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NSFC

PART III

Introduction on Selected Grantees of the National Science Fund for Distinguished Young Scholars and PIs of the Creative Research Groups

Dr. Wu Mingwei

Professor, University of Science and Technology of China
Grantee of the Fund in 2007

Prof. Wu Mingwei's research interest mainly focuses on the theory of the spin dynamics in semiconductors. Under the support of the National Science Fund for Distinguished Young Scholars of China, achievements he has made are partly listed as follows:

1. A nearly 200-page invited review article was published in *Physics Reports* [M. W. Wu, J. H. Jiang, and M. Q. Weng, "Spin dynamics in semiconductors", *Physics Reports* 493, 61 (2010)]. The kinetic spin Bloch equation approach, developed by Prof. Wu Mingwei, was introduced with the abundant results obtained from this approach in the past ten years. The development of the spintronics was also reviewed. This article has been cited by 19 times since its publication in the second half year of 2010.

2. Extended the kinetic spin Bloch equation into bulk semiconductor systems with all the relevant scatterings included, and comprehensively studied the electron spin relaxation in III-V bulk semiconductors [J. H. Jiang and M. W. Wu, "Electron spin relaxation in bulk III-V semiconductors from a fully microscopic kinetic spin Bloch equation approach", *Phys. Rev. B 79*, 125206 (2009)]. Many interesting phenomena are predicted in a 21-page paper, where some widely accepted viewpoints were demonstrated to be incorrect. For example, they predicted that the spin relaxation time in the metallic regime presents a peak in the density dependence in both n-type and intrinsic bulk materials. In intrinsic samples, the non-monotonic behavior of the Coulomb scattering can also result in a peak in the temperature dependence of the spin relaxation time. Due to the screening effect, another peak appears as the increase of the hole density in p-type semiconductors. Moreover, they found that the previous knowledge of the Elliott-Yafect mechanism as the dominant electron spin relaxation mechanism in n-type narrow-band semiconductors such as InSb and InAs is incorrect. Their fully microscopic calculation revealed that the Elliott-Yafet mechanism is always unimportant in III-V bulk semiconductors. In addition, the Bir-Aronov-Pikus mechanism was found to be irrelevant in intrinsic III-V bulk materials. This work provides a great help for the thorough understanding of the spin relaxation in bulk systems. The peak in the density dependence in n-type bulk material was later observed by Cundiff's group in the University of Colorado [Krauß, Bratschitsch, Chen, Cundiff, and Schneider, PRB 81, 035213 (2010); Shen, CPL 26, 067201 (2009)]. The irrelevant role of the Elliott-Yafet mechanism in III-V semiconductors was confirmed by Murdin et al. [Litvinenko, Leontiadou, Li, Clowes, Emeny, Ashley, Pidgeon, Cohen, and Murdin, *APL* 96, 111107 (2010)]. The prediction of the peak in the temperature dependence was also confirmed by Ma et al. [Ma, Jin, and Ma, APL 96, 136102 (2010); Ma, Jin, Wang, and Ma, arXiv: 1004.4048, *JAP* in press]. This paper was published in 2009 and has been cited by 22 times.

3. Reexamined the contribution of the Bir-Aronov-Pikus mechanism in the electron spin relaxation from the kinetic spin Bloch equation theory in intrinsic and p-type quantum wells [J. Zhou and M. W. Wu, “Spin dephasing due to the Bir-Aronov-Pikus mechanism in intrinsic and p-type GaAs quantum wells from a fully microscopic approach”, *Phys. Rev.* B 77, 075318 (2008)]. They found that the previous identification of the Bir-Aronov-Pikus mechanism as the dominant spin relaxation temperature at low temperature is incorrect and explained the origin of the failure of the single particle theory. This

prediction was experimentally confirmed by X. D. Cui's group in the University of Hong Kong [Chunlei Yang, Xiaodong Cui, Shun-Qing Shen, Zhongying Xu, and Weikun Ge, *Phys. Rev.* B 80, 035313 (2009)]. This paper has been cited by 13 times.

