克萨斯农工大学	Professor 教　授	SY Zhu
612	2016-10-11	2016-10-16	Pinaki Sengupta	Nanyang Technological University, Singapore 新加坡南洋理工大学	Associate Professor 副教授	Ling Wang
613	2016-10-10	2016-11-09	Chunjie Yang 杨春洁	Lanzhou University, China 兰州大学	Lecturer 讲　师	Y Li
614	2016-10-10	2016-10-16	Dawei Wang 王大伟	Texas A&M University, USA 美国德克萨斯农工大学	Research Assistant Professor 助理教授	SY Zhu

615	2016-10-08	2016-10-12	Yi Zhu 朱　毅	Tsinghua University, China 清华大学	Associate Researcher 副研究员	JW Zhang
616	2016-09-29	2016-12-02	Renata Wentzcovitch	University of Minnesota, USA 美国明尼苏达大学	Professor 教　授	DB Zhang
617	2016-09-22	2016-12-22	Xiao-Gang Yang 杨小刚	Wuhan Institute of Technology, China 武汉工程大学	Lecturer 讲　师	Q Wang
618	2016-09-19	2016-09-26	Feng Liu 刘　锋	University of Utah, USA 美国犹他大学	Professor 教　授	CSRC
619	2016-09-19	2016-10-26	Jing-Ying Wang 王京盈	Shandong University, China 山东大学	Lecturer 讲　师	Y Ding
620	2016-09-18	2016-10-23	Gerard Labrosse	Université Paris-Sud 11, France 法国巴黎第十一大学	Professor 教　授	LZ Chen
621	2016-09-16	2016-09-24	Ji-Jun Zhao 赵纪军	Dalian University of Technology, China 大连理工大学	Professor 客座教授	CSRC
622	2016-09-14	2017-03-31	Sheng-Bai Zhang 张绳百	Rensselaer Polytechnic Institute, USA 美国伦斯勒理工学院	Professor 教　授	HQ Lin & SH Wei
623	2016-09-14	2016-09-24	Jia-Wei Mei 梅佳伟	University of Utah, USA 犹他大学	Postdoc 博士后	F Liu
624	2016-09-14	2017-03-31	Sheng-Bai Zhang 张绳百	Rensselaer Polytechnic Institute, USA 美国伦斯勒理工学院	Professor 教　授	HQ Lin & SH Wei
625	2016-09-12	2016-11-08	Can Huang 黄　灿	Xiamen Univeristy, China 厦门大学	Lecturer 讲　师	Martin Stynes
626	2016-09-12	2016-09-20	Rui-Qin Zhang 张瑞勤	City University of Hong Kong 香港城市大学	Professor 客座教授	CSRC
627	2016-09-05	2017-06-15	Yi-Feng Duan 段益峰	china university of mining and technology, China 中国矿业大学	Associate Professor 副教授	SH Wei
628	2016-09-05	2016-10-31	Hong-Lin Liao 廖洪林	PLA University of Science and Technology, China 解放军理工大学	Associate Professor 副教授	JW Zhang

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
629	2016-09-05	2017-08-31	Yi-Feng Duan 段益峰	china university of mining and technology, China 中国矿业大学	Associate Professor 副教授	SH Wei
630	2016-09-04	2017-07-31	Luyou Xie 颉录有	Northwest Normal University, China 西北师范大学	Associate Professor 副教授	X Gao
631	2016-09-04	2017-07-31	Luyou Xie 颉录有	Northwest Normal University, China 西北师范大学	Associate Professor 副教授	X Gao
632	2016-09-02	2016-09-12	Xiao-Wei Liu 刘晓薇	Qilu University of Technology, China 齐鲁工业大学	Associate Professor 副教授	Martin Stynes
633	2016-09-01	2016-09-14	Jin Zhang 张　进	Shandong Normal University, China 山东师范大学	Lecturer 讲　师	Martin Stynes
634	2016-08-30	2016-09-05	Mao-Jun Li 李茂军	Chongqing University, China 重庆大学	Lecturer 讲　师	XL Deng
635	2016-08-21	2016-09-06	Zu-Jian Ying 应祖建	Universit`a di Salerno, Italy 意大利萨勒诺大学	Senior Researcher 资深研究员	HG Luo
636	2016-08-20	2016-09-12	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
637	2016-08-18	2016-08-31	Jun Li 李　俊	Xiamen Univeristy, China 厦门大学	Assistant Professor 助理教授	W Yang
638	2016-08-17	2016-08-22	Wei-Bin Li 李伟斌	huazhong university of science and technology, China 华中科技大学	Professor 教　授	TX Ma
639	2016-08-16	2016-08-16	Hong Qian 钱　紘	University of Washington, Seattle，USA 美国西雅图华盛顿大学	Professor 教　授	LS Luo
640	2016-08-16	2016-08-22	Rui-Qin Zhang 张瑞勤	City University of Hong Kong, China 香港城市大学	Professor 客座教授	CSRC

641	2016-08-16	2016-08-22	Marcos Rigol	The Pennsylvania State University, USA 美国宾夕法尼亚州立大学	Professor 教 授	R. Mondaini
642	2016-08-14	2016-08-17	Xiu yang 杨 修	Pacific Northwest National Laboratory, USA 美国太平洋西北国家实验室	Scientist 科学家	W Cai
643	2016-08-12	2016-08-19	Zhao-Li Guo 郭照立	Huazhong University of Science and Technology, China 华中科技大学	Professor 教 授	CSRC
644	2016-08-12	2016-08-19	Hai-Bo Dong 董海波	University of Virginia, USA 美国佛吉尼亚大学	Associate Professor 副教授	XL Deng
645	2016-08-11	2016-08-13	Igor Boglaev	University of New Zealand, New Zealand 新西兰大学	Professor 教 授	Martin Stynes
646	2016-08-10	2016-08-31	Xun-Wang Yan 闫循旺	Anyang Normal University, China 安阳师范学院	Associate Professor 副教授	ZB Huang
647	2016-08-10	2016-08-23	Li-Xiang Cen 岑理相	Sichuan University, China 四川大学	Professor 教 授	HG Luo
648	2016-08-10	2016-11-10	Yong-Hong Zhao 赵永红	Sichuan Normal University, China 四川师范大学	Associate Professor 副教授	HG Luo
649	2016-08-10	2016-08-12	Bosco Garcia Archilla	University of Seville, Spain 西班牙塞维利亚大学	Professor 教 授	Martin Stynes
650	2016-08-09	2016-08-24	San-Huang Ke 柯三黄	Tongji University, China 同济大学	Professor 教 授	HQ Lin
651	2016-08-09	2016-08-14	Jose Luis Gracia	University of Zaragoza, Spain 西班牙萨拉戈萨大学	Associate Professor 副教授	Martin Stynes
652	2016-08-09	2016-08-14	Carmelo Clavero	University of Zaragoza, Spain 西班牙萨拉戈萨大学	Professor 教 授	Martin Stynes
653	2016-08-09	2016-08-11	Feng-Long Gu 顾凤龙	South China Normal University 华南师范大学	Professor 教 授	W Cai
654	2016-08-09	2016-10-08	Dong Zhang 张 东	Institute of Semiconductors, CAS, China 中科院半导体研究所	Assistant Professor 助理研究员	Kai Chang

CSRC VISITING SCHOLARS (2016.08-2017.07)

NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
655	2016-08-09	2016-10-08	Wen-Kai Lou 娄文凯	Institute of Semiconductors, CAS, China 中科院半导体研究所	Assistant Professor 助理研究员	Kai Chang
656	2016-08-08	2016-08-13	Gert LubeGert Lube	University of Göttingen, Germany 德国格廷根大学	Professor 教　授	Martin Stynes
657	2016-08-06	2016-08-14	Eugene O'Riordan	Dublin City University, Ireland 爱尔兰都柏林城市大学	Professor 教　授	Martin Stynes
658	2016-08-06	2016-08-11	Guang-Hui Hu 胡光辉	University of Macau, China 澳门大学	Assistant Professor 助理教授	JW Zhang
659	2016-08-06	2016-08-24	Ke Yin 殷　钶	Huazhong University of Science and Technology, China 华中科技大学	Associate Professor 副教授	HG Liu
660	2016-08-05	2016-08-12	Guang-Hui Zhou 周光辉	Hunan Normal University, China 湖南师范大学	Professor 教　授	JQ You
661	2016-08-05	2016-08-12	Xiao-Jie Liu 刘晓洁	Northeast Normal University, China 东北师范大学	Professor 教　授	HQ Lin
662	2016-08-04	2016-08-19	Li-Gang Wang 王立刚	Zhejiang University, China 浙江大学	Professor 教　授	SY Zhu
663	2016-08-04	2016-08-15	Shi-Dong Jiang 蒋世东	New Jersey institute of technology, USA 美国新泽西理工学院	Associate Professor 副教授	ZM Zhang
664	2016-08-03	2016-08-24	Min Hyung Cho	University of Massachusetts Lowell, USA 美国麻省大学洛威尔分校	Assistant Professor 助理教授	W Cai
665	2016-08-03	2016-08-14	Natalia Kopteva	University of Limerick, Ireland 爱尔兰利默里克大学	Professor 教　授	Martin Stynes
666	2016-08-02	2016-08-18	Yao Ma 马　遥	Xian University of Technology, China 西安理工大学	Lecturer 讲　师	W Yang

