南京大學
NANJING UNIVERSITY

Research at Nanjing University

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Research at Nanjing University

Nanjing University (NJU), one of China`s key comprehensive universities under the direct supervision of the Ministry of Education, can be dated back to 1902 when it was known as Sanjiang Normal School. During the following decades, NJU has gradually developed multi-disciplinary programs in humanities, social sciences, natural sciences, technological sciences, life sciences, modern engineering and management. Presently, NJU is comprised of over 25 schools and 71 departments, running more than 82 undergraduate programs, 213 master programs, and nearly 147 PhD programs.

In its over 100 years' history, NJU has cultivated a great number of prominent and learned figures, and thus has greatly contributed to the nation's revitalization and development. Many famous scientists and scholars have studied or worked here. There are over 31 members of Chinese Academy of Sciences (CAS) and Chinese Academy of Engineering (CAE) in this university. Among 1,107 CAS members elected from 1955-2007, NJU graduates cover nearly 1/5. Moreover, 117 NJU graduates have won National Distinguished Young Scientists Award since its founding in 1994.

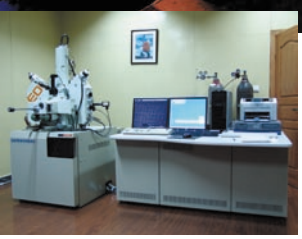
Nanjing University houses a good number of national innovative research bases.

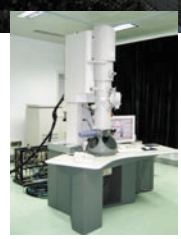
- National Laboratory: Nanjing State Laboratory of Microstructures
- State Key Laboratories: 1) SKL of Coordination Chemistry; 2) SKL of Solid State Microstructures; 3) SKL of Pollution Control and Resource Reuse; 4) SKL of Pharmaceutical Biotechnology; 5) SKL of Novel Software Technology; 6) SKL for Mineral Deposits Research.
- The Key Laboratories of Ministry of Education: 1) The MOE Key Lab of Coast and Island Development; 2) The MOE Key Lab of Mesoscopic Chemistry; 3) The MOE Key Lab of Mesoscale Severe Weather; 4) The MOE Key Lab of Analytical Chemistry for Life Science; 5) The MOE key Lab of modern acoustics; 6) The MOE Key Lab of Modern Astronomy and Astrophysics; 7) The MOE Key Lab of Model Animals and Diseases Research (in construction)
- National Engineering Research Center: National Engineering Research Center for Organic Pollution Control and Resources Reuse.
- Engineering Research Center of Ministry of Education: 1) Engineering Research Center of Protein and Peptide; 2) Engineering Research Center of Water Treatment and Restoration of Water Environment

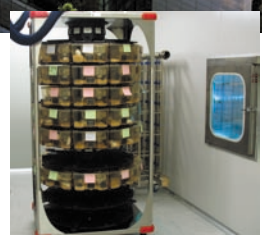
In recent years, NJU has undertaken dozens of state key projects. And the quality and quantity of research papers cited by Science Citation Index (SCI) ranks top among the Chinese universities. Over the past decade, NJU has acquired more than 800 national, provincial and ministerial awards for research. In 2006, NJU won the National First Prize, which is the highest award for natural scientific research in China.

Besides basic scientific research, NJU puts a lot of efforts in applied scientific research and engineering to promote the economic and social development of China. Since 2005, in collaboration with local governments, NJU has set up over 13 institutes to boost the industry-academia cooperation and local economy, relating to such areas as new materials, electronic information, bio-pharmaceuticals, environment & resources, and fine chemicals.

Nanjing University strives to be a world-leading international, comprehensive and research-oriented university.







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State Key Laboratory of Coordination Chemistry

The State Key Laboratory of Coordination Chemistry (SKLCC) was founded and started receiving applications from both domestic and foreign researchers in 1990. The official approval as the state key laboratory came in 1991. The SKLCC has been awarded "A-level" laboratory by the United Evaluation Committee of the country in 1995. It ranks in top ten among all the state key laboratories of chemistry and chemical engineering during the countrywide evaluations in 1999, 2004 and 2009, respectively.

The SKLCC has 38 faculty members, including 27 professors, 8 associate professors and one academician of the Chinese Academy of Science (Prof. Xiao-Zeng YOU). The laboratory is well equipped with most of the modern analytical instruments and a well-trained technical team is capable of providing all required services for research. The SKLCC has been focusing mainly on the basic researches covering the key areas of coordination chemistry: functional coordination chemistry, bio-inorganic chemistry, organometallics, nano-science as well as the surface and interface chemistry. The researches are closely relevant to the material science and life science. A series of research achievements have been accomplished in the synthesis and characterization of coordination compounds with electric, optical, magnetic, and biological properties, and in the assembly of supramolecular compounds and nano-sized materials. The laboratory has won several major national natural science awards and many other ministerial or provincial awards. Each year since its establishment more than 200 research papers are published in the world-recognized journals .

The SKLCC has close collaborations and scientific exchanges with domestic and foreign scientists and has hosted many national and international conferences. It has trained more than 600 graduate students for PhD and MSc degrees since its establishment.

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State Key Laboratory of Solid State Microstructures

As one of the major labs approved and funded by the National Planning Commission of China in 1984, it was established and ratified in 1987. State Key Laboratory of Solid State Microstructures is divided into four divisions: observation of microstructures, spectroscopy and physical properties fabrication, tile study of new materials and condensed matter theory. They are composed of 17 research groups.

The lab covers researches on distribution, interaction, fabrication and transformation of microstruetures at different levels. Special attention is paid to the relationship between the microstructures and the physical properties. With the help of the experimental methods of state-of-art, various kinds of microstructured materials are designed and fabricated. The physical process and effects therein are investigated. New functional materials with expected microstructures and performance are designed and developed via various modern techniques.

The mission of the lab is to develop experimental techniques and methods of fabrication, observation and measurement of the microstructured materials, to study physics of defects and phase transition, and to establish theoretical methods and computing techniques of solid state microstructures. By revealing the links between microstructures of the materials and physical properties, it is expected to control the solid state microstructures , which can be used in their applications. At present the materials under investigation in NLSSMS include solid thin films, muhilayered films, nanosized and cluster materials, dielectric superlattice and semiconductor superlattiee, high Tc superconductors, liquid crystals, polymers, and colloids, etc.

The lab is always classed among the highest rank in every assessment of the State key labs undertaken by government agencies. It was mentioned by the world-famous scientific journal "Nature" as an institution in Asia(outside Japan) with research standard approaching world-class [Nature, 389 (1997) 113].

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State Key Laboratory of Pollution Control and Resource Reuse

Relying on the research resources of environmental science & environmental engineering of Tongji University and Nanjing University, the State Key Laboratory of Pollution Control and Resource Reuse offers an important platform of research and teaching for 3 national key disciplines (including Environmental Engineering, Environmental Science and Municipal Engineering) and 7 Ph.D. programs. The laboratory, which was founded in 1991 with the approval of the State Planning Commission in 1989, formally commenced operation in 1995 after the national level acceptance. The Laboratory passed twice the national evaluation in 2000 and 2005. The Director of Laboratory's Academic Committee is Professor Hao Jiming, Academician of CAE, and the director of the Laboratory is Professor Zhao Jianfu. Professor Li Aimin, Associate Director of the laboratory, presided over the work of Nanjing Branch Office.