4. Studied the spin-orbit coupling in ZnO and GaN for the first time [J. Y. Fu and M. W. Wu, "Spin-orbit coupling in bulk ZnO and GaN", *J. Appl. Phys.* 104, 093712 (2008)]. The work has been extensively referred to interpret the experiment, and has received 18 citations.

From 2008, Prof. Wu Mingwei has published 38 papers and one chapter in a book, which have been totally cited by 158 times. He was invited to give presentation in international conference in Japan, Russia, Poland, Brazil, and Turkey these years. He served now as the editor of *Physica E* and the member of editorial board of J. Supercond. & Noval Magnetism. He was invited as the member of the International Program Committee in 30th International Conference on the Physics of Semiconductors (ICPS 2010, Seoul, Korea).

Dr. Xue Hongwei

Professor, Shanghai Institute of Plant Physiology and Ecology, CAS
Grantee of the Fund in 2004

Prof. Xue Hongwei's research interests are mainly focused on the mechanisms of plant hormones and plant seed development functional genomics. The main achievements include:

1. Regarding to the cross-talk of plant hormones and functional mechanism of steroid hormones, Prof. Xue and his team analyzed the steroid hormone-responsive genes and summarized the effects of steroid hormone on plant development and photomorphogenesis. The research result demonstrated that brassinosteroids regulates the plant tropism through regulating the expression and distribution of auxin efflux carriers (PIN proteins). He identified a membrane localized steroid binding protein from Arabidopsis, demonstrated the specific binding of MSBP1 to progesterone and brassinosteroids, and revealed its negative role in cell elongation and signal transduction of brassinosteroids. In addition, it is discovered that casein kinase I (EL1) specifically phosphorylates DELLA protein SLR1, an important negative regulator in gibberelline signaling, and maintain the activity and stability of SLR1.

2. Prof. Xue systemically studied the interactions of

auxin and phosphatidylinositol (PI) signaling pathway and revealed that phospholipase D zeta2 and its product phosphatidic acid (PA) stimulates the cycling of auxin efflux carriers (PIN1 and PIN2) to membrane by regulating the vesicle trafficking, and auxin responses; inositol polyphosphate 5-phosphatase (5PTase13) regulates the cotyledon vein development by regulating the auxin homeostasis; and inositol 1,4,5-trisphosphate regulates the polar auxin transport through affecting the degradation of auxin efflux carriers (PIN proteins) in vacuoles.

3. He demonstrated that phosphatidylinositol 4-phosphate 5-kinase (PIP5K9) interacts with cytosolic invertase to involve in sugar metabolism and signaling, to regulates the cell wall status and root cell elongation, suggesting the synergetic effects of sugar metabolism and signaling, cytoskeleton filaments, and phosphatidylinositol (PI) signaling in root cell elongation. In addition, he characterized the effects of inositol polyphosphate 5-phosphatase (5PTase13) in regulating the blue light signaling and blue-light mediated photomorphogenesis through regulating the concentration of cytosolic inositol 1,4,5-trisphosphate and calcium.

Prof. Xue is now served as the director of Shanghai Institute of Plant Physiology and Ecology, Chinese Academy of Sciences, the director of National Key Laboratory of Plant Molecular Genetics, and the president of the Shanghai Society for Plant Physiology. He has published about 40 papers in the *Plant Cell, EMBO J, the Plant J, Plant Physiology* since 2005 and wrote review articles for Current Opinion of Plant Biology, Biochemical J on invitation. The projects of “Functional genomics studies of rice high-quality and stress-resistance” and “Studies of mechanism of hormones in plant growth” which were implemented by him were awarded as the Shanghai S & T Progress Prize in 2005 and Shanghai Natural Sciences Award in 2007, respectively. He was awarded with the Science and Technology Award for Chinese Youth in 2009.

