

Monsoon behavior balanced by glaciers

With the support from the National Natural Science Foundation of China, Prof. An Zhisheng and his colleagues at the State Key Laboratory of Loess and Quaternary Geology, Institute of Earth Environment in Xi'an, China have analyzed ancient sediments from a lakebed in southwestern China in order to build a 2.6 million year-long record of ISM variability. An article in August 5, 2011 issue of *Science* reported their research findings.

According to the report, the Indian Summer Monsoon, or ISM, is an annual climate cycle that influences the seasonal rainfall in South Asia and has major implications for human well-being. Though its modern behavior is well-documented, researchers have wondered how the ISM has varied over long, glacial-interglacial time scales.

Whereas previously, researchers speculated that the ISM has only strengthened during warm periods, when the ice sheets in the Earth's southern hemisphere melted, it is now clear that the ISM has always depended on the size of the ice sheets in both hemispheres at the same time. The researchers' findings show that the ISM reached its weakest point, and even began to strengthen again, before global volumes of glacial ice had reached a maximum. These results highlight the important role of both hemispheres in governing the relationship between the ISM and glacial cycles, they say. A Perspective by Liu Zhengyu explains the study in more detail.

The title of the paper published in *Science* was "Glacial-Interglacial Indian Summer Monsoon Dynamics," and coauthored by An. Zhisheng; X. Qiang; Z. Jin; Y. Sun; H. Xu; Y. Cai; W. Zhou; X. Liu; W. Liu; Z. Shi; L. Yan; H. Chang; F. Wu; L. Ai; F. Lu at; A. Zhisheng; X. Qiang; Z. Jin; Y. Sun; H. Xu; Y. Cai; W. Zhou; X. Liu; W. Liu; Z. Shi; L. Yan; H. Chang; F. Wu; L. Ai; F. Lu at Chinese Academy of Sciences in Xi'an, China; A. Zhisheng; W. Zhou at Xi'an Jiaotong University in Xi'an, China; S.C. Clemens; W.L. Prell at Brown University in Providence, RI; J. Shen; S. Wang; X. Xiao at Chinese Academy of Sciences in Nanjing, China; J. Luo at Japan Agency for Marine-Earth Science and Technology in Kanagawa, Japan.

Research Discovers Frequent Mutations of Chromatin

With the support of National Natural Science Foundation of China, BGI, the largest genomics organization in the world, and Peking University Shenzhen Hospital, published online in *Nature Genetics* that the study on frequent mutations of chromatin remodeling genes in transitional cell carcinoma (TCC) of the bladder on August 8th, 2011. Their study provides a valuable genetic basis for future studies on TCC, suggesting that aberration of chromatin regulation might be one of the features of bladder cancer.

According to the article in *Nature Genetics*, bladder cancer is the ninth most common type of cancer worldwide, which affects three times as many men as women. Almost all bladder cancers originate in the urothelium, so they are also known as one of the most common tumors of the genitourinary tract. Each year, about 360,000 new cases of bladder cancer are expected, and about 150,000 people will die of this disease in the world. In North America, South America, Europe, and Asia, TCC is the most common type of bladder cancer diagnosed, accounting for 90% of all bladder malignancies in those regions.

"Considering the high risks of TCC and the lack of comprehensive analysis, we and our partners initiated this project to identify other previously unidentified genes associated with the bladder cancer." said Professor Cai Zhiming, President of Shenzhen Second People's Hospital and the former President of Peking University Shenzhen Hospital. "I hope our unexpected discoveries in this study can provide more important insights into potential diagnoses and the therapeutic applications." he added.

In this study, the exomes of nine patients with TCC were sequenced with BGI's exome sequencing platform. Then, all the somatically mutated genes were screened in a prevalence set of 88 additional patients with TCC at different tumor stages and grades. "After the detections and statistical analysis, we discovered 49 new significantly mutated genes associated with TCC, and these genes are previously unknown to be mutated in TCC." said Professor Gui Yaoting, the co-leading author of the study and Vice-Director of the Institute of Urology at Peking University Shenzhen Hospital, "Another interesting finding is that eight genes among them are associated with chromatin remodeling, which could be related with frequent mutations in the majority of TCCs."

"We identified the genetic aberrations of the chromatin remodeling genes in 59% of the 97 individuals with TCC, and discovered one gene, UTX, could be altered substantially more frequently in tumors with low stages and grades." said Guo Guangwu, one of the co-leading authors of the study and PI of this project at BGI. "This study indicates UTX may pose a potential role in the classification and diagnosis of bladder cancer."

As we all know, aberrations of the chromatin remodeling genes may directly lead to the misregulation of multiple downstream effector genes, consequently promoting the tumor genesis process. "In our study, the newly discovered genetic mutations in the chromatin remodeling genes, except for UTX, are previous unknown in the primary tumors of TCC." said professor Cai. "Our results demonstrate that the disruption of the chromatin remodeling machinery may be one of the main mechanisms that lead to TCC."

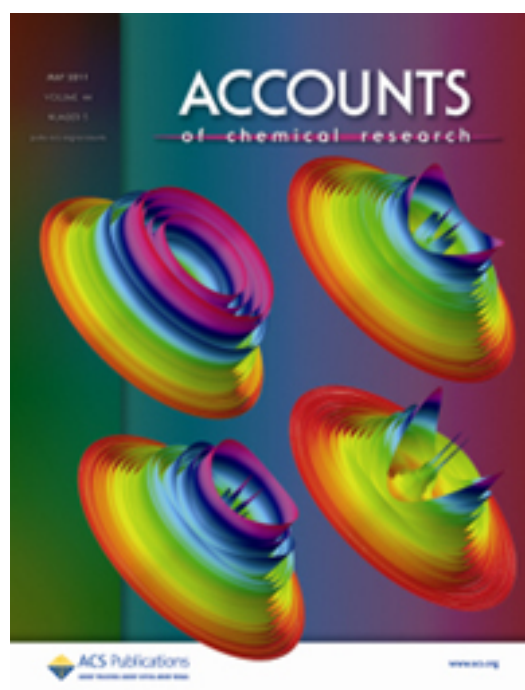
Professor Wang Jun, Executive Director of BGI, said, "This study provides further understanding of bladder cancer and other human cancers through the comprehensive analysis of genetic alterations in TCC. It also implicates the necessity to enhance the epigenomics research in the field of cancer studies in the future. "