667	2016-08-01	2017-08-31	Jun Li 李　君	Nankai University, China 南开大学	Lecturer 讲　师	Q Wang
668	2016-08-01	2016-09-30	Henrik Johannesson	University of Gothenburg, Sweden 瑞典哥德堡大学	Professor 教　授	CSRC
669	2016-08-01	2017-07-31	Jun Li 李　君	Nankai University, China 南开大学	Lecturer 讲　师	Q Wang
670	2016-08-01	2016-08-05	Yang Xiang 项　阳	The Hong Kong University of Science and Technology, China 香港科技大学	Professor 教　授	WQ Ren
671	2016-08-01	2016-08-14	Dingwang Yuan 袁定旺	Hunan University, China 湖南大学	Associate Professor 副教授	YN Zhang
672	2016-08-01	2016-08-22	Ghassan Georges Batrouni	University of Nice-Sophia Antipolis, France 法国尼斯大学	Professor 教　授	R. Mondaini
673	2016-08-01	2016-08-12	Chun-Mei Wang 王春梅	Texas State University, USA 美国德克萨斯州立大学	Assistant Professor 助理教授	W Cai
674	2016-08-01	2016-08-31	Xi-Hua Yang 杨希华	Shanghai University, China 上海大学	Associate Professor 副教授	SY Zhu

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
675	2016-07-31	2016-08-16	Jing-Fang Huang 黄京芳	University of North Carolina at Chapel Hill, USA 美国北卡罗来纳大学教堂山分校	Professor 教　授	W Cai
676	2016-07-30	2016-08-05	Zu-Jian Ying 应祖建	Sapienza University of Rome, Italy 意大利罗马大学	Senior Researcher 资深研究员	HG Luo

CSRC VISITING SCHOLARS (2015.08-2016.07)

NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
677	2016-07-29	2016-08-10	Ji-Jun Zhao 赵纪军	Dalian University of Technology, China 大连理工大学	Professor 客座教授	CSRC
678	2016-07-29	2016-08-27	Hui-Qing Zhu 朱慧卿	University of Southern Mississippi, USA 美国南密西西比大学	Associate Professor 副教授	ZM Zhang
679	2016-07-29	2016-08-17	Xiao-Yang Xu 许晓阳	Shanxi University, China 陕西理工学院	Associate Professor 副教授	XL Deng
680	2016-07-28	2016-08-01	Jing-wei Hu 胡婧玮	Purdue University, USA 美国普度大学	Assistant Professor 助理教授	LS Luo
681	2016-07-27	2016-07-31	Zhi Wang 王　志	Sun Yat-Sen University, China 中山大学	Associate Professor 副教授	W Yang
682	2016-07-26	2016-08-09	Da-Dong Yan 严大东	Beijing Normal University, China 北京师范大学	Professor 教　授	MS Miao
683	2016-07-26	2016-08-28	Hong-Gang Luo 罗洪刚	Lanzhou University, China 兰州大学	Professor 教　授	CSRC
684	2016-07-25	2016-07-31	Tiezheng Qian 钱铁铮	The Hong Kong University of Science and Technology, China 香港科技大学	Professor 教　授	WQ Ren
685	2016-07-25	2016-08-31	Dong-Sheng Geng 耿东生	University Of Science & Technology Beijing, China 北京科技大学	Professor 教　授	WM Lau& LM Liu
686	2016-07-25	2016-07-28	Guo-Wei Wei 魏国卫	Michigan State University, USA 美国密歇根州立大学	Professor 教　授	W Cai
687	2016-07-25	2016-08-01	Yan-Xiang Zhao 赵雁翔	George Washington University, USA 美国乔治华盛顿大学	Associate Professor 副教授	LL Ju

688	2016-07-25	2016-08-23	Run-Chang Lin 林润昶	Texas A&M University, USA 美国德州农机大学	Associate Professor 副教授	ZM Zhang
689	2016-07-25	2016-07-28	Shang-You Zhang 张上游	University of Delaware, USA 美国特拉华大学	Associate Professor 副教授	ZM Zhang
690	2016-07-25	2016-07-28	Li-Ping Yang 杨丽平	Chongqing University, China 重庆大学	Lecturer 讲　师	HQ Lin
691	2016-07-25	2016-12-31	Yan-Hua Wang 王彦华	Shanxi University, China 山西大学	Associate Professor 副教授	N Zhao
692	2016-07-25	2016-08-24	Wen-Long You 尤文龙	Soochow University, China 苏州大学	Associate Professor 副教授	N Zhao
693	2016-07-23	2016-08-20	Li-Ming Tang 唐黎明	Hunan University 湖南大学	Associate Professor 副教授	SH Wei
694	2016-07-21	2016-07-30	Yuping Duan 段玉萍	Tianjin University, China 天津大学	Professor 教　授	XC Tai
695	2016-07-20	2016-08-02	Xinyou Lv 吕新友	huazhong university of science and technology, China 华中科技大学	Associate Professor 副教授	JQ You
696	2016-07-20	2016-08-23	Chun-Ju Hou 侯春菊	Jiangxi University of Science and Technology, China 江西理工大学	Associate Professor 副教授	MS Miao
697	2016-07-20	2016-07-25	Raghuvir.pai	Manipal university, India 印度马尼帕尔国际大学	Professor 教　授	Y Ding
698	2016-07-20	2016-07-28	Hong-Lin Liao 廖洪林	PLA University of Science and Technology, China 解放军理工大学	Associate Professor 副教授	JW Zhang
699	2016-07-19	2016-08-03	San-Huang Ke 柯三黄	Tongji University, China 同济大学	Professor 教　授	HQ Lin
700	2016-07-19	2016-08-04	Xi-Liang Lv 吕锡亮	Wuhan University, China 武汉大学	Professor 教　授	JW Zhang
701	2016-07-18	2016-07-24	Yan-Ling Li 李延龄	Jiangsu Normal University, China 江苏师范大学	Professor 教　授	HQ Lin

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
702	2016-07-18	2016-09-04	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教　授	HQ Lin
703	2016-07-18	2016-08-17	Xiaoli Wang 王晓丽	Linyi University, China 临沂大学	Associate Professor 副教授	MS Miao
704	2016-07-18	2016-08-17	Jianfu Li 李建福	Linyi University, China 临沂大学	Associate Professor 副教授	MS Miao
705	2016-07-18	2016-08-17	Wen-Jie Fan 范文杰	Dalian Ocean University, China 大连海洋大学	Associate Researcher 副研究员	RQ Zhang
706	2016-07-17	2016-07-23	Kensuke Yokoi	Cardiff University, UK 英国卡迪夫大学	Lecturer 讲　师	XL Deng
707	2016-07-13	2016-07-15	Xia-Qing Shi 施夏清	Suzhou University, China 苏州大学	Associate Professor 副教授	LH Tang
708	2016-07-12	2016-07-15	Paul J. Dellar	Oxford Centre for Industrial and Applied Mathematics, UK 英国牛津工业和应用数学中心	Lecturer 讲　师	LS Luo
709	2016-07-11	2016-07-31	Zhi-Zhong Sun 孙志忠	Southeast University, China 东南大学	Professor 教　授	ZM Zhang
710	2016-07-11	2016-08-20	Chang- Hui Yao 姚昌辉	Zhengzhou University, China 郑州大学	Associate Professor 副教授	ZM Zhang
711	2016-07-11	2016-08-10	Jin-Cheng Ren 任金城	Henan University of Economics and Law, China 河南财经政法大学	Associate Professor 副教授	JW Zhang
712	2016-07-11	2016-08-26	Yu-Zhong Zhang 张宇钟	Tongji University, China 同济大学	Professor 教　授	HQ Lin
713	2016-07-11	2016-08-08	Qing-Hu Chen 陈庆虎	Zhejiang University, China 浙江大学物理系	Professor 教　授	LH Tang

714	2016-07-11	2016-07-12	XuHui Huang 黄旭辉	Hong Kong University of Science and Technology, China 香港科技大学	Associate Professor 副教授	LH Tang/J Yu
715	2016-07-11	2016-08-03	Maosheng Miao 苗茂生	California State University Northridge, USA 美国加州州立大学北岭分校	Assistant Professor 助理教授	CSRC
716	2016-07-11	2016-12-31	Bei Zeng 曾　蓓	University of Guelph, Canada 加拿大圭尔夫大学	Associate Professor 副教授	JQ You
717	2016-07-11	2016-08-08	Wei-Qing Ren 任维清	National University of Singapore, Singapore 新加坡国立大学	Associate Professor 副教授	CSRC
718	2016-07-10	2016-08-15	Xu-Wen Wang 王旭文	East China Jiaotong University, China 华东交通大学	Lecturer 讲　师	Y Ding
719	2016-07-09	2016-08-08	Wen-Ming He 何文明	Wenzhou University, China 温州大学	Professor 教　授	ZM Zhang
720	2016-07-08	2016-07-29	Vítor Vieira	Technical University of Lisbon, Portugal 葡萄牙里斯本技术大学	Professor 教　授	CSRC
721	2016-07-08	2016-07-29	Ricardo Guimaraes Dias	University of Aveiro, Portugal 葡萄牙阿威罗大学	Professor 教　授	CSRC
722	2016-07-05	2016-07-28	Jian-Hua Xing 邢建华	University of Pittsburgh, USA 美国匹兹堡大学	Professor 教　授	CSRC
723	2016-07-05	2016-07-18	Ionut Danaila	University of Rouen, France 法国鲁昂大学	Professor 教　授	WZ Bao
724	2016-07-05	2016-07-18	Luminita Danaila	University of Rouen, France 法国鲁昂大学	Professor 教　授	WZ Bao
725	2016-07-05	2016-07-20	Li-Hai Liang 李海梁	Capital Normal University, China 首都师范大学	Professor 教　授	WZ Bao
726	2016-07-05	2016-07-20	Shu Wang 王　术	Beijing University of Technology, China 北京工业大学	Professor 教　授	WZ Bao
727	2016-07-04	2016-08-03	Eduardo CastroEduardo Castro	Technical University of Lisbon, Portugal 葡萄牙里斯本技术大学	Professor 教　授	CSRC