Based on the strategic demands of the country, targeting the state-of-the-art science and technology, and guided by the National Long- and Medium-term Program of Sci-Tech Development Planning, the laboratory gives priority to the major common environmental pollution issues arising from the rapid economic development and urbanization process. Combining basic and applied researches in the field of pollution control and resource reuse, the laboratory has conducted extensive innovative and interdisciplinary research and has developed a series of pollution control and resource reuse technologies with independent intellectual properties in such fields as municipal wastewater advanced treatment, industrial wastewater management and reuse, domestic refuse disposal and reuse, environment restoration and watershed pollution control, etc. Nowadays, the laboratory has become a globally recognized environmental and technological innovation platform, international cooperation and exchange center as well as high-quality talent training center.

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State Key Laboratory of Pharmaceutical Biotechnology

The State Key Laboratory of Pharmaceutical Biotechnology affiliated to Nanjing University was approved by the State Planning Committee and the State Education Committee in 1990. With the financial loan of 1.15 million US dollars from World Bank, the lab was established in 1990 and passed the authentication in 1995. In 2001 and 2006, the lab successfully passed again the regular authentication sponsored by the State Education Committee.

Currently, this lab has formed a stable and talented research group. Among 53 fulltime research fellows, 27 are professors. This lab focuses on the fundamental and application studies in cardiovascular diseases, immunological diseases and metabolic diseases. Based on the research platforms of drug source molecule, bioinformatics, animal model of human diseases, the lab want to uncover the pathogenesis mechanisms of major diseases, to identify the new drug targets and to develop novel, original, high quality drugs with independent intellectual properties. Since 1995, the lab has entailed 14 Major national "973" scientific research programs, four national scientific climbing plan programs, 17 "863" national scientific research programs, six National Science Fund for Distinguished Youth Scholar programs, one excellent scientific innovation group program,136 national science foundation programs and 124 horizontal cooperation programs. Until now, 1343 research papers were published including 983 "SCI" papers, 28 treatises were published, 73 patents were issued including two American patents. The lab also received three National Scientific Awards (second class), one National Science and Technology Award (first class) and one National Scientific Award (first class).

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State Key Laboratory of Novel Software Technology

The Laboratory of Novel Software Technology at Nanjing University was established in 1978, based upon years of researches conducted by the Department of Computer Science and Technology and the Institute of Computer Software of Nanjing University. In 1990, it was officially recognized as one of the State Key Laboratories, and was opened to researchers from all over the world since then.

Other than basic scientific problems in the field, the laboratory focuses on the research and application of novel software technology, which can be divided into three levels: the exploration of new software methods and technologies, the research and development of software technologies and the application of new technologies and software product development. Among the main research directions are: new-style programming and methodology, distributed computing and parallel processing, software quality assurance and automation, operating system and information security, supporting technology of intelligent software and multimedia software. Recent works include the subjective and dependable framework of software methodology, supporting technology of machine learning and intelligent software, supporting technology of pervasive computing and application, human-oriented processing technology and the application of multimedia information. It aims to develop a series of supporting system for Internet-oriented applications, by means of software methodology and machine learning.

The Laboratory has been supported by funding of more than four hundred projects, and has won more than sixty prizes at national or ministerial level with a number of papers of high quality published, which have been cited and commented by peer researchers from all over the world. The laboratory has made effort to broaden positively the application of scientific achievements, and has been granted a number of patents and software copyrights. The Lab has been playing a role in the development of the economy and society of the country.

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State Key Laboratory for Mineral Deposits Research

The State Key Laboratory for Mineral Deposits Research is affiliated to the Department of Earth Sciences, Nanjing University. This laboratory started its construction in 1991. In October 1995, this laboratory was approved by the Ministry of Science and Technology of China. Academician Prof. Wang DZ, Prof. Zhu JC, and Prof. Ma DS are former directors of the laboratory. The present director is Prof. Jiang Shao-Yong, and the present chairman of the Scientific Committee of the laboratory is Academician Prof. Chang Yang-Fu. The laboratory has now 59 permanent staffs, among whom there are one Academician of Chinese Academy of Sciences, seven laureates of the National Science Foundation for Outstanding Young Scientists and five laureates of the Changjiang Scholarship Professors.

The research objective of the laboratory is to understand the mechanism of mineralization, as well as to employ ore-forming theory to guide mineral exploration. The researches carried out in the laboratory are mainly focused on the following three aspects: 1) study of distribution of mineral deposits, ore geneses and mineral exploration, in particular for those metal resources that are urgently needed or are most abundant in China. Currently our research emphases are on geo-fluids and the large-scale mineralization and formation of giant ore deposits. 2) basic geological study related to mineralization. Current research emphases are on the crust-mantle evolution and petrogenesis of granite and volcanic rocks, in particular in south China and its surrounding areas. 3) basic geochemical study related to mineralization, with emphasis on the elemental and isotopic behaviours during geological events and global environmental changes in the Earth history.

The laboratory is equipped with a large variety of state-of-art analytical instruments capable of making composition and structure analysis on all kinds of geological samples, in particular trace and rare earth element analysis, stable and radiogenic isotope analysis, fluid inclusion study, and high-pressure, high-temperature experimental work.

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State Key Laboratory of Analytical Chemistry for Life Science

This key laboratory was established in 2004. It focused mainly on fundamental research. In 2008, the laboratory was awarded "Excellent Class" in the appraisal by the Education Ministry key laboratories of chemistry. In 2009, it was further honorably nominated for the appraisal of National Key Laboratories of Chemistry, and was given good results. And in 2011, the laboratory was approved by the Ministry of Science & Technology to be a State Key Laboratory. Now the researches of the laboratory concentrate mainly on five fields, including bioelectroanalytical chemistry, characterization and construction of biofunctional materials and interfaces, biological analysis and molecular diagnostics, molecular recognition and separation, and drug and environmental toxicological analysis.

In 2005 this laboratory was awarded "Creative Research Groups" from National Natural Science Foundation of China and has been granted successive funding since then. Such marked achievement relies on the great work of this academic group. The academic team is featured with high education level, full professional configuration, active academic thinking, reasonable age structure, sound unity and cooperation, and multi-disciplinary. There are 31 researchers in this academic group, including one academician, two Changjiang Scholars, three outstanding young scientists, and five new century excellent talents. A majority of the group members are young doctors. During 2004 to 2009, the laboratory achieved great scientific research success, including 729 SCI publications (389 of them were published in journals with IF higher than 3.0), 74 patents (37 of them were authorized),three 3 academic books (in both English and Chinese), seven academic chapters (in both English books and Chinese books), one "2nd class" of National Natural Science Awards, two "1st class" of Natural Science Awards by Education Ministry of China, one "the Science and Technology Awards of the Ho Leung Ho Lee Foundation", four "2nd class" of Scientific and Technological Progress Prize of Jiangsu Province, and two "1st class" of Scientific and Technological Prize (CAIA Prize) of Chines Association for Instrumental Analysis.

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The MOE Key Laboratory of Coast and Island Development

The Key Laboratory of Coast and Island Development, Ministry of Education of China, are educationally and academically strong in the area of coast and continental margins, mainly focusing on the following fields: marine geomorphology and sedimentology, coastal zone ecology and environmental changes, the land-sea interaction, marine geographic information system and coastal zone disasters and management.

The key lab is equipped with advanced field survey devices, such as GPS navigation system, acoustic sonar & seismic profilers, wave & current maters, core penetrators and samplers, sediment analysis system, dating system and marine GIS system. Current study areas are mainly along coastal zones and inner shelf. Researches focus on coastal environment-resource issues, evolution history of the radial sandy ridge field, coastal plain in the South Yellow Sea, site selection of deep water harbors, coastal environmental impact assessment of Bohai Sea and the Digital South China Sea. The lab has close academic relationship with universities from Canada, U.K. and U.S. in the area of marine sciences.