Dr. Chen Jun

Professor, Nanjing University

Grantee of the Fund in 1997

Prof. Chen Jun’s research mainly focuses on surficial geochemistry. Supported by National Science Fund for Distinguished Young Scholars and other NSFC funds, Prof. Chen conducted his researches on continental chemical weathering and geochemistry of Asian dust. The major achievements are as follows:

1. Characteristics of chemical weathering on the Loess Plateau and the dust provenance. Based on the understanding sedimentation and geochemical processes of eolian loess, he reveals that the chemical weathering in Northern Tibetan Plateau is weak since late Cenozoic while physical weathering is relatively strong. The weathered products constitute the main substance of the desert and become a major contributor to Asian eolian dust. This provided a reliable geological basis for the studying of the sources, transportation pathway and climate effects of the historical and modern eolian dust.

2. New geochemical proxies for East Asian monsoon evolution. Prof. Chen and his group established new method to distinguish wind sorting from weathering-pedogenesis and selected several novel geochemical proxies to reflect paleomonsoon and climate change. These proxies include Rb/Sr ratio indicating the intensity of summer monsoon,

Zr/Rb ratio indicating the intensity of winter monsoon, and hematite/goethite ratio reflecting the dry/wet climate change. These proxies, with the advantage of specific origin and easy and precise analytical methods, have been widely applied in river, lacustrine and marine sediments research.

3. Relationship between continental weathering-monsoon evolution and global cooling during late Cenozoic. The study reveals that: (1) preferential weathering of micas in the background of global cooling may lead to increase of marine Sr isotope ratio; (2) Asian monsoon began to intensify significantly from 4.2 Ma which was 1.5 Ma earlier than the onset of Northern Hemisphere glaciation, and this monsoon intensification probably enhanced continental chemical weathering, decreased atmospheric CO2 concentration and triggered the growth of ice sheet in Northern Hemisphere; (3) the global silicate weathering intensification since 15 Ma is in step with global cooling, which may be associated with Tibetan Plateau uplift and the accompanied Asian monsoon intensification.

4. Potential sources of eolian dust in Chinese Loess Plateau. Prof. Chen unraveled that the isotope composition of deserts in northern China was controlled by the regional tectonic setting. He also found that eolian dust in Loess Plateau mainly derived from the desert on the northern margin of Tibetan Plateau. Due to the continuing uplift of Northern Tibetan Plateau since late Cenozoic, strong physical weathering and relatively weak chemical weathering may occur and the weathering product composed the main part of desert material and becomes the main contributor to dust material in Loess Plateau.

5. Binary sources for the natural background of eastern Asian dust. The result shows that the provenance of Asian dust's natural background may comprise arid lands around northern boundary of China and deserts on northern margin of Tibetan Plateau. Further study reveals that spring dust in Beijing has an additional anthropogenic source. This achievement provides new insight on Asian dust provenance research, gives important approaches to understand the transport process of past and modern dust, and has clear significance on tracing source regions of Asian long-range transported dust and urban dust.

Prof. Chen Jun has published over 180 articles, over 80 of which are SCI papers and have been cited for more than 500 times by SCI papers. He has also published 4 books or textbooks, and was awarded with the second-class prize of the National Natural Science Award in 2010 and the first-class prizes of the Natural Science Award of Ministry of Education of China in 2002 and 2009 respectively.

Prof. Chen currently serves as Vice Chairman of the Chinese Society for Mineralogy, Petrology and Geochemistry, Vice Chairman of the Chinese Society for Quaternary Research. He is also Council Member of Science of China and Chinese Science Bulletin, and Member of the editorial committees for Science of China, Acta Geologica Sinica, Geological Review, and Geochimica.

In 2010, the research team led by Prof. Chen was funded by the Science Fund for Creative Research Groups of NSFC

Dr. Luo Xiangang

Professor, Institute of Optics and Electronics, CAS
Grantee of the Fund in 2008

Prof. Luo Xiangang has been dedicating to an interdisciplinary approach towards research that bridges the areas of micro-nano optics, nanofabrication and microengineering, and optical imaging technologies as well as their potential applications in optical engineering. The research topics are typically a combination of fundamental exploration, engineering design and optimization methods, device fabrication and characterization, and various applications. Some of the main research achievements are as follows:

He proposed surface plasmons resonant nanolithography beyond diffraction limit and completed imaging devices with reduction ratio for imaging nanolithography. The established lithographic machine obtained 40nm line width pattern at a wavelength of 365nm. The proposed research was considered to be one of the feasible ways alternatives to the complex and expensive traditional lithography.