Significant Progress in Water Photochemistry Research

The experimental group led by Dr. Yang Xueming, supported by the National Science Foundation of China, conducted its investigation on the photochemistry of water in the gas phase at the full quantum state resolved level, by using of the high resolution H-atom Rydberg tagging technique, in combination with a tunable vacuum ultraviolet (VUV) light source indigenously developed in Dr. Yang's laboratory. In collaborations with Prof. Richard Dixon, a fellow of Royal Society in UK, at the University of Bristol, they have made significant progress in the study of water photochemistry in the entire VUV region. Recently, Yang Xueming, Yuan Kaijun and Richard Dixon were invited to write a comprehensive review on the topic of water photochemistry for the *Accounts of Chemical Research*. The review paper has been just published by the *Accounts of Chemical Research* as a cover article (Acc. Chem. Res. 44, 369(2011)).

Water molecule is one of the most important molecules in the Universe. Photochemistry of the water molecule plays a crucial role in atmospheric chemistry, combustion process and interstellar chemistry. It is a benchmark system for experimental and theoretical studies of unimolecular reactions.

In the last ten years or so, the group led by Yang Xueming and collaborators have made considerable advances in the study of the photochemistry of water and its isotopologues. They have published 19 papers all together, including a paper in *Science*. These studies have helped us greatly in our understanding of the characteristics of the excited states, and dissociation mechanisms of water. The results of these works also provide an important knowledge for modeling the role of water molecule in the atmospheric chemistry, as well as in the combustion chemistry and the interstellar chemistry.



Structural signature in amorphous alloy formation and plastic deformation

Supported by the Key Project and the Fund for Creative Research Groups of the National Natural Science Foundation of China, Prof. Wang Weihua and his group from Institute of Physics, CAS, together with their cooperative partner Prof. LI Maozhi from Renmin University of China, adopted molecular dynamics simulations to carry out their research on structural and dynamical features for the glass forming ability (GFA) in a model $\text{Cu}_x\text{Zr}_{100-x}$ metallic glass-forming systems. It is revealed that not only the $\langle 0,0,12,0 \rangle$ icosahedral clusters but also some Zr-centered clusters such as $\langle 0,2,8,6 \rangle$, $\langle 0,1,10,4 \rangle$ and $\langle 0,1,10,5 \rangle$ play a key role in slowing down the dynamics in CuZr system. While Zr-centered clusters fundamentally determine the stability and slow dynamics, they are further enhanced by $\langle 0,0,12,0 \rangle$. Due to the strong spatial correlation between $\langle 0,0,12,0 \rangle$ and these Zr-centered clusters, their relative population influences the dense packing and dynamics in metallic glasses, and further the GFA. The research, which was published in *Appl. Phys. Lett.* 96, 021901(2010) and highlighted by Nature Asian Materials website (<http://www.natureasia.com/asia-materials/highlight.php?id=648>), could provide deep understanding on some important issues of glass formation mechanism.

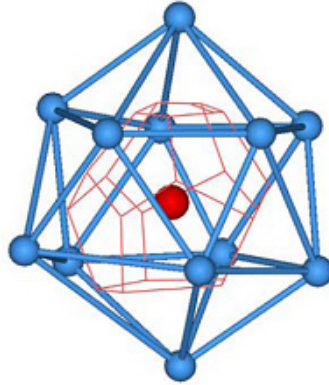


Fig.1. A cluster in CuZr binary metallic glass. It is a distorted icosahedra and has close relation with the glass forming ability of alloys.

More recently, they have studied, with molecular dynamics simulations, the structural features of a model CuZr metallic glass during deformation. Spatially heterogeneous irreversible rearrangement is observed in terms of non-affine displacement. It is revealed that the regions with smaller non-affine displacement have more Voronoi pentagons, while in those with larger non-affine displacement other types of faces are more populated. They used the degree of local five-fold symmetry as the structural indicator to predict the plastic deformation of the local structures and found that the plastic events prefer to be initiated in the regions with less degree of local five-fold symmetry and propagate toward the region with more degree of local five-fold symmetry. The research, which was published in *Phys. Rev. Lett.* 106, 135503(2011), is of important significance to understand the long standing issues of plastic mechanism of amorphous materials.

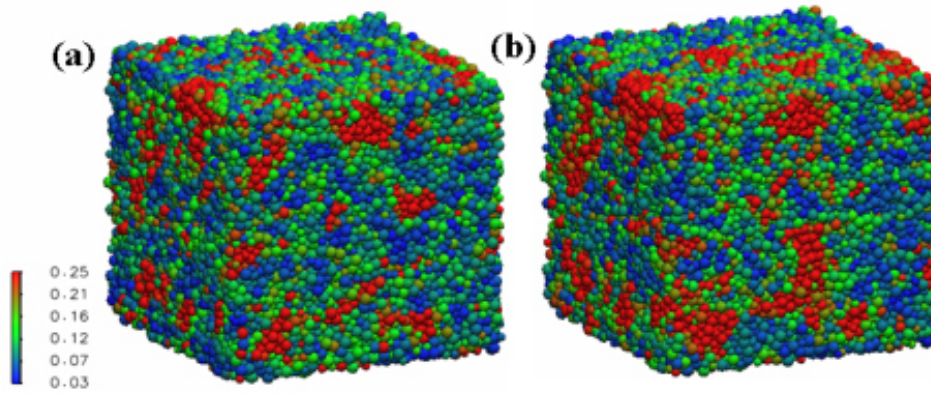


Fig.2. The atomistic configurations of the non-affine displacement $D2$ illustrated by colors at the strain of 5% with time interval of =10 ps (a) and 40 ps (b).