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The MOE Key Laboratory of Mesoscopic Chemistry

The key laboratory of mesoscopic chemistry of MOE was founded in 2003 on the basis of the state key discipline of physical chemistry. The laboratory advocates interdisciplinary cooperation, and mainly concentrates on experimental and theoretical study on the design, controllable construction and functionality of mesoscopic system. There are 35 researchers in the lab including three academicians of Chinese Academy of Science, two Cheung Kong Scholar professors, five gainers of NSFC funding for outstanding young scientists, and five young scientists affiliated to the new century's excellent talent project of MOE, as well as an Innovative Research Team in University of MOE.

In the past few years, some first-class findings with worldwide influence have been achieved, which deal with the studies on mesoscopic systems concerning the quantum chemistry method, the growth mechanism, controllable synthesis and assembly as well as the functionalization and application especially for catalysis. Most of these achievements have been accomplished in connection with the performance of the national key projects related to energy, environment and life science, which were fulfilled in the lab. The lab has gradually formed its own character of persistence on fundamental understanding, openness to multiple viewpoints and disciplines, tight coupling of theory and experiment, the application-oriented motivation and the discovery of new phenomena.

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The MOE Key Laboratory of Mesoscale Severe Weather

The MOE Key Laboratory of Mesoscale Severe Weather (LMSW) was built in the period from 1991 to 1995. Later in the year of 2000, it has been evaluated as a key laboratory of the Ministry of Education(LMSWE). The Laboratory now is one of the famous institutes in China researching on relevant fields of mesoscale severe weather.

At present, the setup of LMSWE consists of ⑴Severe Weather Observatory; ⑵Mesoscale Dynamics and Numerical Simulation;⑶Severe Weather Prediction Department;⑷Computer and Internet center. The laboratory has so far achieved remarkable results on Mesoscale Frontal Dynamics, Boundary Layer Dynamics, Severe Convective Storm Dynamics and Numerical Simulation, and has also won many different kinds of prizes in science and technology progress, ranging from national to provincial levels. Meanwhile, the laboratory has gained significant achievements on Doppler weather radar data analysis.

During the last five years, the specialists of LMSWE had undertaken many key projects on atmosphere science. The laboratory has already won a large amount of awards, including national science and technology progress prize and provincial science progress award.

While accomplishing many research tasks, the laboratory has fostered many senior talents on mesoscale meteorology in China, including a number of masters, doctors, post doctors and foreign doctors. For many years the laboratory has cooperated closely with other national or foreign academic institutes. Fruitful results have been obtained and those activities do promote its unique influence home and abroad.

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The MOE key Laboratory of Modern Acoustics

Key Laboratory of Modern Acoustics in Nanjing University founded in 1954 has become a main acoustic college as a teaching and research base. It is the only laboratory that has undergraduates and the state acoustic key discipline. Currently it has a complete talent-training system from undergraduate to doctoral, post-doctoral at all levels of acoustic, covering the majority of basic and applied research on acoustic sound. The overall academic standards are among the best in the country, and it also enjoys a high academic reputation. As a key basic research acoustic laboratory and acoustic Talent Development base, our laboratory leads the development of world science and strengthens basic acoustic research. Meanwhile, the laboratory extends the scope of the practical application, meets the strategic needs of the country and makes a significant contribution to economy and society. There are five major research areas: 1) effects of ultrasound in medical life science applications; 2) New Materials Preparation and Characterization of ultrasound; 3) the physics of acoustic stealth technology and applications; 4) Audio and Video Information Processing technology; 5) complex structure characteristics of sound propagation. Close and fruitful international cooperation and exchange are the advantages of this laboratory: Ministry of Science and Technology cooperation on the EU commitment to special projects; participation in the Motorola's Global University Program, University of Western Australia's combination with successful applicants from National Natural Science Foundation of the "two bases" of overseas cooperation projects; joint application of University of Leuven, Belgium Ministry of Science and the scientific and technological cooperation projects in the Government of Belgium.

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The MOE Key Laboratory of Modern Astronomy and Astrophysics

With the approval of Ministry of Education in 2006, Nanjing University had made preparation for the setting of "Key Laboratory of Modern Astronomy and Astrophysics, Ministry of Education" based on "the Professional Laboratory of Astronomical Data Analysis and Computational Physics", which was completed in June, 2009. This laboratory relies on the national key majors of astrophysics, astrometry and celestial mechanics with about 25 researchers.

The main research directions are as follow:

1. High energy astrophysics. The main research focuses on supernova (SN) and supernova remnant (SNR), gamma ray bursts, compact objects and some related high energy astronomy phenomenon.
2. Solar active region physics. The main research focuses on the solar active features' 3-dimensional structure and evolution, as well as the magneto-hydrodynamics process within the solar active region.
3. Active galaxy and cosmology. The main research focuses on the star bursts and galaxy near by Galaxy, active galactic nucleus, and cosmology evolution, etc.
4. Non-linear celestial mechanics, planetary formation and dynamics evolution. The main research focuses on the chaos phenomenon, stability and orbit diffusion law in Hamiltonian system. The research methods and results are used for the research of planetary formation and non-linear science.
5. Deep space exploration and aerospace dynamics. The main research focuses on the motion law of natural object (asteroid and satellite) and artificial object, as well as its stability, orbit resonance, the theory of N-body dynamics evolution and numerical computation, etc.
6. Astronomical optics. The main research focuses on the astronomical instruments and techniques, especially on the development of astronomical telescope in optics system, and we manage to take part in the national astronomical key projects.

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National Resource Center for Mutant Mice

National Resource Center for Mutant Mice (NRCMM), affiliated to Nanjing University, is currently the largest depository for mouse strains in China. It also provides the best transgenic and gene-targeting service in Asia.

With 481 strains on stock, NRCMM has distributed more than 70,000 genetically engineered mice to both research institutes and commercial companies in the past five years. These mice includes disease models for cardiovascular diseases, tumor, metabolic diseases and immunodeficiency, as well as neurodegenerating diseases. NRCMM also provides services for importing/exporting mouse models. In the last two years, transgenic core of NRCMM has generated more than 70 transgenic strains and more than 130 knockout mouse strains for hundreds of laboratories in China. NRCMM also offered transgenic mice services for institutes and companies in USA, UK and Australia in the last two years.

In October 2009, AAALAC International accreditation was renewed. Our quality control system of NRCMM is highly appreciated by our collaborative partners.

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Institute for Climate and Global Change Research

The Institute for Climate and Global Change Research (ICGCR) of Nanjing University was approved to be established in July, 2009, with integrated advantages of multi-disciplines at Nanjing University and the urgent needs of China's socio-economical development. The institute is a university-level cross-disciplinary research body with scientists in atmospheric sciences, earth sciences, geographic sciences, environmental sciences, remote sensing sciences and biological sciences as well as economic and social sciences. It will be developed into a key entity in China to conduct research on key issues related to climate and global change. Meanwhile, through interdisciplinary collaboration as well as extensive cooperation with international and domestic top research institutions and organizations, ICGCR will also be developed into an international academic exchange center and a training base for innovative talents in the field of climate change in China.

Based on current distinguished features and advantages in the fields of monsoonal regional climate and environment research at Nanjing University, through field campaign, regional modeling and technology development, the scientific objectives of ICGCR are to understand the key processes of the change of the earth system (including the atmosphere, the hydrosphere, cryosphere, lithosphere and biosphere), and the effects of human activities, to uncover comprehensive disastrous, environmental and resource effects of the change in East Asian monsoon climate system, and to develop new theories, methodologies and technologies for disaster prediction, impact assessment, and human mitigation and adaptation related to climate change in China. These studies will definitely provide solid scientific support for the policy makings concerning the national/local government's disaster prevention and reduction and in dealing with climate change, and eventually for the sustainable socio-economical development.