He proposed the ideas about modulating the phase of electromagnetic waves under the sub wavelength scale, and gave the engineering design method for electromagnetic function device design. A series of 3-H (High numerical aperture, High refractive ability, and High resolution) electromagnetic devices were completed. The research results won the first class prize of Sichuan Science and Technology Progress Award in 2010.

He has published more than 120 papers and obtained 36 invention patents. He has given over 17 plenary and invited talks at international conferences and institutions. Prof. Luo Xiangang's research results were awarded as the first class prizes by Sichuan Science and Technology Progress both in 2009 and 2010. In 2009, he was selected as "National Candidate for the New Century Millions of Talents Project ".

Dr. Cai Hongbin

Professor, Guanghua School of Management, Peking University
Grantee of the Fund in 2007

With the supports by the National Science Fund for Distinguished Young Scholars, Prof. Cai Hongbin has made substantial contributions in the following research areas.

Study of the mechanisms of social learning. Applying frontier research methods in experimental economics and utilizing deliberately designed field experiments, Prof. Cai and his coauthors demonstrate the important roles of information transmission in consumers' choices in social contexts. His research provides strong evidence for the roles of rational motives in social learning (e.g. "Herding Effect"). Such findings are able to help firms optimize marketing strategies and improve marketing

efficiency in practice.

Study of firms' horizontal boundaries and reputation strategies. Using repeated game models, Prof. Cai made his studies on the relations between firms' reputation strategies and their horizontal acquisitions and expansions, and developed a theory of firms' boundaries based upon reputation mechanism. This theory differs significantly from the traditional focus on employment relations or property rights in the literature of theory of the firm. Thus, it provides a new perspective for the understanding of firms' boundaries, one of the most fundamental issues in the theory of firm, and contributes to firms' branding strategies and acquisition and expansion strategies.

Study of the relations between firms' incentive design and the cultivations of firm's internal innovation and labor market. With the support from the National Science Fund for Distinguished Young Scholars, Prof. Cai has completed two research projects in this field: (1) The relations between firms' incentive mechanism design and its innovation capability. In this project he studed that how firms design optimal incentive mechanisms to promoting innovation activities within firms and provided useful insights for firms that aim to promote innovative activities. (2) The effects of Chinese firms' relatively strong egalitarian belief on their incentive mechanism designs, in particular, on the design and renegotiation of incentive contracts. This research helps to understand the complexity of Chinese firms' internal incentive mechanisms under specific cultural contexts.

Study of tax policies and Chinese firms' behaviors. Utilizing panel data of China's Industrial firms above designated size, Prof. Cai empirically examined the relations between Chinese firms' tax evasion behaviors and the degree of within-industry competition. While showing the influence of within-industry competition and tax environment on firm behaviors, his research also has rich implications on improvements of current tax policies.

Study of business environment and firms' cost structures. Utilizing survey data from the World Bank, Prof. Cai offered his explanations to disproportionately high travel and entertainment costs of Chinese firms. This study revealed that the influences of firms' business environments, particularly the degree of integrity of local governments, on firms' efficiencies. As one implication of the project, its findings provide strong support to the building of "service-oriented government".

Since 2008, Prof. Cai Hongbin has published 9 papers at leading international economics journals such as *American Economic Review and RAND Journal of Economics,* and 3 papers in leading Chinese economics and management journals. Besides these cutting-edge academic research outputs, Prof. Cai has also led a number of policy-oriented research projects contracted by various ministries, such as "Major Research Project on National Agricultural Census" with the National Bureau of Statistics, "Reforms of Collective Ownership Institutions of Forestry" with the State Forestry Administration and "Reforms of Rural Cooperative Medical System" with the Ministry of Health. These research projects have produced valuable policy proposals and made significant policy and social impacts.