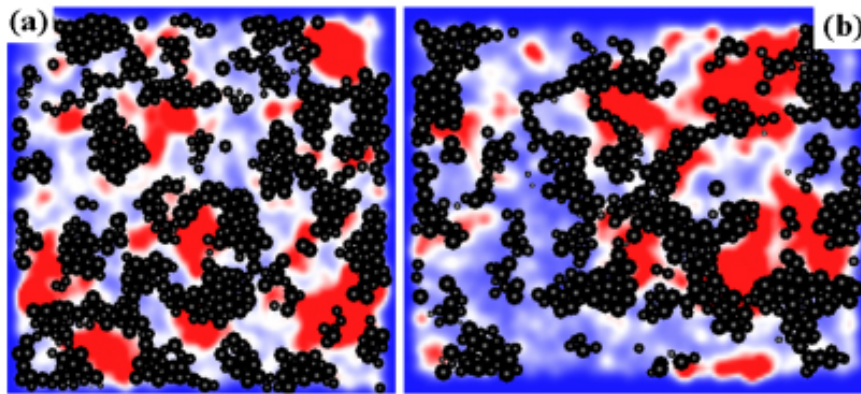


Fig.3. The correlation between the structures having more degree of local five-fold symmetry and the irreversible rearrangement during deformation at the strain of (a) 5% and (b) 10%.

The neural basis of *Drosophila* larval light/ darkness preference

In a project funded by NSFC, a team led by Associate Professor Gong Zhefeng and Professor Liu Li from the Institute of Biophysics, Chinese Academy of Sciences, discovered that two pairs of central brain neurons control the switch of the preference between light and darkness, by applying the GAL4/UAS system to block function of certain neural cells and investigating the consequent changes in *Drosophila* larval light avoidance behavior. A short report article published on *Science* on Oct. 22, 2010 reported this discovery.

According to the report, animal behaviors are generally quite flexible. Animals can adjust their behavior according to the changes in natural environment, nutritional condition as well as factors like age. But, how are animals' innate behaviors affected by external and internal factors? The underlying neural circuit is still not fully understood. In the case of human being, the behavioral habits and preferences change as the external environmental factors or internal factors like age change. In the case of invertebrates like *Drosophila*, behavioral preferences also change to meet the physiological needs as environmental condition changes. Young *Drosophila* larva prefers to stay in darkness whereas the older leaves for sites with more light --- the larvae no longer need food but they need a cleaner place for pupation.

Associate Professor Gong and his group first screened more than 700 Gal4 lines to obtain preliminary neural map, the paper says. Then by comparing Gal4 expression patterns, they ascertained that two pairs of isomorphic neurons (NP394 neurons) participate in the regulation of larval phototaxis. The higher activity of NP394 neurons corresponds to stronger light avoidance whereas less to stronger preference for light. Furthermore, they found that these two pairs of neurons are in connection with known larval visual pathway. NP394 neurons are close to the axonal terminal of pdf neurons, which have been well established to receive visual input from light sensory neurons. Thereafter, they proved that there exists synaptic connection between the dendritic terminus of NP394 neurons and the axonal terminus of pdf neurons. These result showed that NP394 neurons are downstream of pdf neurons. Further experiments with functional calcium imaging confirmed not only that NP394 neurons are responsive to light stimulation, but also that pdf neurons play an inhibitory role in NP394 neuron's response to light. This study not only extends the *Drosophila* neural pathway for visual information processing, but also deepens our understanding on how animal brain interprets visual cues. It is one more step towards the complete resolution of the neural basis of how environmental factors and internal factors affect animal innate behavior.

Important roles of brain-specific carnitine palmitoyltransferase and ceramide metabolism in leptin hypothalamic control of feeding

In a recent issue of *PNAS*, Professor Wu Donghai of Guangzhou Institutes of Biomedicine and Health (GIBH) and his colleagues published a paper titled “Important roles of brain-specific carnitine palmitoyltransferase and ceramide metabolism in leptin hypothalamic control of feeding”. Prof. Wu has received sustained support from NSFC since 2006.

This article was co-authored by an international group of 9 researchers reflecting achievement of international cooperation.

According to the article, brain-specific carnitine palmitoyltransferase-1 (CPT-1c) is implicated in CNS control of food intake. Prof. Wu and his group explored the role of hypothalamic CPT-1c in leptin's anorexigenic actions. They first showed that adenoviral overexpression of CPT-1c in hypothalamic arcuate nucleus of rats increases food intake and concomitantly up-regulates orexigenic neuropeptide Y (NPY) and Bsx (a transcription factor of NPY). Then, they demonstrated that this overexpression antagonizes the anorectic actions induced by central leptin or compound cerulenin (an inhibitor of fatty acid synthase). The overexpression of CPT-1c also blocks leptin-induced down-regulations of NPY and Bsx. Furthermore, the anorectic actions of central leptin or cerulenin are impaired in mice with brain CPT-1c deleted. Both anorectic effects require elevated levels of hypothalamic arcuate nucleus (Arc) malonyl-CoA, a fatty acid-metabolism intermediate that has emerged as a mediator in hypothalamic control of food intake. Thus, these data suggest that CPT-1c is implicated in malonyl-CoA action in leptin's hypothalamic anorectic signaling pathways. Moreover, ceramide metabolism appears to play a role in leptin's central control of feeding. Leptin treatment decreases Arc ceramide levels, with the decrease being important in leptin-induced anorectic actions and down-regulations of NPY and Bsx. Of interest, their data indicate that leptin impacts ceramide metabolism through malonyl-CoA and CPT-1c, and ceramide de novo biosynthesis acts downstream of both malonyl-CoA and CPT-1c in mediating their effects on feeding and expressions of NPY and Bsx.

Their research findings provided insights into the important roles of malonyl-CoA, CPT-1c, and ceramide metabolism in leptin's hypothalamic signaling pathways, they say.