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
728	2016-07-03	2016-08-03	Jose Carmelo	University of Minho, Portugal 葡萄牙米尼奥大学	Professor 教 授	CSRC
729	2016-07-03	2016-08-03	Pedro Sacramento	Technical University of Lisbon, Portugal 葡萄牙里斯本技术大学	Professor 教 授	CSRC
730	2016-07-03	2016-08-02	Zhen-Li Xu 徐振礼	Shanghai Jiao Tong University, China 上海交通大学	Professor 教 授	W Cai
731	2016-07-02	2016-08-11	Xiao-Feng Yang 杨霄锋	University of South Carolina, USA 南卡罗莱纳大学	Associate Professor 副教授	Q Wang
732	2016-07-01	2016-07-03	Sumit Mazumdar	University of Arizona, USA 美国亚利桑那大学	Professor 教 授	CSRC/HQ Lin
733	2016-07-01	2016-07-05	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教 授	HQ Lin
734	2016-06-30	2017-07-31	Xiao-Feng Yang 杨霄锋	University of South Carolina, USA 南卡罗莱纳大学	Professor 教 授	Q Wang
735	2016-06-29	2016-07-10	Zhao-Ming Wang 王兆明	Ocean University Of China, China 中国海洋大学	Associate Professor 副教授	JQ You
736	2016-06-29	2016-07-22	Guang-Hua Ji 纪光华	Beijing Normal University, China 北京师范大学	Associate Professor 副教授	Q Wang
737	2016-06-29	2016-07-01	Pan Jun Kim	Asia Pacific Center for Theoretical Physics 亚太理论物理研究中心	Associate Professor 副教授	LH Tang
738	2016-06-28	2016-08-06	Xue-Cheng Tai 台雪成	University of Bergen, Norway 挪威卑尔根大学	Professor 教 授	CSRC
739	2016-06-28	2016-07-04	Li-Ping Yang 杨丽平	Chongqing University, China 重庆大学	Lecturer 讲 师	HQ Lin

740	2016-06-28	2016-07-07	Jian Zi 资　剑	Fudan University, China 复旦大学	Professor 教　授	JQ You
741	2016-06-27	2016-06-28	Xia-Qing Shi 施夏清	Suzhou University, China 苏州大学	Associate Professor 副教授	LH Tang
742	2016-06-27	2016-06-28	Tian-Hui Zhang 张天辉	Suzhou University, China 苏州大学	Professor 教　授	LH Tang
743	2016-06-24	2016-07-23	Jie Li 李　杰	University of Cambridge, UK 英国剑桥大学	Professor 教　授	LS Luo
744	2016-06-23	2016-07-07	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
745	2016-06-21	2016-06-23	Zhen-Yu Zhang 张振宇	University of Science and Technology of China 中国科学技术大学	Professor 教　授	HQ Lin
746	2016-06-20	2016-07-02	Ji-Guang Sun 孙继广	Michigan Technology University, US 密西根科技大学	Professor 教　授	ZM Zhang
747	2016-06-20	2016-06-26	Tiezheng Qian 钱铁铮	The Hong Kong University of Science and Technology, China 香港科技大学	Professor 教　授	LS Luo
748	2016-06-20	2016-06-23	Dexuan Xie 谢德宣	University of Wisconsin, Milwaukee,USA 美国威斯康辛大学米尔沃基分校	Professor 教　授	W Cai
749	2016-06-19	2016-06-24	Guiren Wang	University of South Carolina, USA 美国南卡罗来纳州立大学	Professor 教　授	Q Wang
750	2016-06-19	2016-06-25	Ting-Wai Chiu 趙挺偉	National Taiwan University 台湾国立大学	Professor 教　授	CSRC/HQ Lin
751	2016-06-19	2016-06-26	Gang Lu 吕　刚	California State University Northridge, USA 美国加州州立大学北岭分校	Professor 教　授	CSRC/HQ Lin
752	2016-06-17	2016-06-25	Francois.Dubois	Université Paris-Sud,France 法国巴黎十一大学	Professor 教　授	LS Luo
753	2016-06-16	2016-08-08	Lili Ju 鞠立力	University of South Carolina, USA 美国南卡罗来纳州立大学	Professor 教　授	CSRC

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
754	2016-06-16	2016-06-19	Peter Schwander	University Milwnlkee Wisconsin, USA 威斯康星大学-麦迪逊分校	Associate Professor 副教授	HG Liu
755	2016-06-15	2016-06-18	Li-Gang Wang 王立刚	Zhejiang University, China 浙江大学	Professor 教　授	TX Ma
756	2016-06-14	2016-07-20	Ting Yu 于　挺	Stevens Institute of Technology, USA 美国史蒂文斯理工学院	Professor 教　授	CSRC
757	2016-06-14	2016-06-25	Zhao-Ming Wang 王兆明	Ocean University Of China, China 中国海洋大学	Associate Professor 副教授	JQ You
758	2016-06-13	2016-06-17	Shenh-Jun Yuan 袁声军	Radboud University Nijmegen, the Netherlands 荷兰内梅亨大学	Associate Professor 副教授	HQ Lin
759	2016-06-13	2016-07-16	Xuan Zhao 赵　璇	Southeast University, China 东南大学	Assistant Professor 助理教授	ZM Zhang
760	2016-06-09	2016-06-21	Lan Zhou 周　兰	Hunan Normal University, China 湖南师范大学	Professor 教　授	CP Sun
761	2016-06-09	2016-07-09	Wei Cai 蔡　巍	Stanford University, USA 美国斯坦福大学	Professor 教　授	CSRC
762	2016-06-08	2016-07-03	Alex HansenAlex Hansen	Norwegian University of Science and Technology, Norway 挪威科技大学	Professor 教　授	CSRC
763	2016-06-06	2016-06-19	Xiang-Rong Wang 王向荣	The Hong Kong University of Science and Technology 香港科技大学	Professor 教　授	JQ You
764	2016-06-05	2016-06-11	Naomichi Hatano	University of Tokyo, Japan 日本东京大学	Professor 教　授	JQ You
765	2016-06-04	2016-06-26	Zhirui Gong 龚志瑞	Shenzhen University, China 深圳大学	Assistant Professor 助理教授	N Zhao

766	2016-06-01	2016-07-31	Zhengyuan Luo 罗征援	National Aeronautics and Space Administration, USA 美国宇航局格伦研究中心	Senior Scientist 资深科学家	LS Luo
767	2016-06-01	2016-06-30	Pierre Lallemand	Université of Paris-Sud, France 法国巴黎南大学	Professor 教　授	LS Luo
768	2016-05-30	2016-06-18	Amnon Aharony	Ben Gurion University, Israel 以色列本古里安大学	Professor 教　授	JQ You
769	2016-05-30	2016-06-18	Ora Entin-Wohlman	Ben Gurion University & Tel Aviv University, Israel 以色列本古里安大学 & 以色列特拉维夫大学	Professor 教　授	JQ You
770	2016-05-27	2016-06-17	Hao-Bin Wang 王浩斌	University of Colorado Denver,USA 美国科罗拉多大学丹佛分校	Professor 教　授	CSRC
771	2016-05-25	2016-12-31	Yibo Gao 高一波	Beijing University of Technology, China 北京工业大学	Associate Professor 副教授	Y Li
772	2016-05-25	2016-07-24	Shmuel Gurvitz	Weizmann Institute, Israel 以色列魏茨曼研究所	Professor 教　授	JQ You
773	2016-05-23	2016-07-15	Peihong Zhang 张培鸿	University of Buffalo,SUNY, USA 美国纽约州立大学布法罗分校	Associate Professor 副教授	CSRC
774	2016-05-21	2016-05-26	Petro Ribeiro	Center of Physics and Engineering of Advanced Materials, IST, Portugal 葡萄牙里斯本大学高级技术研究所	Associate Researcher 副研究员	Stefano Chesi
775	2016-05-18	2016-06-17	Suhail Zubairy	Texas A&M University, USA 美国德州农工大学	Professor 教　授	CSRC
776	2016-05-17	2016-06-05	Xue-Dong Hu 胡学东	University at Buffalo, SUNY, USA 美国纽约州立大学布法罗分校	Professor 教　授	JQ You
777	2016-05-17	2016-06-16	Anders Sandvik	Boston University, USA 美国波士顿大学	Professor 教　授	HQ Lin
778	2016-05-16	2016-08-31	Jerry Zhijian Yang 杨志坚	Wuhan University, China 武汉大学	Professor 教　授	CSRC/HQ Lin
779	2016-05-16	2016-05-21	Mei-Yong Liao 廖梅勇	National Institute for Materials Science, Japan 日本国家材料科学研究所	Researcher 研究员	TF Li