Dr. Zhang Xue

Chang Jiang Scholar of Genetic Medicine
Professor and Chair of Medical Genetics, Institute of Basic Medical Sciences, Chinese Academy of Medical Sciences (CAMS) & Peking Union Medical College (PUMC)
Grantee of the Fund in 2001

Prof. Zhang is currently focusing his study on the identification of the causative genes underlying Mendelian disorders and of the pathogenic copy number variations (CNVs) responsible for genomic disorders. His works had been mainly supported by a NSFC Key Program and partially by a NSFC Science Fund for Creative Research Groups. Recent findings by his team include:

1. γ-Secretase Gene Mutations in Familial Acne Inversa

Acne inversa (AI), also known as follicular occlusion triad, is a chronic, recurrent, inflammatory disease of hair follicles that often runs in families. The team lead by Profs. ZHANG Xue, SHEN Yan and WANG Baoxi at CAMS & PUMC studied six Chinese families with features of AI as well as additional skin lesions on back, face, nape, and waist and found independent loss-of-function mutations in PSENEN, PSEN1, or NCSTN, the genes encoding essential components of the γ-secretase multiprotein complex. The results identify the γ-secretase component genes as the culprits for a subset of familial AI, implicate the γ-secretase-Notch pathway in the molecular pathogenesis of AI, and demonstrate that familial AI can be an allelic disorder of early-onset familial Alzheimer's disease.

2. A New Genetic Mechanism for Hair Loss

Marie Unna hereditary hypotrichosis (MUHH) is an autosomal dominant form of genetic hair loss. A large international team lead by Prof. ZHANG first identified, in a large Chinese family carrying MUHH, a pathogenic initiation codon mutation in U2HR, an inhibitory upstream ORF in the 5' UTR of the gene encoding the human hairless homolog (HR). In 18 more families from different ancestral groups, the team identified a range of defects in U2HR, including loss of initiation, delayed termination codon and nonsense and missense mutations. Functional analysis showed that these classes of mutations all resulted in increased translation of the main HR physiological ORF. The results establish the link between MUHH and U2HR, show that fine-tuning of HR protein levels is important in control of hair growth, and identify a potential mechanism for preventing hair loss or promoting hair removal.

3. Chromosome 17q24 CNVs in Congenital Generalized Hypertrichosis

Congenital generalized hypertrichosis terminalis (CGHT) is a rare condition characterized by universal excessive growth of pigmented terminal hairs and often accompanied with gingival hyperplasia. Prof. ZHANG and colleagues described three Han Chinese families with autosomal-dominant CGHT and a sporadic case with extreme CGHT and gingival hyperplasia. They first mapped the CGHT locus to chromosome 17q24.2-q24.3. Further genetic studies showed that all familial cases had inherited a microdeletion on 17q24 and the sporadic case had a de novo microduplication on the same chromosomal region. This work identifies CGHT as a genomic disorder.

The aforementioned three findings have been published in *Science, Nature Genetics and American Journal of Human Genetics,* respectively. Prof. Zhang had presented these works as an invited speaker in six international scientific conferneces.

Prof. Zhang is now the deputy director of the State Key Laboratory of Medical Molecular Biology, located at the CAMS Institute of Basic Medical Sci-

ences, and the president-elect of the Chinese Society of Medical Genetics under the Chinese Medical Association. He also serves on editorial board of many national and international journals, including *Chinese Science Bulletin and American Journal of Human Genetics.*

Dr. Liu Tingxi

Professor, Institute of Health Sciences, CAS
Grantee of the Fund in 2006

Prof. Liu Ting Xi's laboratory focuses its research on the genetic basis and translational medicine research of blood development and diseases. Under the support of NSFC, the major research progresses and achievements are as follows:

In collaboration with several international research centers, Prof. Liu and his team screened and identified CTNNA1 (alpha-catenin) genes as a potential tumor suppressor of leukemia stem cells. This gene is located in the critical deleted region on the long arm of human chromosomal 5, which has been hunting for 3 years (Nature Medicine, 2007). Based on these findings, he recently found that the alpha-catenin function with two additional leukemia suppressor genes PTEN and C/EBPalpha in a common signaling transduction pathway. The CTNNA1-PTEN-C/EBPalpha axis is evolutionarily conservetive and controls the hematopoietic stem cell development and myeloid transformation through regulating the activity of EZH2/EED/SUZ12 complex-mediated H3K27 trimethylation. The findings provide an important insight into the targeted therapy on the leukemia stem cells (Blood, 2010).
In 2008, using zebrafish as a genetic and developmental biology model, Prof. Liu identified 62 SET domain-containing genes in the zebrafish genome, which have been shown to posses histone methytransferase activity, and investigate their spatial and temporary expression features during vertebrate embryogenesis (PloS ONE, 2008). Based on these findings, the team selected one of these SET domain-containing genes, SETDB2 for further functional study. They show that the SETDB2 posses potential H3K27 trimethylation activity and function to restrict the dorsal organizer territory and regulates the left-right asymmetry through suppressing FGF8 signaling. The results provide a novel epigenetic mechanism in the regulation of dorsal organizer and left-right asymmetry during vertebrate embryogenesis (PNAS, 2010).

In 2009, Prof. Liu identified an evolutionarily conserved microRNA-144, specifically expressed in the zebrafish and mammalian erythroid progenitors and mature erythrocytes. The microRNA-144 can selectively regulate the synthesis of alpha-hemoglobin, but not beta-hemoglobin, through targeting the Kurpple's like transcription factor KLFD. On the other hand, the KLFD can transactivate the microRNA-144 expressing through binding to its proximal promoter, thus forming a intricate feedback regulatory network. The research indicates a novel genetic mechanism underlying the hemoglobin regulation by microRNA during erythroid differentiation (Blood, 2009).

Prof. Liu established a novel gene knockdown technology that is able to efficiently knockdown the expression of a given gene in a heritable and tissue-specific fashions, which has largely expanded the power of zebrafish as a developmental biology and disease models. The research results have been highly recognized by the zebrafish community worldwide. Up to now, there have been more than 40 laboratories from United States of American, England, Japan, Germany, Canada, French and Singapore around the word contacting us for further collaboration on this system (PloS ONE, 2009).

Since 2007, the laboratory has published many original researches results on the highly impacted scientific journals including *Nature Medicine, PNAS, Blood, Journal of Immunology and Journal of Biological Chemistry,* etc. The total number of published papers is 15 with a impact factor more than 109, one of which is patented. These original results help us not only to understand the developmental and genetic bases of blood development and diseases, but also provide invaluable tools and models for performing whole-animal high throughput screen in the future to screen and identify potential therapeutic drugs in collaboration with GuiYang Traditional Chinese Medical College, KunMing Botany Institute of Chinese Academy of Sciences and GSK Pharmaceutical Company.

Prof. Liu are awarded as several honors including “National Candidate for the New Century Millions of Talents Project” and “Mingzhi Ruye Life Science Award” in 2007, as well as “Fourth Shanghai Science and Technology Yong Talent Nomination Award” in 2008, and “ Tan Jiazhen Life Science Innovation Award”in 2010.

Dr. Zhou Xiangyu

Professor, Academy of Mathematics and System Sciences, CAS
PI of the Creative Research Group in 2004

Prof. Zhou’s work focuses on several complex variables and complex geometry. Under the support of the National Science Fund for Distinguished Young Scholars and the Science Fund for Creative Research Group of NSFC, Prof. Zhou has made numbers of achievements as the following:

Prof. Zhou and his team revealed the relation between the group version of Cartan-Serre’s theorem with the complexification conjecture of invariant domains, solved a rigidity problem on the automorphism groups which generalizes the well-known result for Reinhardt domains, and obtained some results on the structure and properties of holomorphic vector bundles and their cohomology over general Hopf manifolds; got some results on extension theorem and currents.