Integrin activation and internalization on soft ECM as a mechanism of induction of stem cell differentiation by ECM elasticity

In the June 7th issue of *PNAS*, Professor Feng Xiqiao of Department of Engineering Mechanics of Tsinghua University and his colleagues published a paper titled “Integrin activation and internalization on soft ECM as a mechanism of induction of stem cell differentiation by ECM elasticity”. Prof. Feng has received sustained support from NSFC since 1993.

This article was co-authored by a group of 10 researchers.

According to the article, the mechanism by which ECM elasticity induces lineage specification of stem cells has not been clearly understood. Integrins are well-documented mechanosensors that are positioned at the beginning of the sensing pathway. By using an antibody specifically recognizing the active conformation of $\beta 1$ integrin, they observed that $\beta 1$ integrin activation in bone marrow mesenchymal stem cells (BMMSCs) was induced by soft substrate to a significantly greater degree than by stiff substrate. In contrast, however, the level of cell surface integrin on soft substrate was significantly lower than that on stiff substrate. Soft substrate markedly enhanced the internalization of integrin, and this internalization was mediated mainly through caveolae/raft-dependent endocytosis. The inhibition of integrin internalization blocked the neural lineage specification of BMMSCs on soft substrate. Furthermore, soft substrate also repressed the bone morphogenetic protein (BMP)/Smad pathway at least partially through integrin-regulated BMP receptor endocytosis. A theoretical analysis based on atomic force microscopy (AFM) data indicated that integrin–ligand complexes are more easily ruptured on soft substrate; this outcome may contribute to the enhancement of integrin internalization on soft substrate.

Taken together, their findings suggest that ECM elasticity affects integrin activity and trafficking to modulate integrin BMP receptor internalization, thus contributing to stem cell lineage specification.

Determination of electron pairing symmetry of iron-based superconductor FeSe

The research team led by Prof. Qi-Kun Xue at Department of Physics, Tsinghua University, and Prof. Xucun Ma at Institute of Physics, Chinese Academy of Sciences, has made a major breakthrough in study of the electron pairing symmetry of FeSe superconductor. The related results have recently been published in the journals of *Science* and *Physical Review B* (*Science* 332, 1410 (2011), *Phys. Rev. B* 84, 020503 (R) (2011)).

Iron-based superconductors are presently one of the hottest topics in condensed matter physics and open up a new avenue in the study of unconventional high-temperature superconductors. Similar to cuprates, one of the central issues in iron-based superconductors is the electron pairing symmetry, which is crucial for understanding the mechanism of high- T_c superconductivity. Despite the intense investigation in the last four years, the pairing symmetry in the newly discovered iron-based superconductors remains elusive, partially due to the inhomogeneous samples. To address this issue explicitly, superconducting single crystals or films with extremely high quality are essential.

Among iron-based superconductors, PbO-type β -FeSe has the simplest chemical composition and can be an archetype system for unraveling the mechanism of superconductivity. The FeSe single crystals and films reported so far, however, are known to suffer from great fluctuation in stoichiometry, disorder and clustering pathologies. Moreover, for heteroepitaxial FeSe films the lattice-mismatch between the films and substrates introduces compressive or tensile strain into the films, which becomes more dramatic in ultra-thin films. The situations make the understanding of their superconductivity more challenging.

This research team successfully prepared stoichiometric and superconductive FeSe single crystalline films with extremely high quality by using state-of-the-art molecular beam epitaxy (MBE) technique (Figs. 1A and 1B). Layer-by-layer growth of high quality films has been achieved in well-controlled manner under Se-rich condition, which allows to investigate the thickness dependent superconductivity of FeSe. *In situ* low temperature scanning tunneling spectra reveal that the local superconducting gap in the quasiparticle density of states remains robust down to two triple layers for the minimum measurement temperature of 2.2 K. With such samples, the superconducting gap measured by scanning tunneling spectroscopy at ultralow temperature (0.4 K) shows a V-shaped feature near the Fermi level (Fig. 1C), which clearly demonstrates the existence of line nodes. More importantly, by introducing magnetic field, they could also be able to investigate the quantized vortices, bound states in vortex center and the evolution of bound states (Fig. 2). Both vortex structure and evolution of bound states show two-fold symmetry, providing a direct proof for the two-fold symmetry in electron pairing function of FeSe. This is very amazing because the crystal lattice of FeSe has four-fold symmetry and all properties of FeSe are expected to have the same symmetry. The symmetry breaking means that a new type of ordering of electrons must have been formed in FeSe. In collaboration with the theoretical group led by Prof. Cong-Jun Wu at University of California San Diego, they proposed that the four-fold symmetry breaking may originate from the orbital-dependent reconstruction of electronic structure in FeSe.

These findings will be of great help in preparing other iron-based superconductor films with high quality and in understanding the superconducting mechanism of FeSe and other iron-based superconductors.

The work was financially supported by National Natural Science Foundation of China, Ministry of Science and Technology of China, and Chinese Academy of Sciences.

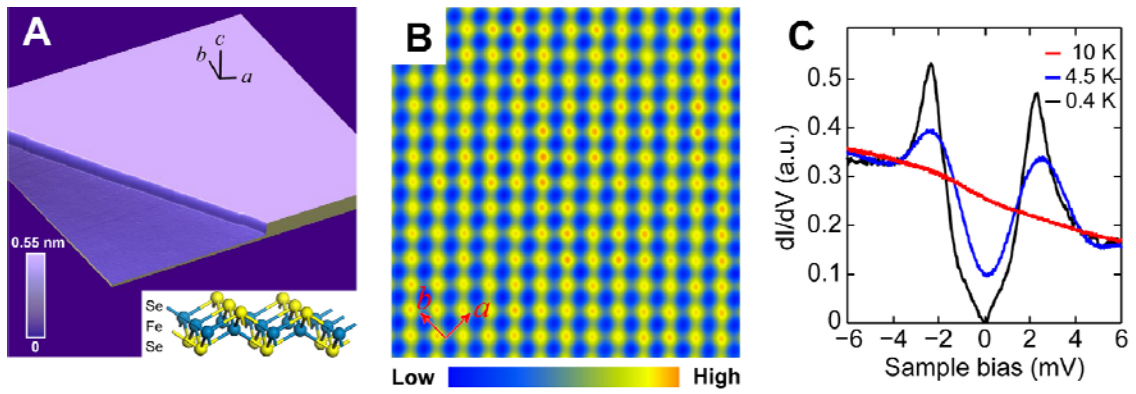


Fig. 1 STM characterization of the as-grown FeSe films. (A) Topographic image ($200 \times 200 \text{ nm}^2$) of a FeSe film. (B) Atomic resolution STM topography ($5 \times 5 \text{ nm}^2$) of FeSe film. (C) Temperature dependence of differential conductance spectra.