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List of Major Research Teams

1	Fabrication and Physical Properties of Novel Microstructured Materials	Supported by National Science Foundation of China
2	Geochemistry of Rock-forming and Ore-forming Processes During Lithosphere Interaction in South China	
3	Studies on High Energy Processes in Astrophysics	
4	New Type Low Dimension Quantum Structure and Devices	
5	Study on New Analytical Theory and Methods for Life Chemistry	
6 *	Functional Coordination Compounds	
7 *	Research on Software Methodology and Technology for Internet	
8	Drug Candidates & Their New Mode of Action	
9	Study on New Optical Effect in Artificial Micro/ Nano Structures	
10	Studies on the Microstructured Materials and Opto-electronic Devices	Supported by Ministry of Education
11	Acoustics and Signal Processing in Complicate Medium	
12	Controllable Construction and Functionalization of Some Specific Mesoscopic Systems: Experimental and Theoretical Studies	
13	Theoretical Studies on the Condensed Matter and Interdisciplinary Physics	
14	Development, Aging and Animal Models	
15	Eco-materials and Renewable Energy Research	
16	Differential Equations and Dynamical Systems	
17	Pollution Control and Resource Reuse of Toxic Pollutants	
18	Novel Electromagnetic Materials and Devices for Information Application	

* Supported by both National Science Foundation of China and Ministry of Education.

Research Theme:

Fabrication and Physical Properties of Novel Microstructured Materials

Research Content:

The subjects are mainly the fundamentals in designing novel microstructrured materials, including structural designing, fabrication methodology, growth mechanism, physical properties and the potential applications. More specifically, on nanometer scale, we focus on band structure, transport property and spin states of molecules, organic macromolecules, clusters, quantum dots, heterojunctions and superlattices; on the scales of micrometer and sub-micrometer, we focus on the excitation and transmission of electromagnetic and elastic waves in domain structure, phase structure and heterostructures. Combining advanced experimental methods with theoretical and computational studies, we introduce inhomogeneous artificial microstructures into homogeneous materials, and design the electron, photon and phonon band structures of the materials. In this way, we are expected to achieve the specific physical functions with the specially designed microstructured materials.

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——Major Research Teams

Research Theme:

Geochemistry of Rock-forming and Ore-forming Processes During Lithosphere Interaction in South China

Research Content:

This project focuses on the crust-mantle interaction and its constraints on large scale magmatism and large scale hydrothermal mineralization in south China. Using state-of-art geochemical methods, we aim to study the characteristic and evolution of south China block through geological history particularly in the Mesozoic period, to reveal the geodynamic setting of south China and to solve the petrogenesis of granite and basalts and ore genesis of hydrothermal ore deposits in south China. Main topics include: (1) Crust-mantle interaction and genesis of granites and volcanic rocks in south China. We aim to construct the temporal and spatial framework of granites and volcanic rocks in SE China, to recognize the existence and scale of crust-mantle interaction in south China and to obtain information on large scale magmatism and its tectonic setting in Nanling Mts, material constitutions and formation ages of Precambrian basement and crust accretion in south China block. (2) Crust-mantle evolution and formation processes and mechanisms of hydrothermal ore deposits in south China. We aim to focus on crust-mantle interaction and their effects on large scale mineralization in south China. Major focus will be on studies of massive sulfide deposits, tin deposits and uranium deposits in south China. (3) Development and application of the state-of-art geochemical and isotopic methods and their use in solving geological problems in south China.

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Research Theme:

Studies on High Energy Processes in Astrophysics

Research Content:

Under the support of this fund, we have done researches related to high-energy processes in astrophysics, including gamma-ray bursts, X-ray binaries and supernova remnants, solar high-energy activities and high-energy phenomena in active galaxies. We have made important progress in some of these researches, the highlights of which are shown below:

1. Gamma-Ray Bursts: We proposed a new model for the central engine of GRB X-ray flares, i.e. X-ray flares can be produced by differentially rotating, millisecond pulsars after the mergers of binary neutron stars. We originally proposed the GRB cosmology study. We proposed that it may be generated by the tidal disruption of a star by an intermediate mass black hole. In this model, the GRB will not be associated with any supernova. The theoretical energy release is also consistent with the observations of GRB 060614. We published a couple of papers on high-energy emission from gamma-ray bursts.

2. X-ray binaries and supernova remnants: main works include investigations on the formation and evolution of various types of compact star binaries and investigations on the possible influence of supernova fallback disks on the observations of young compact objects. Our Chandra observations of the thermal composite Supernova remnant (SNR) 3C391 reveal a highly clumpy hot-gas structure and derive a uniform spatial temperature and density distribution. We found the synchrotron index softening of the pulsar wind nebula in SNR N157B.

3. Solar high-energy activities: main works include high Energy Particle Diagnostics based on Optical Spectral Lines. A Mechanism for EIT Waves was Proposed. Improvement of the Magnetic Reconnection Model. Promoting the French-Chinese Space Mission “SMESE”.

4. High-energy phenomena in galaxies: We present the Spitzer Space Telescope InfraRed Array Camera (IRAC) and Multiband Imaging Photometer (MIPS) observations for a nearby sample of elliptical galaxies. By using the population synthesis models to derive ‘pure’ emission-line spectra for a nearby Seyfert 2 galaxies, we explore the relation between the nuclear nebular components and the stellar population properties.

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——Major Research Teams

Research Theme:

New Type Low Dimension Quantum Structure and Devices

Research Content:

We will insist on the combination of material, devices and physics,the combination between theory and experiments, development of the research in the three directions of semiconductor heterostructure and devices, nanostructure and nanoelectronics, and novel quantum structures and devices, centering the topic of new low dimension quantum structure and devices. We will discuss and investigate the common science questions, especially construct the entire knowledge, and try our best to make breakthrough in the important science questions. We expect that we would obtain important success in key areas including the semiconductor lighting engineering materials and devices, Si nanostructure and devices, spin transportation and new devices etc..

Keywords: low dimension quantum structures; semiconductor heterstructures; nanoelectronics;quantum transportation.

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Research Theme:

Study on New Analytical Theory and Methods for Life Chemistry

Research Content:

This group will focus its research on the key scientific problems in life science study by developing new analytical methods, technologies and equipments. The research work contains three fields: bioanalytical chemistry; assembly, characterization and biosensing of bionic interfaces; and microfluidic bioanalytical systems and pharmaceutical analysis. Through cooperation among the members of the creative research group and the use of the advantages of cross-disciplinarity, this project aims at developing novel analytical methods and technology for in situ and real time detections of life-related species and revealing some important internal chemical process and signal transduction mechanisms in life activities, which will promote the development of life science research and diagnostic technology of diseases. Meanwhile, these works will further deliver the results with knowledge property right in new theory, new methods and new technologies in analytical chemistry for life science, enhance the international influence of the creative research group, and establish an excellent research group in life analytical chemistry top-ranking in China and even in the world.

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——Major Research Teams

Research Theme:

Functional Coordination Compounds

Research Content:

This research team focuses on inter-disciplinary topics of materials, biology and environmental science etc. To achieve special physical properties, by controlling inter- or intra-molecular interactions, molecular recognitions, synergistic effects and following the rules for molecular self-assemblies, sophisticated ordered molecules with specific structures will be prepared and the relations between functionality and structures will be investigated. The applications for coordination compounds on moleculesions, molecular switches, and molecular machines will be explored. The focus of the project is on the studies on coordination complexes with special optical, electric, and magnetic properties in order to achieve useful molecular materials related to high technologies. The design and synthesis of model compounds of metalloenzymes, new probes for biological metal ions and novel metal-based drugs is another major focus of the project. Novel coordination compounds with desired structure and properties will be studied as analogues of cisplatin or ferrocenes. The effects of metal complexes on disease diagnosis, treatment and their interactions in biological systems will be investigated.