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
780	2016-05-15	2016-05-22	Tu-nan Chang 张图南	University of Southern California, USA 美国南加利福尼亚州立大学	Professor 教　授	X Gao
781	2016-05-09	2016-06-08	Hua-Ping Lei 雷华平	Institute of Solid State Physics, CAS, China 中科院固体物理研究所	Associate Professor 副教授	CSRC/HQ Lin
782	2016-05-09	2016-05-16	Guo-Hua Zhong 钟国华	Shenzhen Insititutes of Advanced Technology (CAS), China 中科院深圳先进技术研究员	Associate Professor 副教授	HQ Lin
783	2016-05-09	2016-05-14	Su-Chan Park	The Catholic University of Korea, Korea 韩国加图立大学	Professor 教　授	LH Tang
784	2016-05-09	2016-05-14	Hyunggyu Park	Korea Institute for Advanced Study, Korea 韩国高等科学院	Professor 教　授	LH Tang
785	2016-05-09	2016-05-14	Jooyoung Lee	Korea Institute for Advanced Study, Korea 韩国高等科学院	Professor 教　授	LH Tang
786	2016-05-09	2016-06-01	Yang Yang 杨　扬	Michigan Technological University, USA 美国密歇根科技大学	Assistant Professor 助理教授	ZM Zhang
787	2016-05-06	2016-06-05	Lili Ju 鞠立力	University of South Carolina, USA 美国南卡罗来纳州立大学	Professor 教　授	CSRC
788	2016-05-06	2016-05-23	Yansun Yao	University of Saskatchewan, Canada 加拿大萨省大学	Assistant Professor 助理教授	CSRC/HQ Lin
789	2016-05-05	2016-05-12	Si-Hong Shao 邵嗣烘	Peking University, China 北京大学	Associate Professor 副教授	W Cai
790	2016-05-05	2016-05-12	Tiao Lu 卢　朓	Peking University, China 北京大学	Associate Professor 副教授	W Cai

791	2016-05-05	2016-06-06	Fan Yang 杨　帆	Beijing Institute of Technology, China 北京理工大学	Professor 教　授	Ling Wang &TX Ma
792	2016-05-04	2016-05-29	Hui Liang 梁　慧	Heilongjiang University, China 黑龙江大学	Professor 教　授	Martin Stynes
793	2016-05-04	2016-05-05	Zhao-Li Guo 郭照立	Huazhong University Of Science And Technology, China 华中科技大学	Professor 教　授	CSRC
794	2016-05-04	2016-05-12	Xia Ji 季　霞	Academy of Mathematics and Systems Science , CAS, China 中国科学院数学与系统科学研究院	Associate Researcher 副研究员	W Cai
795	2016-04-21	2016-04-25	Yan-Ling Li 李延龄	Jiangsu Normal University, China 江苏师范大学	Professor 教　授	HQ Lin
796	2016-04-18	2016-04-19	Feng Liu 刘　锋	University of Utah, USA 美国犹他大学	Professor 教　授	CSRC/HQ Lin
797	2016-04-18	2016-05-20	Yu-Zhong Zhang 张宇钟	Tongji University, China 同济大学	Professor 教　授	HQ Lin
798	2016-04-18	2016-05-17	Yong-Sheng Zhang 张永胜	Institute of Solid State Physics, CAS, China 中科院固体物理研究所	Researcher 研究员	CSRC/HQ Lin
799	2016-04-03	2016-04-09	Gilberto Teobaldi	University of Liverpool, UK 英国利物浦大学	Lecturer 讲　师	W Cai
800	2016-04-01	2016-09-01	Qing-Gao Wang 王清高	Anyang Normal University,China 安阳师范学院	Lecturer 讲　师	SH Wei
801	2016-03-29	2016-04-03	Xian-Fang Yue 岳现房	Jining University, China 济宁学院	Associate Professor 副教授	X Gao
802	2016-03-28	2016-06-27	Guang-Ri Jin 金光日	Beijing Jiaotong University, China 北京交通大学	Professor 教　授	CP Sun&WYang
803	2016-03-24	2016-03-25	Wei-Hua Wang 王维华	Nankai University, China 南开大学	Associate Professor 副教授	DB Zhang
804	2016-03-24	2016-04-24	Xiao-Lin Wei 魏晓琳	Xiangtan University, China 湘潭大学	Professor 教　授	LM Liu

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
805	2016-03-22	2016-03-29	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教 授	HQ Lin
806	2016-03-21	2016-03-24	Peter W Milonni	Los Alamos National Laboratory & University of Rochester, USA 美国洛斯阿拉莫斯国家实验室/美国罗切斯特大学	Professor 教 授	SY Zhu
807	2016-03-21	2016-04-20	Yu-Juan Zhang 张玉娟	University Of Science & Technology Beijing, China 北京科技大学	Lecturer 讲 师	ZY Hu
808	2016-03-19	2016-03-24	Bertrand Delamotte	University Pierre et Marie Curie, France 法国巴黎第六大学	Professor 教 授	LH Tang
809	2016-03-15	2016-03-23	Xiao-Feng Qian 钱晓锋	University of Rochester, USA 美国罗彻斯特大学	Research Associate	JQ You
810	2016-03-09	2016-03-24	Sebastian Doniach	Standford University, USA 美国斯坦福大学	Professor 教 授	HG Liu
811	2016-03-09	2016-03-19	Cristian Micheletti	International School for Advanced Studies (SISSA), Italy 意大利国际高等研究院	Professor 教 授	LH Tang
812	2016-03-09	2016-03-11	Li-Jian Jiang 姜立建	Hunan University, China 湖南大学	Professor 教 授	W Cai
813	2016-03-08	2016-03-09	Xiao-Feng Qian 钱晓锋	University of Rochester, USA 美国罗彻斯特大学	Research Associate	JQ You
814	2016-03-06	2016-03-15	Lan Zhou 周 兰	Hunan Normal University, China 湖南师范大学	Professor 教 授	CP Sun
815	2016-03-04	2016-03-10	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教 授	HQ Lin

816	2016-03-03	2016-03-24	Zhi-Rui Gong 龚志瑞	Shenzhen University, China 深圳大学	Assistant Professor 助理教授	N Zhao
817	2016-03-03	2016-03-09	Hao Fu 付　号	Wuhan Institute of Physics and Mathematics, CAS, China 中国科学院武汉物理与数学研究所	Associate Professor 副教授	Y Li
818	2016-03-03	2016-03-24	Zhi-Rui Gong 龚志瑞	Shenzhen University, China 深圳大学	Assistant Professor 助理教授	N Zhao
819	2016-02-29	2016-03-09	Roya Zandi	University of California, USA 美国加利福尼亚大学	Professor 教　授	LH Tang
820	2016-02-29	2016-03-28	Henri Orland	Institut de Physique Théorique, CEA-Saclay, France 法国原子能机构	Professor 教　授	CSRC
821	2016-02-26	2016-02-29	Qing-Hu Chen 陈庆虎	Zhejiang University, China 浙江大学	Professor 教　授	SY Zhu
822	2016-02-24	2016-02-27	Wei-Qing Ren 任维清	National University of Singapore ,Singapore 新加坡国立大学	Associate Professor 副教授	CSRC
823	2016-02-18	2016-02-28	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
824	2016-02-16	2016-02-21	Guo-Hua Zhong 钟国华	Shenzhen Insititutes of Advanced Technology (CAS), China 中科院深圳先进技术研究员	Associate Researcher 副研究员	HQ Lin
825	2016-02-15	2016-02-21	Xiao-Jia Chen 陈晓嘉	Center for High Pressure Science & Technology Advanced Research, Shanghai, China 北京高压科学研究中心	Professor 教　授	HQ Lin
826	2016-02-14	2016-02-21	Yan-Ling Li 李延龄	Jiangsu Normal University, China 江苏师范大学	Professor 教　授	HQ Lin
827	2016-02-14	2016-02-14	Guang-Ming Zhang 张广铭	Tsinghua University, China 清华大学	Professor 教　授	HQ Lin
828	2016-02-01	2016-02-05	Siqi Shi 施思齐	Shanghai University 上海大学	Professor 教　授	SW Gao

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829	2016-02-01	2016-12-31	Junwei Luo 骆军委	Institute of Semiconductors, CAS, China 中国科学院半导体研究所	Professor 教 授	SH Wei
830	2016-01-31	2016-02-05	Xian-Gang Wan 万贤纲	Nanjing University, China 南京大学	Professor 教 授	HQ Lin
831	2016-01-29	2016-01-31	Xi-Wen Guan 管习文	Wuhan Institute of Physics and Mathematics(CAS), China 中科院武汉物理与数学研究所	Professor 教 授	HQ Lin
832	2016-01-26	2016-12-31	Ruzhi Wang 王如志	Beijing University of Technology 北京科技大学	Professor 教 授	Leo Lau &LM Liu
833	2016-01-20	2016-01-25	Jun Jing 景 俊	Jilin University 吉林大学	Professor 教 授	JQ You
834	2016-01-20	2016-01-31	Ling-Yi Meng 孟令一	Xiamen Univeristy, China 厦门大学	Research Associate 助理研究员	CY Yam
835	2016-01-20	2016-01-31	Xiaoli Wang 王晓丽	Linyi University, China 临沂大学	Professor 教 授	CSRC/HQ Lin
836	2016-01-18	2016-01-28	Jinhui Wu 吴金辉	Northeast Normal University, China 东北师范大学	Professor 教 授	CP Sun
837	2016-01-18	2016-01-22	Yan Chen 陈 焱	Fudan University, China 复旦大学	Professor 教 授	JQ YOU
838	2016-01-18	2016-02-03	Zhihai Wang 王治海	Northeast Normal University, China 东北师范大学	Lecturer 讲 师	Y Li
839	2016-01-17	2016-01-22	Can Huang 黄 灿	Xiamen Univeristy, China 厦门大学	Assistant Professor 助理教授	Martin Stynes