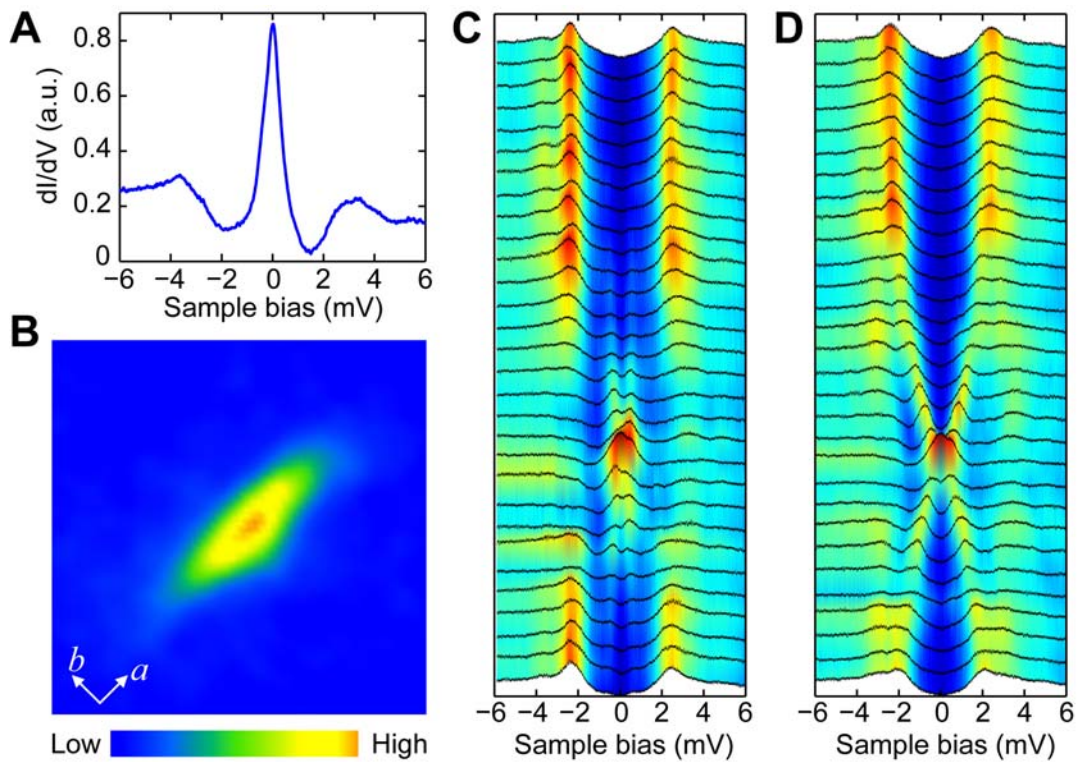


Fig. 2 The vortex core states. (A) STS on the center of a vortex core. (B) Zero bias conductance map ($40 \times 40 \text{ nm}^2$) for a single vortex at 0.4 K and 1 Tesla magnetic field. (C and D) Tunneling conductance curves measured at equally-spaced (2 nm) distance along *a*- and *b*-axes.

List of Projects Jointly Funded by NSFC and CNRS in 2011

National Natural Science Foundation of China (NSFC) and National Center for Scientific Research of France (CNRS) jointly support exchange programs in 2011. After evaluation and consultation, 10 projects are approved:

No.	Project Name	Chinese PI Chinese Affiliation	French PI French Affiliation
1	Explicit solutions of extended soliton equations and their applications in fluid dynamics	Runliang LIN Tsinghua University	Robert Conte UMR 8536, Centre de mathématiques et de leurs applications, Ecole normale supérieure de Cachan
2	Catalytic conversion of cellulose over solid catalyst-supported ionic liquids	Yanlong GU Huazhong University of Science and Technology	François Jérôme UMR 6503 CNRS-Université de Poitiers
3	Identification of AtLTP interacting protein in <i>Arabidopsis thaliana</i>	HU JIAN China Agricultural University	Laurent DESLANDES CNRS-INRA, LIPM
4	Application of molecular and isotopic markers to track the pollution sources in coastal sediment	Dongyan LIU Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences	Robert Galois / Pierre Richard LIENSs CNRS-La Rochelle University
5	Study on the earthworm population, behavior and molecular stress responses	Yinsheng LI Shanghai Jiao Tong University	Daniel CLUZEAU Equipe RBPE, UMR CNRS EcoBio, Université de RENNES 1 ; Station Biologique
6	Exact and parameterized algorithms for independent set, vertex cover and some related problems	Mingyu XIAO University of Electronic Science and Technology of China	Vangelis Paschos LAMSADE, University Paris-Dauphine
7	Novel far-infrared glass fibres based on highly purified Te-chalcogenide glasses	Xunsi WANG Ningbo university	XiangHua Zhang University of Rennes 1
8	A data fusion approach in the context of a vision aided SINS/GNSS Ultra-tight Integrated Navigation System	Xinlong WANG Beihang University	Jean-Yves Tourneret University of Toulouse
9	Open innovation, globalization and absorptive capacity: The changing and interconnected strategies of French and Chinese telecommunication firms	Jun JIN Zhejiang University	Edward Lorenz University of Nice Sophia-Antipolis
10	Network configuration of technological activities and innovation performance in modular networks: an institutional comparison between France and China	Bin HAO East China University of Science and Technology	Yannick Lung Research Group on Theoretical and Applied Economics, University of Montesquieu-Bordeaux