Prof. Zhou was awarded with several honors as the "Qiushi" Award for Young Scholars in 1998; the first class prize of the Natural Science Award of Chinese Academy of Sciences in 1999; S.S. Chern Mathematics Award in 2001; the second-class prize of the National Natural Science Award. He is an invited speaker of International Congress of Mathematicians in 2002 and received the National Science Fund for Distinguished Young Scholars in 1998 and the Science Fund for Creative Research Group of National Natural Science Foundation of China in 2004, 2007, 2011 as academic leader of the Group.

Dr. Qu Jiuhui

Research Professor, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing
PI of the Creative Research Group of China in 2006 and 2009

Dr. Qu Jiuhui's main research interests focus on the principles and application of sciece and technology for water quality and water purification. Under the support of the Science Fund for Creative Research Group of the NSFC during the years 2006 and 2009 named "Environmental Micro-interfacial Processes and Pollution Control", the following innovative achievements have been obtained:

With intensive study on species transformation on the micro-interfacial process, Dr. Qu advanced new scientific ideas for water pollution control and water purification. He found that some highly active species could be effectively generated on a special constructed heterogeneous interface and subsequently discovered some important microcosmic mechanisms of pollutant transformation in the aquatic environment. Based on these theoretical findings, Dr. Qu and his research team established a comprehensive technological system incorporating enhanced purification, safe supply and distribution, and tap-end protection to improve drinking water quality. The concept of this technological system was applied to many important water quality distribution and treatment engineering works including the infrastructure for the 2008 Beijing Olympic Games. These technologies have been applied to solve drinking water problems of 63 Chinese embassies and consulates.

Dr. Qu found that by-products produced from the reaction between natural organic matters (NOM) and specific active oxidants could be minimized by controlling the species change and regulation of special interfacial processes in water treatment. His research group also identified the correlating mechanism between coagulant (and adsorbent) species and the structure of natural organic matter. According to the findings, new technology was developed to minimize the formation of disinfection by-product (DBPs) during chlorination or oxidation in drinking water purification. This technological system has so far benefited more than twenty large-scale water treatment plants enabling them to meet state water quality regulations in the case of using micro-polluted source water.

Advancing the micro-interfacial principles for in-situ transformation of As(III) to As(V), Dr. Qu and his research team invented a series of novel composite adsorbents and new technologies for the simultaneous removal of As(III) and As(V). These novel adsorbents had high adsorption capacity, low costs and were easy to implement. Thus, his research successfully resolved the global puzzle of simultaneous removal of As(III) and As(V) from drinking water and river systems using practical methods. This technology has been implemented successfully and applied widely in China. Dr. Qu and his research group have continued to lead the development of effective treatment technology for the remediation of As-polluted water bodies. Based on these developed principles and methods of arsenic removal, application of the technology has been demonstrated in large and small scale drinking water purification plants in China. The achievements in this area were awarded with Dr. Qu and his research group the Project Innovation Awards, Globe Honor Award, International Water Association (IWA) and IWA East Asia Regional Project Innovation Awards in 2010.

Dr. Qu also won the National Science and Technology Advancement Award in both 2004 and 2006.

He was also awarded the Prize for Scientific and Technological Progress by the Ho Leung Ho Lee Foundation of Hong Kong in 2009. Dr. Qu is currently the director of the Research Center for Eco-Environmental Sciences (RCEES), the Chinese Academy of Sciences; the Member of the International Water Association Boards of Directors; Vice Chairman of All-China Environment Federation and the Member of the National Environmental Advisory Committee of China. He is served as the Chief Scientist of the 973 program “Research on the Process of Composite Pollution, Eco-toxicological Effect and Mechanism of Environmental Pollution Control and Remediation in Beijing-Tianjin-Bohai Bay Area of China”. He is also chaired as the PI of the Expert Panel for the Natioal Migh Technology Rerearch and Development Program project “Research and Demonstration on Emergency Technological System of Major Environmental Pollution Incidents”. He was elected as an academician of The Chinese Academy of Engineering in 2009.