840	2016-01-15	2016-03-15	Ruo Li 李　若	Peking University, China 北京大学	Professor 教　授	JW Zhang
841	2016-01-15	2016-02-01	Yan-Ling Li 李延龄	Jiangsu Normal University, China 江苏师范大学	Professor 教　授	HQ Lin
842	2016-01-15	2016-03-01	Xiaofeng Yang 杨霄锋	University of South Carolina, USA 美国南卡罗莱纳大学	Associate Professor 副教授	LL Ju
843	2016-01-13	2015-01-20	Chao Zhang 张　超	Yantai University, China 烟台大学	Lecturer 讲　师	HQ Lin
844	2016-01-12	2016-02-04	Xiao-Yang Xu 许晓阳	Shanxi University of Techenology, China 陕西理工学院	Associate Professor 副教授	XL Deng
845	2016-01-11	2016-01-18	Ligang Wang 王立刚	Zhejiang University, China 浙江大学	Professor 教　授	SY Zhu
846	2016-01-07	2016-01-07	Si Wu 吴　思	Beijing Normal University, China 北京师范大学	Professor 教　授	CS Zhou
847	2016-01-06	2016-01-09	Hua-Zhong Tang 汤华中	Peking University, China 北京大学	Professor 教　授	JW Zhang
848	2016-01-06	2016-01-09	Yang Wang 汪　洋	Hong Kong University of Science and Technology, HK 香港科技大学	Professor 教　授	W Cai
849	2016-01-06	2016-01-09	Xiao-Ping Wang 王筱平	Hong Kong University of Science and Technology, HK 香港科技大学	Professor 教　授	Q Du
850	2016-01-06	2016-01-09	Xiang-Jun Xing 邢向军	Shanghai Jiao Tong University, China 上海交通大学	Professor 教　授	W Cai
851	2016-01-05	2016-01-19	Zhi-Jian Yang 杨志坚	Wuhan University, China 武汉大学	Professor 教　授	W Cai
852	2016-01-04	2016-01-08	Chun-Xiong Zheng 郑春雄	Tsinghua University, China 清华大学	Professor 教　授	JW Zhang
853	2016-01-03	2016-01-08	Sheng-Jun Wang 王圣军	Shannxi Normal University, China 陕西师范大学	Associate Professor 副教授	CS Zhou

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
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854	2016-01-02	2016-01-09	Chang-Song Zhou 周昌松	Hong Kong Baptist University, HK 香港浸会大学	Associate Professor 副教授	CSRC
855	2016-01-02	2016-02-02	Ming Li 李　明	China University Of Petroleum, China 中国石油大学	Associate Professor 副教授	CP Sun
856	2016-01-01	2016-12-31	Kai Liu 刘　凯	Renmin University of China, China 人民大学	Associate Professor 副教授	SW Gao
857	2016-01-01	2016-12-31	Xinzheng Li 李新征	Peking University 北京大学	Associate Professor 副教授	SW Gao
858	2015-12-30	2016-01-29	Suhail Zubairy	Texas A&M University, USA 美国德州农工大学	Professor 教　授	SY Zhu
859	2015-12-28	2015-12-28	Lei Xu 徐　磊	The Chinese University of Hong Kong 香港中文大学	Professor 教　授	XL Xu
860	2015-12-25	2015-12-28	Zi-Jing Lin 林子敬	The University of Science and Technology of China 中国科学技术大学	Professor 教　授	HQ Lin
861	2015-12-25	2016-03-25	Hua Tian 田　华	Taiyuan University of Technology 太原理工大学	Lecturer 讲　师	PF Guan
862	2015-12-24	2015-12-31	Jun-Yi Zhu 朱骏宜	The Chinese University of Hong Kong, HK 香港中文大学	Assistant Professor 助理教授	DB Zhang
863	2015-12-24	2015-12-29	Zhen Zhang 张　振	National University of Singapore, Singapore 新加坡国立大学	Associate Professor 副教授	JW Zhang
864	2015-12-24	2015-01-12	Javier Jcarrasco	CIC Energigune	Associate Researcher 副研究员	LM Liu
865	2015-12-23	2015-12-25	Cheng Wang 王　成	University of Massachusetts Dartmouth, USA 美国麻省大学达特茅斯分校	Associate Professor 副教授	LL Ju

866	2015-12-23	2015-12-31	Xu-Wen Wang 王旭文	East China Jiaotong University 华东交通大学	Lecturer 讲　师	Y Ding
867	2015-12-21	2015-12-27	Jing-fang Huang 黄京芳	University of North Carolina at Chapel Hill, USA 美国北卡罗来纳大学教堂山分校	Professor 教　授	W Cai
868	2015-12-21	2015-12-31	Ke Liang 梁　科	Nankai University, China 南开大学	Professor 教　授	Q Wang
869	2015-12-21	2015-12-25	Hui Zhang 张　辉	Beijing Normal University, China 北京师范大学	Professor 教　授	JW Zhang
870	2015-12-21	2015-12-24	Chuan-Ju Xu 许传炬	Xiamen University, China 厦门大学	Professor 教　授	JW Zhang
871	2015-12-21	2015-12-25	Ya-Na Di 邸亚娜	Academy of Mathematics and Systems Science, Chinese Academy of Sciences, China 中国科学院数学与系统科学研究院	Associate Professor 副教授	JW Zhang
872	2015-12-17	2016-01-12	Min Hyung Cho	University of Massachusetts Lowell, USA 美国马萨诸塞大学洛威尔分校	Assistant Professor 助理教授	W Cai
873	2015-12-16	2016-01-10	Hai-yan Jiang 姜海燕	Beijing Institute of Technology，China北京理工大学	Associate Professor 副教授	W Cai
874	2015-12-16	2016-01-10	Xia Ji 季　霞	Academy of Mathematics and Systems Science , CAS, China中国科学院数学与系统科学研究院	Associate Researcher 副研究员	W Cai
875	2015-12-16	2016-01-10	Hai-yan Jiang 姜海燕	Beijing Institute of Technology, China 北京理工大学	Associate Professor 副教授	W Cai
876	2015-12-14	2015-12-20	Bo Hellsing	University of Gothenburg, Sweden 哥德堡大学	Professor 教　授	SW Gao
877	2015-12-13	2015-12-19	Chang-Song Zhou 周昌松	Hong Kong Baptist University, HK 香港浸会大学	Associate Professor 副教授	CSRC
878	2015-12-12	2015-12-20	Zhi-Jian Yang 杨志坚	Wuhan University, China 武汉大学	Professor 教　授	W Cai
879	2015-12-12	2016-01-01	Jie Li 李　杰	University of Cambridge, UK 英国剑桥大学	Lecturer 讲　师	LS Luo

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
880	2015-12-12	2015-12-17	Hongwei Li 李宏伟	Shandong Normal University, China 山东师范大学	Associate Professor 副教授	JW Zhang
881	2015-12-10	2015-12-30	Li-Li Ju 鞠立力	University of South Carolina, USA 美国南卡罗莱纳大学	Professor 教　授	CSRC
882	2015-12-08	2015-12-17	Jiantao Wang 王建涛	The Institute of Physics, Chinese Academy of Sciences, China 中科院物理所	Professor 教　授	SW Gao
883	2015-12-08	2015-12-11	Mogens Høgh Jensen	University of Copenhagen, Denmark 丹麦哥本哈根大学	Professor 教　授	LH Tang
884	2015-12-07	2015-12-09	Boris I. Yakobson	Rice University, USA 美国莱斯大学	Professor 教　授	DB Zhang
885	2015-12-07	2015-12-13	Jason Twamley	Macquarie University, Australia 澳大利亚麦考瑞大学	Professor 教　授	Stefano Chesi
886	2015-12-06	2016-01-10	Wei-Qing Ren 任维清	National University of Singapore ,Singapore 新加坡国立大学	Associate Professor 副教授	CSRC
887	2015-12-06	2015-12-08	Chang-Song Zhou 周昌松	Hong Kong Baptist University, HK 香港浸会大学	Associate Professor 副教授	CSRC
888	2015-12-05	2016-01-05	Wei-zhu Bao 包维柱	National University of Singapore, Singapore 新加坡国立大学	Professor 教　授	CSRC
889	2015-12-02	2015-12-05	He-Peng Zhang 张何朋	Shanghai Jiao Tong University, China 上海交通大学	Associate Professor 副教授	XL Xu
890	2015-12-02	2015-12-11	Xia-Qing Shi 施夏清	Soochow University, China 苏州大学	Associate Professor 副教授	LH Tang

891	2015-12-01	2016-01-10	Lei Zhang 张　磊	Peking University, China 北京大学	Researcher 研究员	Q Du
892	2015-12-01	2015-12-17	Chate Hugues	Institut de Physique Théorique, CEA-Saclay, France 法国原子能机构	Professor 教　授	CSRC
893	2015-12-01	2015-12-10	Xiang-Rong Wang	The Hong Kong University of Science & Technology, HK 香港科技大学	Professor 教　授	LH Tang
894	2015-12-01	2015-12-31	Xinzheng Li 李新征	Peking University 北京大学	Associate Professor 副教授	SW Gao
895	2015-12-01	2016-01-10	Lei Zhang 张　磊	Peking University, China 北京大学	Researcher 研究员	Q Du
896	2015-11-28	2015-12-13	Xiang-Yao Wu 吴向尧	Jilin Normal Univerity, China 吉林师范大学	Professor 教　授	HQ Lin
897	2015-11-28	2015-12-13	Yun-Tuan Fang 方云团	Jiangsu University, China 江苏大学	Professor 教　授	HQ Lin
898	2015-11-28	2015-12-31	Hong-Gang Luo 罗洪刚	Lanzhou University, China 兰州大学	Professor 教　授	HQ Lin
899	2015-11-25	2015-11-29	Xiu-Feng Lang 郎秀峰	Hebei Normal University of Science & Technology 河北科技师范学院	Lecturer 讲　师	WM Lau&LM Liu
900	2015-11-25	2015-11-30	Jun Jing 景　俊	Jilin University 吉林大学	Professor 教　授	JQ You
901	2015-11-24	2015-12-02	Ting Yu 于　挺	Stevens Institute of Technology, USA 美国史蒂文斯理工学院	Professor 教　授	CSRC
902	2015-11-23	2015-12-31	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
903	2015-11-22	2015-11-25	Xiao-Guang Wang 王晓光	ZheJiang University 浙江大学	Professor 教　授	CP Sun
904	2015-11-18	2015-12-01	Yan-Hui Liu 柳延辉	Yale University, USA 美国耶鲁大学	Lecturer 讲　师	PF Guan