List of Projects Jointly Funded by NSFC and ESRC in 2011

National Natural Science Foundation of China (NSFC) and the Economic and Social Research Council of UK (ESRC) jointly support research programs in the fields of economic restructuring, high education, skill labour migration and infrastructure provision. After evaluation and consultation, 3 projects are approved:

No.	Project Name	Chinese PI Chinese Affiliation	English PI English Affiliation
1	Return Migrates and International Knowledge Flows: China and UK	Jiangyong LU Peking University	Xiaohui LIU Loughborough University Business School
2	CEO Effects on Firm Performance in China: the Role of Incentives, Firm Governance Arrangements and CEO Human Capital	Xianguo YAO Zhejiang University	Alex BRYSON National Institute of Economic and Social Research
3	Social Capital and Social Mobility – A Comparative Study between China and Britain	Haifeng DU Xian Jiaotong University	Yaojun LI University of Manchester

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List of Projects Jointly Funded by NSFC and RS in 2011

According to the agreement between the National Natural Science Foundation of China (NSFC) and the Royal Society of UK (RS), NSFC and RS jointly support exchange programs in 2011. After evaluation and consultation, 14 projects are approved:

No.	Project Name	Chinese PI Chinese Affiliation	English PI English Affiliation
1	Femtosecond Laser Inscribed Active Optical Waveguides in Vanadate Laser Crystals	Feng CHEN Shangdong University	Ajoy Kar Heriot-Watt University
2	NMR Studies of Nanomaterials and the Role of Oxygen in Catalytic Processes	Luming PENG Nanjing University	Clare Grey University of Cambridge
3	Mechanochemical Synthesis of Metal-Organic Frameworks	Wenbing YUAN Hainan University	Stuart James Queen's University Belfast
4	A Study on the Mechanisms of Pile Failure during Seismic Liquefaction	Yu HUANG Tongji University	Subhamoy Bhattacharya University of Bristol
5	On Bottom Stability of Sumarine Pipeline due to Wave-Induced Liquefaction	Xianglian ZHOU Shanghai Jiao Tong University	Dong-Sheng Jeng University of Dundee
6	The self-assemblage of Tropism Structural Conductive Nanofibre/hydrogels and the Response to Bio-Electricity	Yudong ZHENG University of Science and Technology Beijing	Asim Ray Brunel University
7	Stress Wave Propagation in Damaged Rock	Wancheng ZHU Northeastern University	Qingming Li University of Manchester
8	Increased Robustness and Practicability for Physical Modeling in Computer Graphics	Yongjin LIU Tsinghua University	Chenfeng Li Swansea University
9	Integrated Technique for Fast and Physics-Based Character Modeling and Animation	Xiaogang JIN Zhejiang University	Lihua You Bournemouth University
10	Grey System Theory and Computational Intelligence	Sifeng LIU Nanjing University of Aeronautics and Astronautics	Yingjie Yang De Monfort University
11	Investigation of Growth Factors in Chronic Thromboembolic Pulmonary Hypertension	Jun WANG Capital Medical University	Lan Zhao Imperial College London
12	Functional Roles of Olfactory Receptors and Odorant Binding Proteins in Wasp Microplitis Mediator	Yuyuan GUO Institute of Plant Protection, Chinese Academy of Agricultural Sciences	JingJiang Zhou Rothamsted Research
13	Biomimetic Motion Learning Control of Robotic Exoskeleton Interacting with Human	Zhijun LI Shanghai Jiao Tong University	Etienne Burdet Imperial College London
14	Physiological Consequences of Cardiac Na ⁺ Channel Mutations	Aiqun MA Xian Jiaotong University	James Fraser University of Cambridge

List of Projects Jointly Funded by NSFC and RSE in 2011

The National Natural Science Foundation of China (NSFC) and the Royal Society of Edinburgh (RSE) jointly support exchange programs in the field of information sciences in 2011. After evaluation and consultation, 7 projects are approved:

No.	Project Title	Chinese PI Chinese Affiliation	Scottish PI Scottish Affiliation
1	Object Identification for Complex Data	Hongzhi WANG Harbin Institute of Technology	Wenfei Fan The University of Edinburgh
2	Unified articulatory-acoustic modelling for flexible and controllable speech synthesis	Zhenhua LING University of Science and Technology of China(USTC)	Junichi Yamagishi University of Edinburgh
3	Research on modulation and coding for UWB over fiber signals	Hongwei CHEN tsinghua university	Xu Wang Heriot Watt University
4	Fundamentals for a chaos-based wireless underwater communication system	Haipeng REN Xi'an University of Technology	Murilo da Silva Baptista University of Aberdeen
5	An Approach to Modelling and Evolution of Service Architecture and Its Reliability in Clouds	Huiqun ZHAO North China University of Technology	Xiaodong Liu Edinburgh Napier University
6	Analysis and synthesis of stochastic hybrid systems and their applications to freeway traffic control	Liguo ZHANG Beijing University of Technology	Xuerong Mao The University of Strathclyde
7	Toward a context-sensitive high-order statistical language model	Yuexian HOU Tianjin University	Dawei Song The Robert Gordon University