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Research Theme:

Research on Software Methodology and Technology for Internet

Research Content:

The pervasiveness of the Internet makes the environment faced by software systems much more open and more dynamic than before, which raises great challenges of flexible and trustable sharing, integration and coordination of various resources in such an environment. As a step towards and an answer to the challenge, this research is aimed at a new paradigm of Internet software systems, named "Software Web" or "Internetware", which is featured by autonomy, reactiveness, flexibility, and evolvability of both the constituents and the resulting systems. Related theories, models, methods and techniques of the Software Web will be investigated by integrating results from different areas such as software agents, artificial intelligence, formal methods and networking. Our main efforts will be put in the fundamental structures and mechanisms of software agents, working architectures for the Software Web, machine learning and self-adaptation techniques, and corresponding software frameworks and middleware platforms.

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——Major Research Teams

Research Theme:

Drug Candidates & Their New Mode of Action

Research Content:

The efficient discovery of novel bioactive natural products is one of the cores in medicinal chemistry and biology. The aim of our group is to find novel drug candidates and their new mechanism based on the intercross of natural product chemistry, biochemistry, pharmacology and immunology. To achieve this goal, a new methodology has been applied to find out bioactive drug candidates in both microbes and plants harboring in special environment. We are also very interested in the discovery of immunosuppressants with good selectivity based on the molecular mechanism in immune response, and in the development of a new methodology on new immuno-regulation. Since 2003, our group have published 231 papers (half of which were published in top or core journals in relevant fields), which have been cited 757 times by others. We have got one international, one National Science, three provincial or ministry, and two international meeting awards.

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Research Theme:

Study on New Optical Effect in Artificial Micro/Nano Structures

Research Content:

This project aims to study the interaction between the light and the electron, exciton and other elementary excitations in micro/nano structures, to manipulate the photonic excitation and propagations beyond the diffraction limit, to explore the optical excitation, propagation and related coherence effect, and study of the new optical effects on quantum confined structures, as well as to provide a road map and foundations for implementation of all-optical and electro-optical hybrid functional material and micro/nano devices.

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——Major Research Teams

Research Theme:

Studies on the Microstructured Materials and Opto-electronic Devices

Research Content:

The mission of this project is to develop novel optoelectronic devices through the artificially micro-structured materials. We will design and process the artificial microstructures of the multi-domains, hetero-structures, alternative crystal orientations, and multi-phases in crystals, which modulate spatially in 2D or 3D with physical properties of the piezoelectric, nonlinear optic, elastic, dielectric, and electro-optic coefficients etc. We will explore novel optoelectronic effects that the single crystals and uniform materials don't have. Among these microstructured materials, we focus on the optical superlattice QPM material with the nonlinear optic coefficient modulated, photonic crystals with the dielectric coefficient modulated, and sonic crystals with elastic coefficient modulated, etc..

With the progress of nanotechnology, many abnormal effects have been revealed by artificially structured materials, exemplified by semiconductors quantum well superlattices, superconductor Josephson junctions, and metal superlattice giant magneto-resistance, etc., which helps to manipulate the properties by artificial structure at nanometer and micrometers order. We develop the theory to model and design the desired photo-electronic effects with special microstructures, a technology to prepare designed structure and method to test the performances of these prepared micro-structured materials. With these innovations, we search for the materials and devices to use photon to perform the information receiving, processing, transferring and displaying through the manipulation of photon's amplitude, phase, frequency, polarization and entanglement.

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Research Theme:

Acoustics and Signal Processing in Complicate Medium

Research Content:

(1) Bioeffects induced by ultrasound and its application in bio-medical fields: ultrasound propagation and bioeffects in tissues, nonlinear acoustic imaging techniques, modern ultrasonic diagnostic and therapeutic techniques, design of new devices and instruments, and investigation on new prospectives.

(2) New material fabrication and characterization with ultrasound: mechanisms of photoacoustical, photothermal and thermoacoustical effects; new methods and technologies, as well as applications in engineering and non-destructive evaluation; characterization of the macro/micro-structures.

(3) Physical mechanisms and applications of acoustic and electromagnetic cloaking techniques: physical mechanisms of invisibility to acoustic and electromagnetic waves, and applications in cloaking metamaterial fabrication; implementation of selective transmission or absorption of acoustic waves by designing various structures of materials; developing periodic layered structure.

(4) Audio/video information processing technologies: acoustic properties of radiation, transmission, reception, and perception within the audible frequency range; mechanisms of the interaction between acoustic waves and surrounding materials; novel phenomena induced by the interaction between audible acoustic waves and other materials; new acoustic signal processing methods, audio acoustic devices and acoustic test equipment.

(5) Propagation of acoustics in complicate medium: propagation properties of acoustic wave in complicate medium and the information extraction technologies; theoretical models of composite ultrasonic transducers with periodic structure.

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——Major Research Teams

Research Theme:

Controllable Construction and Functionalization of Some Specific Mesoscopic Systems: Experimental and Theoretical Studies

Research Content:

Mesoscopy is the bridge connecting microscopy with macroscopy, which is a new field in today's chemical research beyond the molecular frontier. This innovative research team, affiliated to the Key Laboratory of Mesoscopic Chemistry of MOE, concentrates on the experimental and theoretical study on the growth mechanism, controllable construction and functionalization of some selected important mesoscopic systems in three aspects. 1) Quantum chemistry methods and molecular dynamics, as well as the structure-property correlations for mesoscopic systems. 2) Growth mechanism, compositional and structural regulation of typical nanotubes (e.g., carbon-based, oxide and amorphous alloy nanotubes) and one-dimensional group-III nitrides, as well as the controllable assembly of two-dimensional bionic membranes. 3) Energy-, environment- and bionic sensor-oriented functionalization.

In the past few years, some first-class results with worldwide influence have been achieved and most of which have been accomplished in connection with the performance of the related national key projects. The research team have gradually formed its own character in persistence on fundamental understanding, the openness to multiple viewpoints and disciplines, the tight coupling of theory and experiment, the application-oriented motivation and the discovery of new phenomena.

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Research Theme:

Theoretical Studies on the Condensed Matter and Interdisciplinary Physics

Research Content:

1. Strongly Correlated Systems and Unconventional Superconductivity

Charge and spin dynamics, the competition and coexistence of ordered phases in strongly correlated electron systems; the physical properties and superconducting mechanism in unconventional superconductors.

2. Restricted Quantum System and Low-dimensional Physics

Our recent interests focus on charging and spin transport properties in mesoscopic and normal/superconductor hybrid systems by using Keldysh Green's function technique. The basic questions we ask are: how to predict electric current flowing through a nano-device connected to the outside world by metallic electrodes? How does the interaction between electrons affect the current-voltage characteristic of a mesoscopic system? How to use the electron spin degree of freedom to design new quantum devices? These problems are directly relevant to the future microelectronics technology.

3. Interdisciplinary Physics related to condensed physics

The physical properties and mechanisms of protein folding, association and aggregation processes. The physical interactions between protein systems and various ingredients (such as ion, RNA and so on). Large-scale simulations of protein kinetics. Simplification and Physical Modeling of protein systems. The tempo-spatial patterns and their physical mechanisms of neuronal networks The physical mechanisms for the Selectivity and Robustness of signal transduction in biological regulatory networks.