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
905	2015-11-18	2015-12-31	Kai Liu 刘　凯	Renmin University of China, China 人民大学	Associate Professor 副教授	SW Gao
906	2015-11-17	2015-11-23	Li-Gang Wang 王立刚	Zhejiang University, China 浙江大学	Professor 教　授	TX Ma
907	2015-11-16	2016-08-31	Huixiong Deng 邓惠雄	Institute of Semiconductors, CAS, China 中国科学院半导体研究所	Associate Researcher 副研究员	SH Wei
908	2015-11-16	2015-11-20	ChaoYang 杨　超	Lawrence Berkeley National Laboratory, USA 美国劳伦斯伯克利国家实验室	Senior Scientist 资深科学家	W Cai
909	2015-11-16	2015-11-23	Huai-Ming Guo 郭怀明	Beihang University, China 北京航空航天大学	Associate Professor 副教授	TX Ma
910	2015-11-16	2015-11-27	Da-Yong Liu 刘大勇	The Institute of Solid State Physics, CAS, China 中科院固体物理所	Associate Professor 副教授	HQ Lin
911	2015-11-16	2015-11-20	Gang Chen 陈　钢	Fudan University, China 复旦大学	Professor 教　授	CSRC/HQ Lin
912	2015-11-16	2016-08-31	Huixiong Deng 邓惠雄	The Institute of Semiconductorsthe, CAS, China 中国科学院半导体研究所	Associate Researcher 副研究员	SH Wei
913	2015-11-15	2015-11-27	Wenxian Zhang 张文献	Wuhan University, China 武汉大学	Professor 教　授	JQ You
914	2015-11-13	2015-11-20	Frauenheim Thomas	University of Bremen, Germany 德国不来梅大学	Professor 教　授	CY Yam
915	2015-11-13	2015-11-23	Tian-Xing Ma 马天星	Beijing Normal University, China 北京师范大学	Associate Professor 副教授	CSRC
916	2015-11-12	2015-11-30	Liang-Jian Zou 邹良剑	The Institute of Solid State Physics, CAS, China 中科院固体物理所	Researcher 研究员	HQ Lin

917	2015-11-12	2015-11-20	Hao Fu 付　号	Wuhan Institute of Physics and Mathematics, CAS, China 中国科学院武汉物理与数学研究所	Associate Researcher 副研究员	Y Li
918	2015-11-10	2015-11-10	Jun Hu 胡　俊	Peking University, China 北京大学	Professor 教　授	Martin Stynes
919	2015-11-09	2015-11-13	Wei Gong 龚　伟	Academy of Mathematics and Systems Science, CAS, China 中国科学院数学与系统科学研究院	Assistant Professor 助理教授	JW Zhang
920	2015-11-09	2015-11-15	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin
921	2015-11-08	2015-12-12	Lin Tian 田　琳	University of California-Merced, USA 美国加州大学默塞德分校	Associate Professor 副教授	JQ You
922	2015-11-04	2015-11-05	Weihua Deng 邓伟华	Lanzhou University, China 兰州大学	Professor 教　授	Martin Stynes
923	2015-11-02	2015-11-06	Gotthard Seifert	Dresden University of Technology, Germany 德国德累斯顿工业大学	Professor 教　授	DB Zhang
924	2015-11-02	2015-11-03	Jimin Zhao 赵继民	The Institute of Physics, Chinese Academy of Sciences, China 中科院物理所	Researcher 研究员	SW Gao
925	2015-11-01	2015-11-14	William McLean	University of New South Wales, Australia 澳大利亚新南威尔士大学	Associate Professor 副教授	Martin Stynes
926	2015-10-30	2015-11-02	David Paul Landau	University of Georgia, USA 美国乔治亚大学	Professor 教　授	CSRC/HQ Lin
927	2015-10-29	2015-12-31	Jun Luo 罗　俊	Tianjin University of Technology, China 天津理工大学	Professor 教　授	WM Lau&LM Liu
928	2015-10-29	2015-12-31	Shangyi Ma 马尚义	Institute of Metal Research Chinese Academy of Sciences, China 中国科学院金属研究所	Associate Researcher 副研究员	WM Lau&LM Liu
929	2015-10-27	2015-10-31	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin

CSRC VISITING SCHOLARS (2015.08-2016.07)

NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
930	2015-10-26	2015-12-25	Ming-Wen Zhao 赵明文	Shandong University, China 山东大学	Professor 教 授	WM Lau&LM Liu
931	2015-10-23	2015-11-28	Chang-Song Zhou 周昌松	Hong Kong Baptist University 香港浸会大学	Associate Professor 副教授	CSRC
932	2015-10-22	2015-12-31	Xiaoqiang An 安晓强	Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, China 中国科学院生态环境研究中心	Researcher 研究员	LM Liu
933	2015-10-20	2015-10-30	Torsten Linss	University of Hagen, Germany 德国哈根大学	Professor 教 授	Martin Stynes
934	2015-10-19	2016-01-31	Bing Chen 陈 兵	Shandong University of Science and Technology, China 山东科技大学	Associate Professor 副教授	Y Li
935	2015-10-19	2015-11-18	Hong Liu 刘 红	Institute of Earthquake Science China Earthquake Administration, China 中国地震局地震预测研究所	Associate Researcher 副研究员	JJ Zhao
936	2015-10-19	2016-01-31	Bing Chen 陈 兵	Shandong University of Science and Technology, China 山东科技大学	Associate Professor 副教授	Y Li
937	2015-10-19	2015-10-31	Xinyou Lv 吕新友	huazhong university of science and technology, China 华中科技大学	Associate Professor 副教授	JQ You
938	2015-10-19	2016-07-31	Yun-An Yan 严运安	Guizhou Normal College, China 贵州师范学院	Professor 教 授	CSRC
939	2015-10-18	2015-10-25	Hasan DeMirci	Stanford Linear Accelerator Center, USA 美国斯坦福线性加速器中心国家实验室	Professor 教 授	HG Liu
940	2015-10-18	2015-10-21	Chin-Kun Hu 胡进锟	Institute of Physics of Academia Sinica, Taiwan 台湾中央研究院物理所	Researcher 研究员	HQ Lin
941	2015-10-17	2015-10-22	Cai-Zhuang Wang 王才壮	Ames Laboratory, Iowa State University, USA 美国爱荷华州立大学	Professor 教 授	HQ Lin

942	2015-10-14	2015-10-17	Jun Jing 景　俊	Jilin University 吉林大学	Professor 教　授	JQ You
943	2015-10-13	2015-12-06	S. Gurvitz	Weizmann Institute of Science, Israel 以色列魏兹曼研究所	Professor 教　授	JQ You
944	2015-10-11	2015-10-15	Hao Fu 付　号	Wuhan Institute of Physics and Mathematics, CAS, China 中国科学院武汉物理与数学研究所	Associate Researcher 副研究员	Y Li
945	2015-10-10	2015-10-12	Hang Zheng 郑　杭	Shanghai Jiaotong University, China 上海交通大学	Professor 教　授	SY Zhu
946	2015-10-04	2015-10-17	Xuedong Hu 胡学东	University of Buffalo, SUNY, USA 美国纽约州立大学布法罗分校	Professor 教　授	JQ You
947	2015-09-28	2015-12-25	Hua Tian 田　华	Taiyuan University of Technology 太原理工大学	Lecturer 讲　师	JJ Zhao
948	2015-09-28	2015-09-30	Youjin Deng 邓友金	University of Science and Technology of China 中国科学技术大学	Professor 教　授	CSRC/HQ Lin
949	2015-09-27	2015-10-03	Xiu-Feng Lang 郎秀峰	Hebei Normal University of Science & Technology, China 河北科技师范学院	Lecturer 讲　师	WM Lau&LM Liu
950	2015-09-24	2015-09-30	Edward S. Fry	Texas A &M University, USA 美国德克萨斯国际农工大学	Professor 教　授	SY Zhu
951	2015-09-24	2015-09-25	Jin Zhang 张　进	Shandong Normal University, China 山东师范大学	Assistant Professor 助理教授	Martin Stynes
952	2015-09-21	2015-09-25	Liang-Jian Zou 邹良剑	The Institute of Solid State Physics, CAS, China 中科院固体物理所	Professor 教　授	HQ Lin
953	2015-09-19	2015-09-26	Gang Lu 吕　刚	California State University Northridge, USA 美国加州州立大学北岭分校	Professor 教　授	CSRC/HQ Lin
954	2015-09-17	2015-09-17	Tao Zhang 张　涛	Institute of Physics, CAS, China 中国科学院物理研究所	Associate Researcher 副研究员	HG Liu
955	2015-09-16	2015-10-16	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教　授	HQ Lin