Funding of Major Program Projects in 2010

	Project Title	Applicant/Institution
1	The interface structures and mechanical behavior of laminated electromagnetic composites	Fang Daining(Peking University)
2	Coupling of Photocatalytic Production of Hydrogen with Carbon Dioxide Conversion Driven by Solar Energy	Li Can(Dalian Institute of Chemical Physics, CAS)
3	Precision Synthesis of Topological Polymers	Chen Yongming(Institute of Chemistry,CAS)
4	Study of DNA Barcoding genes and cryptic diversity of animals	Zhang Yaping(Kunming Institute of Zoology,CAS)
5	The Physiological Regulating Mechanisms of Epidermal-Mesenchymal Transition Process	Feng Xinhua(Zhejiang University)
6	Fauna Sinica	Huang Dawei(Institute of Zoology,CAS)
7	The Cryptogamic Flora for China	Zhuang Wenyong(Institute of Microbiology, CAS)
8	Key biogeochemical processes in typical paddy soils and their environmental functions	Zhu Yongguan(Institute of Urban Environment,CAS)
9	Investigation on the physical mechanism of Wenchuan earthquake and its dynamics and hazards	Chen Yuntai(Institute of Geophysics, China Earthquake Administration)
10	The Chemical Processess of Plate Subduction and Implications on Mineralization	Sun Weidong(Guangzhou Institute of Geochemistry, CAS)
11	Strengthening migration regularities and separation theories of valuable components Containing V2O5 and TiO2 minerals in the Metallurgical Process	Xue Xiangxin(Northeastern University)
12	Fundamental research on high speed opto-electronic integration	Zhu Ninghua(Institute of Semiconductors,CAS)
13	Research on Service Operations Management in Newwork Environment	Hua Zhongsheng(University of Science and Technology of China)
14	In vivo Molecular Imaging of Gastric Cancer with Malignant Biological Behaviors	Wu Kaichun(Fourth Military Medical University)
15	Study on the leukemia-induced alterations of HSC/HPC and the related mechanism	Cheng Tao(Chinese Academy of Medical Sciences)
16	Effects of EMT on colorectal cancer metastasis and their mechanisms	Lai Maode(Zhejiang University)

Funding of Key Program Projects in 2010

	Project Title	Applicant
1	Nonlinear partial differential equations of hyperbolic type and mixed type	Chen Shuxing
2	Qualitative Theory and Related Topics of Delay Differential Equations and Discrete Systems	Yu Jianshe
3	Nonlinear Functional Analysis and Infinite Dimensional Dynamical Systems	Zhong Chengkui
4	The arithmetic and geometry of automorphic forms	Liu Jianya
5	Mathematical problems in quantum field theory and string theory	Wu Ke
6	User-Friendly High Efficient Numerical Methods and Applications	Huang Yunqing
7	The theory of complex surface modeling and its application in scientific computing	Chen Falai
8	Some Problems in Several Complex Variables and Complex Geometry	Zhou Xiangyu
9	New concept energy absorbers and their application in crashworthiness design of aircraft	Yang Jialing
10	The model theory, high-performance numerical method and software development for three-dimensional explosion and impact problem	Ning Jianguo
11	Correlation Mechanism with Mechanics of Electromagnetic radiation resulted from hypervelocity impact	Zhang Qingming
12	On the modelling and nonlinear dynamics of the long-span cable stayed bridge	Zhao Yueyu
13	Multi-scale mechanics of the failure mechanism of the advanced fiber-enforced composites and their structures	Liu Renhuai
14	Theoretical and Experimental Investigations on Electro-Magneto-Thermo-Mechanics of Superconducting Materials with Multi-Coupled-Fields	Zhou Youhe
15	Dynamic coupling environment effects of water, sediments and pollutants under complex hydrodynamic conditions	Wang Daozeng
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28	Binary Evolution and its Applications	Han Zhanwen
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341	Surface plasmon polariton devices and integration based on metal/dielectric nano structures	Zhang Jiasen
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343	Investigation of printing technique for polymer light emitting display	Jun Biaopeng
344	Theory and key technology of autostereoscopic 3D display based on lenticular lens and parallax barrier	Wang Qionghua
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372	Relationship between mitochondrial DNA mutation and the development and progress of hypertension in Chinese Hans people and its mechanism	Wang Shiwen
373	Prostaglandin E2 receptor subtype 4 and blood pressure regulation	Guan Youfei
374	The impact of Peroxidase activity of Prostaglandin H Synthesis on Hypertension and its complications	Yu Ying
375	Predisposition to hypertension and hypertensive heart failure by reduced cardiovascular insulin sensitivity: Effect and mechanisms of actions	Gao Feng
376	Programming mechanisms of fetal origins in hypertension and its complication stroke	Xu Zhice
377	The function, mechanism and regulation of novel ion channel associated gene KCTD9 in liver injury	Ning Qin
378	Molecular mechanisms of inflammation causing fatty acids redistribution in liver	Ruan Xiongzong
379	Involvement of different kinds of cells on liver injury	Li Liying
380	Molecular mechanisms of synchronized regeneration of hepatocytes and hepatic non-parenchymal cells after liver injury	Dou Kefeng
381	G-protein coupled receptor 48 regulates the balance between energy expenditure and fat storage	Ning Guang
382	Gastric fuel sensing mechanism in the regulation of energy metabolism and development of obesity	Zhang Weizhen
383	new mechanism of energy: Stat3 acetylation mediating gluconeogenesis in liver	Gao Qian
384	the function of TM4 involving in energy metabolism and development of obesity	Hu Renming
385	Exploring the genetic basis of pathological myopia	Kong Xiangyin
386	Research for the molecular pathogenesis of gene-genes interaction of primary open angle glaucoma	Wang Ningli
387	Identification of novel deafness genes and underlying mechanism	Yuan Huijun