Phase transitions and dynamics in complex fluids such as colloid and polymers, lateral organization in protein-membrane complexes, and nonequilibrium self-organization in living soft matter such as cellular cytoskeleton and self-propelled particles.

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——Major Research Teams

Research Theme:

Development, Aging and Animal Models

Research Content:

1. The relationship of circadian rhythms and tumor and its mechanism

Circadian clock is closely related to human life and health, and it regulates nearly all functions of the body such as behavior, physiological processes and metabolism in a significant daily rhythm manner. Recent reports has shown that circadian can affect cell cycle and apoptosis. Our primary data suggests that dysfunction of circadian rhythm might regulate carcinogenesis. Further study will be conducted to systematically dissect this regulation

2. The signal transduction during cardiovascular development

Unveiling the signal transduction regulatory details involved in cardiovascular development and remodeling will bring us closer to the big picture of heart development and cardiovascular diseases. Based on our previous results, we will focus on the function and mechanism of signal pathways involved in cardiovascular development that regulated by kinases like Akt, MAKP/p38 and phosphotase like PP2A.

3. The molecular mechanism of metabolism and senescence

The organism goes into senescence as soon as the organism develops into adulthood, while metabolism is involved in all the time of development and senescence. The study of the molecular regulatory mechanism of metabolism and senescence will shed light on the understanding of the processes of diseases and health of our body. Meanwhile, it will also help us to know the process of development from another angle. Based on our previous results, we will focus on the molecular regulatory mechanism of BDNF, PAX6 and PP2AC in metabolism and senescence and its relationship with development.

4. Establishment and study of more animal models of disease.

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Research Theme:

Eco-materials and Renewable Energy Research

Research Content:

(1) We study the effects of micro- and nano-structure of photocatalysts on photocatalytic properties and plasmonic photocatalyst.

(2) We will study the photocatalytic reduction of CO_2 using solar energy, and search for a new method to obtain renewable energy.

(3) On the basis of photocatalysis, we will study novel solar cell with nano- and micro-structure, and the application of the noble-metal and semiconductor composite materials on fuel cell.

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——Major Research Teams

Research Theme:

Differential Equations and Dynamical Systems

Research Content:

Our team will focus on various problems in Hamiltonian dynamical systems, differential dynamical systems, ergodic theory, topological dynamical systems, infinite dimensional dynamical systems, stochastic dynamical systems, complex dynamical systems, fluid dynamics, geometric analysis, numerical PDEs, and spectrum theory of Schrodinger operators.

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Research Theme:

Pollution Control and Resource Reuse of Toxic Pollutants

Research Content:

(1) Adsorption technology

We are interested in developing new resin adsorption technology for water treatment.

(2) Environmental Nanotechnology

We aim at preparing highly efficient environmental nancomposites and elucidating the interplay between the targeted pollutants and the resultant materials. Besides, we are interested in proposing nanomaterial-based technology for efficient water and wastewater treatment.

(3) Advanced Oxidation

We are interested in developing technical- and cost-effective advanced oxidation technology for water treatement;

(4) Membrane Separation

We are also interested in developing new membrane materials of better defouling properties as well as their application in water treatment.

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——Major Research Teams

Research Theme:

Novel Electromagnetic Materials and Devices for Information Application

Research Content:

Our group consists of the research backbones, who have been working in the Radio Physics National Key Discipline of Nanjing University, and those researchers who have close working relationship. One of us is an academician of Chinese Academy of Sciences. Two of us are selected in the recruitment program of global experts. Two of us have obtained the National Science Funds of China for Distinguished Young Scientists. Three of us are involved in the Cheung Kong Scholars Program and two of us are chosen as the New Century Excellent Talents in University. Our group has been focusing on the research frontier of the novel electromagnetic (EM) materials and devices for information application (NEMDIA) and has gained many creative achievements. For example, we have two articles published in Nature journals. In the following work, we will further combine the research of the EM wave with materials, devices and physics. Focusing on NEMDIA, we will take advantage of the cross and complement in the multidiscipline to investigate the Terahertz (THz) technology, metamaterials and quantum information technology, both experimentally and theoretically. At the same time, we will also focus on the research on the commonness of the cross subjects to build up an overall understanding of NEMDIA. Our goals are to make breakthrough in solving global and important scientific problems and great achievements in the THz devices.

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List of Representative Ongoing Projects

	Affiliation	Principal Investigator	Project
1	School of Physics	Naiben MIN	Design, Fabrication, Properties, and Applications of Dielectric Superlattice Materials
2		Dingyu XING	Investigations on the Quantum Effects, Quantum Manipulation and Their Applications in Solid-state Microstructurs
3		Mu WANG	Optoelectric Functional Crystalline Materials: Design, Fabrication, Structural Characterization and Physical Properties
4		Haifeng DING	Quantum Effects and Their Manipulation in Low Dimensional Spin Systems
5		Wei WANG	Key Problems and Important Applications of Nonlinear Science
6		Zhigang ZOU	Research on Photocatalytic Materials and Application
7		Min XIAO	Investigating Physical Principles and Technical Realization of Key Components in All-solid-state Quantum Information Processing
8	School of Electronic Science & Engineering	Rong ZHANG	Semiconductor Functional Quantum Structure's Function and Structure
9			An Extended Vertical Hvpe System
10		Peng CHEN	Nitride Monolithic White Leds with Wide Spectrum
11	School of Modern Engineering & Applied Sciences	Di WU	The Coexistence and Competition of Quantum Phases in Some Electron Correlated Systems

	Affiliation	Principal Investigator	Project
12	School of Chemistry and Chemical Engineering	Hongyuan CHEN	The Study on the Functionally Modified Interfaces and Electroanalytical Methods
13			Study of Micro-Nanofluidic Integrated System for Bioanalysis
14		Yi PAN	Study of High K Material for Extremely Large Scale Integrated Circuit
15		Gi XUE	Chemical Reaction and Electro-Chemistry Polymerization of Organic Conjugating Compounds on Metal Surfaces
16		Huangxian JU	Basic Research on Bionic Molecular Recognition and Its Application in Biomedicine
17		Jinglin ZUO	Quantum Manipulation in Molecular and Spintronic Systems
18	School of Life Sciences	Chenyu ZHANG	Metabolic Nuclear Receptors Regulate Mitochondria Function and ER Stress, Consequently Affect Cell Metabolism and Function
19			Molecular Mechanism Research on Type 2 Diabetes Occurrence and Development
20		Renxiang TAN	Investigation on Chemicals of Some Important Medicinal Plants
21		Zichun HUA	Development of Novel Anti-tumor Drug—Tumor-targeting Apoptosis Inducer TRAIL Mutant
22	Medical School	Zhiwei WU	Preventative Technologies and Products for HIV-1
23		Zhihong LIU	A Clinical Trial on the Efficacy of Rhein for Treating Patients with Diabetic Nephropathy
24		Yong QIU	Clinical Treatment and Related Basic Research on Spinal Deformities
25	Model Animal Center	Ying XU	The Molecular Mechanism of Premature Ovarian Failure and Biomarkers
26		Zhongzhou YANG	Mechanistic Study of Signaling Regulation in Cardiovascular Development

	Affiliation	Principal Investigator	Project
27	Department of Computer Science and Technology	Jian LU	Research on Service-Oriented Computing Software Models and Software Coordination
			Technology, Platform and Applications of Internetware
28	School of Atmospheric Science	Xiuqun YANG	Climate Effect of Large-Scale Urbanization in Eastern China and Human Strategy
29	School of Environment	Xiaorong WANG	Environmental Chemical Behavior, Toxic Effects and Early Diagnosis of Ecological Risk for Selected Contaminants
30		Aimin LI	Research and Demonstration for Improving Water Quality and Repairing Aquatic Ecosystem of Huaihe River Basin
31		Shixiang GAO	Warning Technologies for the Risk of Major Environmental Pollution Incidents
32		Hongqiang REN	Research and Engineering Application of Novel Technology for Treating Wastewater from Chemical Industrial Park
33	Water Science Center	Youkuan ZHANG	A Study of Water Pollution Control and Wastewater Treatment Techniques and Comprehensive Demonstration in the Huai River Basin

——Representative Ongoing Projects

Design, Fabrication, Properties, and Applications of Dielectric Superlattice Materials

First Prize of the National Natural Science Award (2006)

Research Subject:

Dielectric superlattice; Nonlinear optical frequency conversion; Polariton.