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
956	2015-09-15	2015-10-10	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教 授	CSRC
957	2015-09-14	2015-10-14	Jianfu Li 李建福	Linyi University, China 临沂大学	Associate Professor 副教授	RQ Zhang
958	2015-09-03	2015-10-31	Hui Jing 景 辉	Henan Normal University, China 河南师范大学	Professor 教 授	CP Sun
959	2015-09-01	2015-11-30	Jian-Guo Wang 王建国	Anhui University of Technology 安徽工业大学	Associate Professor 副教授	PF Guan
960	2015-08-31	2015-09-04	Zhongyi Huang 黄忠亿	Tsinghua University, China 清华大学	Professor 教 授	JW Zhang
961	2015-08-27	2015-11-01	Henrik Johannesson	University of Gothenburg, Sweden 瑞典哥德堡大学	Professor 教 授	CSRC
962	2015-08-26	2015-08-30	Wei Yang 杨 威	Florida State University, USA 美国佛罗里达州立大学	Professor 教 授	YB Shan
963	2015-08-26	2015-09-02	Xiaoyu Liu 刘玉孝	Lanzhong University, China 兰州大学	Professor 教 授	CP Sun
964	2015-08-26	2015-08-29	Hang Zheng 郑 杭	Shanghai Jiaotong University, China 上海交通大学	Professor 教 授	SY Zhu
965	2015-08-24	2015-08-30	Huai-Zhi Wu 吴怀志	Fuzhou University, China 福州大学	Associate Professor 副教授	Y Li
966	2015-08-20	2015-10-28	Abdelaziz Mohamed	Al-Azhar University, Egypt 埃及爱资哈尔大学	Lecturer 讲 师	RQ Zhang
967	2015-08-19	2015-08-27	Mi Pang 庞 蜜	Xi'an University of Technology 西安理工大学	Lecturer 讲 师	Wen Yang

968	2015-08-19	2015-08-27	Yaoi Ma 马　遥	Xi'an University of Technology 西安理工大学	Lecturer 讲　师	Wen Yang
969	2015-08-15	2015-08-18	Feng-Quan Chuang 莊豐權	National Sun Yat-Sen University 台湾国立中山大学	Professor 教　授	CP Chou
970	2015-08-15	2015-08-18	Wan-Sheng Su 蘇萬生	The National Center for High-performance Computing, Taiwan 台湾国立高性能计算中心	Associate Research Fellow	CP Chou
971	2015-08-15	2015-08-31	Wei-Feng Tsai 蔡維楓	National Sun Yat-Sen University 台湾国立中山大学	Assistant Professor 助理教授	CP Chou
972	2015-08-15	2015-09-10	Guangri Jin 金光日	Beijing Jiaotong University, China 北京交通大学	Professor 教　授	CP Sun
973	2015-08-15	2015-08-25	Lan Zhou 周　兰	Hunan Normal University, China 湖南师范大学	Professor 教　授	CP Sun
974	2015-08-15	2015-08-19	Gunar Matthies	Technische Universität Dresden, Germany 德国德累斯顿工业大学	Professor 教　授	Martin Stynes
975	2015-08-15	2015-08-19	Francisco Gaspar	Universidad de Zaragoza, Spain 西班牙萨拉戈萨大学	Associate Professor 副教授	Martin Stynes
976	2015-08-15	2015-08-19	Carmen Rodrigo	Universidad de Zaragoza, Spain 西班牙萨拉戈萨大学	Assistant Professor 助理教授	Martin Stynes
977	2015-08-15	2015-08-20	Xuewu Zhang 张学武	University of Texas Southwest Medical Center, USA 美国德克萨斯大学西南医学中心	Associate Professor 副教授	YB Shan
978	2015-08-15	2015-09-09	Can Huang 黄　灿	Xiamen Univeristy 厦门大学	Assistant Professor 助理教授	Martin Stynes
979	2015-08-14	2015-08-29	Zhi-Rui Gong 龚志瑞	Shenzhen University, China 深圳大学	Assistant Professor 助理教授	N Zhao
980	2015-08-14	2015-08-25	Wen-Zhi Jia 贾文志	Xinan Jiaotong University, China 西南交通大学	Associate Professor 副教授	Y Li
981	2015-08-13	2015-08-21	Zhi-Gang Wang 王志刚	Jilin University 吉林大学	Professor 教　授	RQ Zhang

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
982	2015-08-13	2015-08-19	Max Gunzburger	Florida State University, USA 美国弗罗里达州立大学	Professor 教 授	Q Du
983	2015-08-12	2015-08-12	Zhao-jun Bai 柏兆俊	University of California, USA 美国加利福尼亚大学	Professor 教 授	W Cai
984	2015-08-11	2015-08-12	Xin-guo Ren 任新国	University of Science and Technology of China, China 中国科技大学	Professor 教 授	W Cai
985	2015-08-10	2015-08-22	Xinyou Lu 吕新友	huazhong university of science and technology, China 华中科技大学	Associate Professor 副教授	Stefano Chesi
986	2015-08-10	2015-08-28	Xiu-Feng Lang 郎秀峰	Hebei Normal University of Science & Technology 河北科技师范学院	Lecturer 讲 师	WM Lau&LM Liu
987	2015-08-10	2015-08-14	Chang-Qin Wu 吴长勤	Fudan University, China 复旦大学	Professor 教 授	HQ Lin
988	2015-08-10	2015-08-31	Song-Lin Wu 武松林	Dalian Nationalities University, China 大连民族大学	Lecturer 讲 师	Wen Yang
989	2015-08-09	2015-09-04	Xu Yang 杨 旭	University of California, USA 美国加利福尼亚大学	Assistant Professor 助理教授	JW Zhang
990	2015-08-09	2015-08-16	Peng-Bin Niu 牛鹏斌	Datong University, China 大同大学	Lecturer 讲 师	HG Luo
991	2015-08-09	2015-08-17	Yang-Yao Niu 牛仰尧	Tamkang University 台湾淡江大学	Professor 教 授	XL Deng
992	2015-08-09	2015-08-16	Xiao-Ping Zhang 张晓平	Wuhan University, China 武汉大学	Associate Professor 副教授	LL Ju
993	2015-08-08	2015-08-14	Leon Cohen	City University of New York, USA 美国纽约城市大学	Professor 教 授	SY Zhu

994	2015-08-08	2015-08-22	Chih-Hao Chang 张智豪	Theofanous Co. Inc. USA 美国Theofanous有限公司	Senior Researcher 资深研究员	XL Deng
995	2015-08-07	2015-08-26	Hui Zhang 张　会	Shenyang University 沈阳大学	Lecturer 讲　师	WM Lau&LM Liu
996	2015-08-07	2015-08-27	Xin-feng Liu 刘新峰	University of South Carolina, USA 美国南卡罗来纳大学	Associate Professor 副教授	Q Wang
997	2015-08-07	2015-08-13	De-Kang Mao 茅德康	Shanghai Univeristy, China 上海大学	Professor 教　授	XL Deng
998	2015-08-06	2015-08-06	Xiaofeng Yang 杨霄锋	University of South Carolina, USA 美国南卡罗来纳州立大学	Associate Professor 副教授	Q Wang
999	2015-08-06	2015-09-04	Xu Yang 杨　旭	University of California, USA 美国加利福尼亚大学	Assistant Professor 助理教授	JW Zhang
1000	2015-08-04	2015-08-18	Jun Chang 昌　峻	Shaanxi Normal University, China 陕西师范大学	Professor 教　授	HG Luo
1001	2015-08-04	2015-08-04	Zong-Ze Lv 吕宗泽	Sun Yat-sen University Kaohsiung, Taiwan 台湾高雄中山大学	Professor 教　授	ZM Zhang
1002	2015-08-03	2015-08-23	Chao Zhang 张　超	Yantai University, China 烟台大学	Lecturer 讲　师	HQ Lin
1003	2015-08-03	2015-08-22	Guillermo Romero	University of Santiago of Chile, Chile 智利圣地亚哥大学	Assistant Professor 助理教授	JQ You
1004	2015-08-03	2015-08-03	Wen-zai Wen 文再文	Peking University, China 北京大学	Associate Professor 副教授	W Cai
1005	2015-08-02	2015-08-31	Hong-Gang Luo 罗洪刚	Lanzhou University, China 兰州大学	Professor 教　授	HQ Lin
1006	2015-08-01	2015-08-08	Yanlai Chen 陈炎来	Univesrity of Massachusetts at Dartmouth, USA 美国麻省大学达特莫斯	Assistant Professor 助理教授	ZM Zhang
1007	2015-08-01	2015-08-31	Hongtao Chen 陈竑焘	Xiamen Univeristy, China 厦门大学	Assistant Professor 助理教授	ZM Zhang

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NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
1008	2015-07-31	2015-08-31	Zhi-Guo Wang 王治国	Tongji University, China 同济大学	Professor 教 授	HQ Lin
1009	2015-07-27	2015-08-24	Jun Jing 景 俊	Jilin University 吉林大学	Professor 教 授	JQ You
1010	2015-07-25	2015-08-15	Ru-hai Zhou 周如海	Old Dominion University, USA 美国奥多明尼昂大学	Associate Professor 副教授	Q Wang
1011	2015-07-23	2015-08-09	Wei-qing Ren 任维清	National University of Singapore, Singapore 新加坡国立大学	Associate Professor 副教授	CSRC
1012	2015-07-20	2015-08-20	Xiao-Feng Li 李晓凤	Luoyang Normal University, China 洛阳师范学院	Associate Professor 副教授	ZY Hu
1013	2015-07-20	2015-08-30	Rui-Qin Zhang 张瑞勤	City University of Hong Kong 香港城市大学	Professor 客座教授	CSRC
1014	2015-07-20	2015-08-31	Zhong-Bing Huang 黄忠兵	Hubei University, China 湖北大学	Professor 教 授	HQ Lin
1015	2015-07-20	2015-08-09	Zhu Wang 王 柱	University of South Carolina, USA 美国南卡罗来纳州立大学	Assistant Professor 助理教授	LL Ju
1016	2015-07-20	2015-08-31	Ran Zhang 张 然	Jilin University, China 吉林大学	Professor 教 授	ZM Zhang
1017	2015-07-19	2015-08-18	Pierre Lallemand	Université of Paris-Sud, France 法国巴黎南大学	Professor 教 授	LS Luo
1018	2015-07-19	2015-08-02	Paul Dellar	University of Oxford, UK 英国牛津大学	Professor 教 授	LS Luo
1019	2015-07-16	2015-08-24	Yan-Chao Li 李彦超	University of Chinese Academy of Sciences, China 中国科学院大学	Lecturer 讲 师	HQ Lin