388	Molecular pathogenesis of Gorlin syndrome and its related diseases and the novel therapeutic approaches	Li Tiejun
389	A study on molecular genetics of ALS	Fan Dongsheng
390	Molecular and Cellular Mechanism of Adult Neurogenesis in the Repair of Brain Following Stroke	Sun Fengyan
391	The role of astrocytes in neurovascular injury and functional reconstruction after ischemia	Wang Wei
392	Identification of nuclear BKca channel and its role in ischemia induced neuronal death.	Gao Tianming
393	Role of nNOS in neurogenesis and synapse formation following brain injuries	Zhu Dongya
394	Novel mechanisms of GSK-3 α / β regulation: therapeutic Targets for Parkinson's Disease	Li Mingtao
395	The study on c-Abl signaling transduction in the oxidative stress-induced neuronal cell death	Yuan Zengqiang
396	Retinoid signaling mediated stress injury and hyperactivity of CRH neurons in the pathogenesis of depression	Zhou Jiangning
397	Diagnostic Model and Neuropathological Mechanisms underlying Depressive Disorder Based on Multi-modality Neuro imaging and Massive Data Processing	Gong Qiyong
398	Methodology and Applications of Multi-modal Image Processing Based on Brain Network Computation	He Yong
399	Gene decay and host adaptation: establishing animal infection models by Salmonella typhi and other host-adapted salmonellae	Liu Shulin
400	Mechanistic studies on the antiviral function of ZAP	Gao Guangxia
401	Research on the interactional effects between the essential replication proteins of human cytomegalovirus and their cellular factors	Liu Fenyong
402	Overactive immune response and severe pandemic influenza A(H1N1) 2009	Wang Chen
403	Multiple organs Infection model of H5N1 and H1N1	Gu Jiang
404	an applied basic research on the key points of the bone and periodontal repair and reconstruction in dento-maxillofacial trauma	Zhao Zhihe
405	Enhancement of the healing strength and inhibition of adhesions of the injured tendon by gene therapy	Tang Jinbo
406	The role of FGFR3 in regeneration of articular cartilage	Chen Lin
407	Regulation of migration and differentiation of epidermal stem cells by bio-electric field in wound and its mechanisms	Jiang Jianxin
408	The role of tumor microenvironment on cancer metastasis and recurrence of hepatocellular carcinoma	Fan Jia
409	The role of platelet in pre-metastatic niches formation and lung metastases	Liu Junling
410	The Study of the Role of miRNA in Cancer Progress and Metastasis Through using Self-assembled Cell Microarray	Xi Jianzhong
411	Role of autophagy on the metastasis and recurrence of hepatocellular carcinoma in the tumor micro-environment and its mechanism	Wei Lixin
412	The investigation for the role of osteopontin in tumor microenvironment and epithelial mesenchymal transitions.	Zhao Jian
413	Molecular mechanism of migration, invasion and metastasis regulated by Serglycin in Nasopharyngeal Carcinoma cells	Qian Chaonan
414	Study the roles and mechanisms of miRNA-related gene regulatory networks in multi drug resistance of gastric cancer	Fan Daiming
415	The function and regulative mechanism of microRNA in HER2 signaling-mediated metastasis of cancer cells	Yang An'gang
416	Hypoxic and inflammatory microenvironment of colon cancer affects the self-renewal and differentiation of colon cancer stem cell by regulating the RNA binding protein	Lu Zifan
417	The critical role of Mediator Med23 in ras-active lung cancer	Wang Gang
418	The positive-feed back and constitutive activation of inflammation signaling on the progression and development of cancer	Li Jun

419	The role of fibroblast in inflammation-related tumor development	Qin Zhihai
420	Study on the Molecular Mechanisms of Aberrant Expression of Inflammation-Related Genes in Liver Cancer	Lin Dongxin
421	Screening of estrogen-like compounds in food and risk assessment of metabolic syndrome	Xu Shunqing
422	Rapid screening for hormonal pollutants in food by bionic photonic crystals and the mechanism investigation of combined effect at low-dose exposure to male	Gao Zjixian
423	The quick-screening for chemical contaminants/ mycotoxin-produced fungi in aquatic products/ farm products/ flavorings and the safety evaluations for harmful substances in foods	Zhang Lishi
424	Regulation of allergen induced toll-like receptor expression and cytokine release from mast cells by interferon-lambda	He Shaoheng
425	The effects and mechanisms MRP8/MRP14 on antigen presenting cells and T cells	Jiang Yong
426	Mechanism for TLR2 or TLR4 differentially regulating the development of tissue fibrosis	Hu Zhuowei
427	The molecular mechanism of citrullinated antigen in pathogenesis of rheumatoid arthritis	Li Zhan'guo
428	New mechanism of activated antigen presenting cell from the site of inflammation in rheumatoid arthritis promote Th17 responses	Zhu Ping
429	Specific inhibition of Dyrk1A prevents the formation of pathogenic tau in Alzheimer's disease brain	Liu Fei
430	Kir6.1/K-ATP channel: a new neuro-protective target for Parkinson's disease	Hu Gang
431	The effect of histamine and its receptors on astrocytes function and glial scar formation after cerebral ischemia and the involved mechanism	Chen Zhong
432	Neuroprotective mechanisms of Parkinson's disease and novel pharmaceutical targets research	Wang Xiaomin
433	Research of Etiology and Pathogenesis of Coronary Heart Disease from Blood-stasis to Toxin	Shi Dazhuo
434	Identification of the Molecular Signature Contributing to the Susceptibility of Phlegmatic Hygrosis Constitution to Metabolic Syndrome	Wang Qi
435	Study on mechanism of compatibility of two Zhimu herb-pairs based on analysis in vivo	Huang Chenggang
436	Basic research on composition law of herbal pair of herba ephedrae species	Luo Jiabo

•Research Results•

Long-Range Topological Order in Metallic Glass

In June 17th issue of *Science*, Professor Jiang Jianzhong of Department of Material Sciences, Zhejiang University and his colleagues published a paper titled “Long-Range Topological Order in Metallic Glass”. Prof. Jiang has received sustained support from NSFC since 2003.

This article was co-authored by an international group of 9 researchers.

According to the article, glass lacks the long-range periodic order that characterizes a crystal. In the Ce₇₅Al₂₅ metallic glass (MG), however, they discovered a long-range topological order corresponding to a single crystal of indefinite length. Structural examinations confirm that the MG is truly amorphous, isotropic, and unstrained, yet under 25 gigapascals hydrostatic pressures, every segment of a centimeter-length MG ribbon devitrifies independently into a face-centered cubic (fcc) crystal with the identical orientation. By using molecular dynamics simulations and synchrotron x-ray techniques, they elucidated that the mismatch between the large Ce and small Al atoms frustrates the crystallization and causes amorphization, but a long-range fcc topological order still exists. Pressure induces electronic transition in Ce, which eliminates the mismatch and manifests the topological order by the formation of a single crystal.