Principal Investigator:

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Research Content & Progress:

We extended the concept of superlattice to dielectrics and systematically studied the propagation and excitation of electromagnetic and acoustic waves in quasiperiodic and two-dimensional dielectric superlattices (DSL) as well as the coupling effects. A number of new effects were theoretically predicted and experimentally demonstrated, such as the cascaded nonlinear frequency conversion, the coupling of superlattice vibration with the microwave, the generation of the new type of polaritons, the new mechanism for optical bistability and optical instability, the enhancement of elastic and inelastic scattering by quasi-phase-matching, the coherent construction of the acoustic excitation etc. Based on the above results, we fabricated all-solid-state lasers operating at multi-frequencies as well as quasi-white-light lasers with an output higher than 1W； we extended the long wavelength optical properties of polariton from infrared to microwave range, thus providing a new method for the design of microwave gap devices； we realized the enhancement of the Raman signal up to 4 to 5 orders experimentally, which is useful for designing the new type of Raman Lasers; we fabricated several prototype acoustic devices, operating at frequencies in the range from several hundred MHz to several GHz, which is impossible to realize with the ordinary bulk acoustic devices, etc. We also developed the expert system for the DSL design, three methods for the fabrication of the DSL (i.e., the growth striation method, electric field poling method and grating writing by optical hologram), two techniques to characterize the DSL nondestructively with microwave near field microscopy and environmental electron scanning microscopy.

Investigations on the Quantum Effects, Quantum Manipulation and Their Applications in Solid-State Microstructures

Research Subject:
Quantum manipulation

Principal Investigator:
Prof. Dingyu XING
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Research Content & Progress:
We have extended the concept of superlattice to the dielectrics and systematically studied the propagation and excitation of electromagnetic and acoustic waves in quasiperiodic and two-dimensional dielectric superlattices as well as the coupling effects. We have extended the concept of the Andreev reflection in the superconducting hybrid-structures and proposed the same-spin-band Andreev reflection caused by the spin-flip effects, which can induce the spin-triplet pairing in the superconductors. We have realized the controllable coherent modulation of the three solid-state qubits and prepared the important entangled state, W state. We have proposed and realized a new approach of the multi-qubit manipulation by using the Landau-Zener tunneling effects.

Optoelectric Functional Crystalline Materials: Design, Fabrication, Structural Characterization and Physical Properties

Principal Investigator:
Prof. Mu WANG
muwang@nju.edu.cn

Research Content & Progress:

This project focuses on the fundamentals of designing, fabrication and characterization of new optoelectrical functional crystalline materials. Theories and methods to explore new crystals for applications in high-power laser generation, nonlinear optics in mid-infrared, far-infrared and terahertz frequencies will be developed. The methodology to design new artificial microstructures will be improved, hence the control over the phase, polarization, and propagation of electromagnetic waves will be realized. The project will also develop new growth methods for bulk and thin-film crystalline materials, solve major fundamental problems in crystallization, and evaluate the applications of the newly developed crystals and microstructures.

Quantum Effects and Their Manipulation in Low Dimensional Spin Systems

Research Subject:

Quantum effect; Quantum manipulation; Spin system; Low dimensional system

Principal Investigator:
Prof. Haifeng DING
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Research Content & Progress:

This project mainly focuses on the following four topics: (1) To fabricate magnetic atomic chains/clusters and their assembles and to study their size and structure dependent properties. (2) To prepare ferromganet/monolayer molecular /ferromagnet molecular junctions or ferromagnet-single molecular hybrid nanoparticles, and to study spin injection, transport and manipulation by changing the types of moleculars. (3) To prepare Ruddlesden-Poper series transitional metal oxide and to study their electronic and spin related properties through the variation of the dimension. (4) To complete theoretical design and to prepare lab-level prototype heterostructures, nanoribbon and nanoclusters etc. for spin related functional materials. This project is founded this year.

Key Problems and Important Applications of Nonlinear Science

Research Subject:

Nonlinear science; Key problems; Important applications; Soliton; Chaos; Pattern; Complexity

Principal Investigator:

Prof. Wei WANG

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Research Content & Progress:

Nonlinear science involves studies on common and universal characteristics of nonlinear systems in various fields of sciences, and also on key applications of concepts and methods of nonlinear theory in the fields of science, technology and engineering. Our researches focus on some key problems in the nonlinear science: 1) to establish nonlinear models and observation systems for some catastrophic phenomena, to develop theories of soliton and multi-scale spatio-temporal coupling, and to provide theoretical insights on the mechanisms and prediction of catastrophes such as typhoon, tsunami, and damages of solid materials, 2) to study the stability of orbits, complexity, and controllability of high- and infinite-dimensional dynamic systems with important applications, to try to solve the Arnold diffusion problem; to study spatio-temporal chaotic self-organization, regulatory mechanisms and practical applications of chaos, 3) to study evolution and regulatory methods for spiral wave in reaction-diffusion systems and jet patterns in plasma systems, to set up theoretical understanding for controllable nuclear fusions, and to explore the application of controlling of spiral-wave in therapies of some cardiac diseases, 4) to extract and measure biological information in genome sequences, to build up network-based dynamic models for biological signal transduction and processing, and to realize a quantitative characterization for bioinformatics and functions and dynamics of biological systems. Our researches progress well and most of our proposed works have been finished. Over 300 papers have been published.

Research on Photocatalytic Materials and Application

Research Subject:

Research on hydrogen production by photocatalytic water splitting

Principal Investigator:

Prof. Zhigang ZOU

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Research Content & Progress:

This study is focused on design of photocatalysts, improvement in photocatalytic properties and optimization of photocatalytic reaction system. We study the effects of d and s valence electrons on band structures of photocatalysts, tune the position of valence band and conductor band by solid solution, and extend the absorption of photocatalysts to visible light by doping. We also study the preparation of photocatalysts with mesoporous structure or special morphology, the photocatalytic water splitting of eosin sensitized TS-1 molecular sieve, and the effects of base or acid sites on photocatalytic properties. We have prepared the magnetically separated composite photocatalysts, and foamed Ni loaded TiO2/SiO2, TiO2/Al2O3. Inert interface was used to increase the specific surface area of the photocatalysts by 30 times, thus improving the number of reaction sites. Photocatalysts with photoluminescence was studied to obtain photocatalytic properties without exterior irradiation. We also designed an equipment of photocatalytic water splitting into hydrogen using solar energy, and a system of hydrogen production combined with its application.

Investigating Physical Principles and Technical Realization of Key Components in All-solid-state Quantum Information Processing

Grants from the state:
RMB 13.54 mil/ the first two years

Principal Investigator:
Prof. Min XIAO
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Research Content & Progress:
To fulfill the national need in developing quantum state manipulation, we expect to eventually realize the generation, transportation, storage, logical processing and detection of quantum states of light in all-solid-state materials. We will investigate and demonstrate some key components for all-solid-state quantum information processing, achieve some high-profile results, obtain certain intellectual properties in quantum information science, and train scientists for the future development of quantum chips in China.