1020	2015-07-16	2015-08-24	Tian-Xing Ma 马天星	Beijing Normal University, China 北京师范大学	Associate Professor 副教授	HQ Lin
1021	2015-07-16	2015-08-17	Min Hyung Cho	Dartmouth College, USA 美国达特茅斯学院	Assistant Professor 助理教授	W Cai
1022	2015-07-15	2015-08-15	Maojun Li 李茂军	Chongqing University 重庆大学	Lecturer 讲　师	XL Deng
1023	2015-07-14	2015-09-30	Yuehang Lan 兰岳恒	Tsinghua University, China 清华大学	Associate Professor 副教授	CP Sun
1024	2015-07-13	2015-08-12	Feiran Zhang 张斐然	Shangqiu Normal University, China 商丘师范学院	Professor 教　授	JW Zhang
1025	2015-07-13	2015-08-12	Jincheng Ren 任金城	Southeast University, China 东南大学	Associate Professor 副教授	JW Zhang
1026	2015-07-13	2015-08-12	Xiaoming He 何晓明	Missouri University of Science & Technology, USA 美国密苏里大学理工学院	Associate Professor 副教授	J Ming
1027	2015-07-13	2015-08-13	Fan Yang 杨　帆	Beijing Institute of Technology, China 北京理工大学	Professor 教　授	HQ Lin
1028	2015-07-12	2015-08-26	Yu-Zhong Zhang 张宇钟	Tongji University, China 同济大学	Professor 教　授	HQ Lin
1029	2015-07-12	2015-08-05	MaoSheng Miao 苗茂生	California State University,Northridge 加州州立大学北岭分校	Professor 客座教授	CSRC
1030	2015-07-11	2015-08-15	Lili Ju 鞠立力	University of South Carolina, USA 美国南卡罗来纳大学	Professor 教　授	CSRC
1031	2015-07-10	2015-08-25	Yan-Ling Li 李延龄	Jiangsu Normal University, China 江苏师范大学	Professor 教　授	CSRC/HQ Lin
1032	2015-07-10	2015-12-31	Liwei Xu 徐立伟	Chongqing University, China 重庆大学	Professor 教　授	JW Zhang
1033	2015-07-09	2015-08-19	Zhongming Wang 王忠明	Florida International University, USA 美国佛罗里达国际大学	Associate Professor 副教授	J Ming

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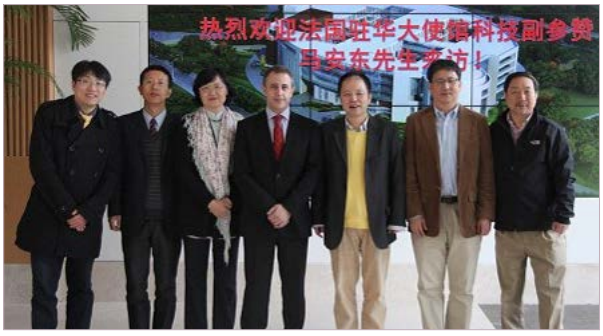
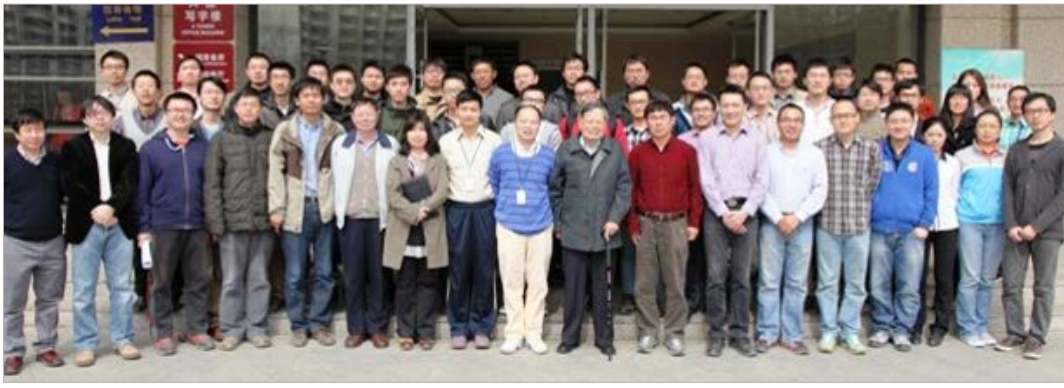
NO.	VISITING PERIOD		NAME 姓名	INSTITUTE 机构	POSITION 职称	HOST
	Start	End				
1034	2015-07-09	2015-08-31	Dongsheng Geng 耿东生	Institute of Materials Research and Engineering 新加坡科技研究局材料与工程研究院	Researcher 研究员	Leo Lau/LM Liu
1035	2015-07-06	2015-09-01	Xiao-Sen Yang 杨孝森	Jiangsu University, China 江苏大学	Lecturer 讲　师	HQ Lin
1036	2015-07-06	2015-07-08	Changshui Yu 于长水	Dalian University of Technology, China 大连理工大学	Professor 教　授	CP Sun
1037	2015-07-05	2015-08-07	Pedro Sacramento	Technical University of Lisbon, Portugal 葡萄牙里斯本技术大学	Professor 教　授	CSRC
1038	2015-07-05	2015-08-05	Eduardo Castro	Technical University of Lisbon, Portugal 葡萄牙里斯本技术大学	Professor 教　授	CSRC
1039	2015-07-04	2015-08-04	Jose Carmelo	University of Minho, Portugal 葡萄牙米尼奥大学	Professor 教　授	CSRC
1040	2015-07-03	2015-08-17	Yaohang Li 黎耀航	Old Dominion University, USA 美国欧道明大学	Associate Professor 副教授	LS Luo
1041	2015-07-01	2015-08-31	Quan Li 李　全	Jilin University 吉林大学	Associate Professor 副教授	YM Ma
1042	2015-07-01	2015-08-31	Cheng Lu 卢　成	Nanyang Normal University 南阳师范学院	Associate Professor 副教授	YM Ma
1043	2015-07-01	2015-08-11	Yanming Ma 马琰铭	Jilin University 吉林大学	Professor 教　授	CSRC
1044	2015-06-30	2015-08-31	San-Huang Ke 柯三黄	Tongji University, China 同济大学	Professor 教　授	HQ Lin
1045	2015-06-30	2015-08-23	Shidong Jiang 蒋世东	New Jersey Institute of Technology, USA 美国新泽西理工学院	Professor 教　授	LS Luo

1046	2015-06-12	2015-08-20	Baruch Rosenstein	National Chiao Tung University, Taiwan 台湾国立交通大学	Professor 教　授	HQ Lin
1047	2015-06-12	2015-08-13	Zhengyuan Luo 罗征援	National Aeronautics and Space Administration, USA 美国宇航局格伦研究中心	Professor 教　授	LS Luo
1048	2015-06-12	2015-08-16	Weizhu Bao 包维柱	National University of Singapore, Singapore 新加坡新加坡国立大学	Professor 教　授	CSRC
1049	2015-06-02	2015-08-10	Peihong Zhang 张培鸿	University of Buffalo,SUNY, USA 美国纽约州立大学布法罗分校	Associate Professor 副教授	CSRC
1050	2015-06-02	2015-08-31	Zhi-Jian Yang 杨志坚	Wuhan University, China 武汉大学	Professor 教　授	CSRC/HQ Lin
1051	2015-06-01	2015-09-30	Xiaoyang Xu 许晓阳	Shanxi University, China 陕西理工学院	Lecturer 讲　师	XL Deng
1052	2015-05-20	2015-08-20	Xu Zhang 张　旭	Purdue University, USA 美国普渡大学	Professor 教　授	ZM Zhang
1053	2015-05-13	2015-08-31	Jian Zhang 张　鉴	Computer Network Information Center, CAS, China 中科院计算机网络信息中心	Assistant Professor 助理教授	Q Du
1054	2015-05-11	2015-08-31	Lei Zhang 张　磊	Peking University 北京大学	Researcher 研究员	Q Du
1055	2015-05-10	2015-08-18	Yongyong Cai 蔡勇勇	Purdue University, USA 美国普渡大学	Assistant Professor 助理教授	CSRC
1056	2015-05-04	2015-12-31	Qiong-Yi He 何琼毅	Peking University, China 北京大学	Researcher 研究员	CP Sun
1057	2015-04-01	2015-08-31	Kai Chang 常　凯	Insititute of Semiconductors, CAS, China 中科院半导体所	Researcher 研究员	HQ Lin
1058	2015-04-01	2015-08-31	Wen-Kai Lou 娄文凯	Insititute of Semiconductors, CAS, China 中科院半导体所	Assistant Researcher 助理研究员	K Chang
1059	2015-04-01	2015-08-31	Dong Zhang 张　东	Insititute of Semiconductors, CAS, China 中科院半导体所	Assistant Researcher 助理研究员	K Chang





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