Semiconductor Functional Quantum Structure's Function and Structure

Research Subject:

Semiconductor; Functional quantum structures

Principal Investigator:

Prof. Rong ZHANG

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Research Content & Progress:

Aiming at the new rule and new effect of semiconductor functional quantum structure, we especially study dependence and variation regularity of semiconductor functional quantum structure's function and structure, develop new structures, achieve new functions, and research new devices. It concretely include s five projects: (1) Regulation principle and device applications for band of wide bandgap semiconductor induced by polarization, polarization properties of wide bandgap semiconductor, regulation principle and device realization for band of semiconductor functional quantum structure by polarization; (2) Spin quantum structure and device of high curie temperature, origin for the ferromagnetism of wide bandgap diluted magnetic semiconductor, stable methods of getting high curie temperature diluted magnetic semiconductor, and spin quantum device; (3) Effect and regulation of semiconductor quantum structure spin splitting, internal connection of quantum confinement structure and spin splitting, effect of strain, and effects of band spin splitting such as spin photocurrent; (4) Functional coordination and device application of semiconductor composite quantum structure, preparing new semiconductor somposite quantum structure, and investigating the functional coordination relation of composite quantum system; (5) Preparation and characterization of new type quantum dot nanostructure, investigating controllable growth and preparing of new type quantum dot structure such as sparse quantum dot and quantum dot molecule, studying the coupling effect of quantum dot electronic state and optical micro cavity.

An Extended Vertical HVPE System

Principal Investigator:
Prof. Rong ZHANG
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Research Content & Progress:

Based on the aim of designing extended vertical HVPE system, a new extended vertical HVPE system has been successfully fabricated. The design requirements have been reached after debugging. Many key problems were solved in the extended HVPE system. The condition and technology of self-peeling technology were investigated and optimized. Two inch free standing GaN thick film with good quality was obtained, which shows that we take the lead in successfully obtaining two-inch free-standing thick GaN film in homeland. The achievement reaches the international advanced level.

Nitride Monolithic White LEDs with Wide Spectrum

Research Subject:

Nitride semiconductor; White LED

Principal Investigator:
Prof. Peng CHEN
pchen@nju.edu.cn

Research Content & Progress:

The objective of this project is to develop novel nitride monolithic LEDs for white light with wide spectrum.

The LEDs fabricated by this project do not include any color-convert material. A wide spectrum from 400 nm to 900 nm has been obtained from the monothic LED. The CRI is 85.4, the chromatic coordinates is near (0.27, 0.31). The color temperature is 7194~11298K. The LEDs work at 20mA@3.5V, its leakage current is less than 1.0 A. This project produced 3 Chinese patent applications and 4 SCI papers.

The Coexistence and Competition of Quantum Phases in Some Electron Correlated Systems

Research Subject:

Multiferroic materials; Graphenes

Principal Investigator:

Prof. Di WU

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Research Content & Progress:

Preparation and substitution of Bi(Fe/Mn)O3-type multiferroics are studied systematically. The phase diagram of some manganites was calculated. A new type of strip phase was predicted in 1/4 doped manganese oxides. The multiferroic characteristic is a result of the non-collinear spin structure in these doped manganese oxides, different from conventional exchange frustration mechanism. The multiferroic coexistence temperature is predicted as high as 100 K. A series of manganite single crystals were grown and their structure and properties were studied. A series of epitaxial multiferroic thin films and superlattices were fabricated. The relation between structure and properties were studied. The tunnel magnetic resistance (TMR) of junctions based on graphenes were calculated. The oscillation of TMR characteristics can be tuned with gate voltage.

The Study on the Functionally Modified Interfaces and Electroanalytical Methods

Principal Investigator:
Prof. Hongyuan CHEN
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Research Content & Progress:

In this project we started with the study of functionally modified interface of electrodes, used some significant biomolecules as model substances including nucleic acids, proteins (enzymes), neurotransmitters, etc., introduced nanotechnology and biochemical technology, did systematic researches on many different matrixes and types of electrode-systems in order to prepare bionic catalytic interface and biosensors, and established some new kinds of electroanalytical methods.

In the study of microelectrode theory and applications, we introduced some new concepts, discovered some new effects, figured out a series of expressions of steady-state current in complicated systems, and deduced the current expression of the microband array electrode and its measurement method. We established more than ten new kinds of micro-biosensors to sensitively determine biomolecules based on micro-disk, micro-column, micro-band and micro-band array electrodes. In the study of the basis and applications of bioelectrochemistry, we fabricated biosensors with different kinds of films, including organic polymer films, inorganic coordination compound films and self-assembly monolayer film modified electrodes and established high sensitive and selective analytical methods to determine nucleic acids, proteins (enzymes), coenzymes and small biomolecules.

We took the lead in modifying nanoparticles on the surface of electrode as an electron wire. It could promote the interface reaction of enzymes and proteins, and make the fixed biomolecules keep their bioactivity for a long time via its bridge-joint effect. We invented several methods to fabricate nano-bionic interfaces, and constructed a set of biosensors with fast response, high sensitivity and long lifetime. In addition, we initiated the assembly of nanoparticles on the insulation gate surface of the field-effect transistors and successfully made the first field-effect transistor biosensor modified by nanoparticles. More over, we discovered the electron-wire effect amplification property and new reaction characteristics of nanoparticles, which were used to fabricate biosensors with improved performances.

In the part of new electrochemical detection method coupled with flow systems, some sensitive analytical systems to detect trace enzymes, nucleic acids, purines, amino acids, oligosaccharides, neurotransmitters, and organic acids etc. by the capillary electrophoresis with electrochemical detection were established. A novel electrochemical detection approach was used that can transform the interfering effect of separation electric field into a universal analytical method. Such a method has been successfully

applied to the detection of not only electroactive but also nonelectroactive analytes, as well as electroosmotic flow rates in microfluidic chip electrophoresis systems.

This project published 140 papers on SCI journals, which were cited 2250 times by SCI papers. Among the citations, 1887 times are from others. The representative 10 papers have been cited by others for 330 times. The highest cited time of one paper is 95. The authors citing our results come from over 20 countries, including USA, England, Germany ,France and Japan etc. The main achievers have been invited to write 5 reviews to report some results of this project. It cultivated 51 graduated students (Ph. D: 39, Master: 12).

Study of Micro-nanofluidic Integrated System for Bioanalysis

Principal Investigator:
Prof. Hongyuan CHEN
hychen@nju.edu.cn

Research Content & Progress:

This program organizes some middle-aged and young scholars in related basic fields such as chemistry, informatics, life science, and nano-technology. It aims at the state's requirement and the international forefield of microfluidics, studies the multiscaled interface characteristics, the rules of media transportation and the control in micro/nano fluidic channels, to reveal the interface behaviours; it designs biomimic micro/nano fluidic chips, establishes integrated fabrication and channel modification methods; it develops the array detection techniques compatible to micro total analysis, and explores the detection of single molecule behaviour and the mechanism of molecular identification in limited threshold on nano channel space; it develops injection techniques for the nano-liter and pico-liter samples, and fabricates micro/nano fluidic systems with the integration of injection, accumulation, reaction, separation and detection units; it explores biomacromolecules and cells' accurate orientation, 3D images, interactions and space-time identifiably stimulated responses, losing, separation and detection of the cell contents, and studies the mechanisms of cell growth, metabolization, fade and the interaction mechanism between medical molecules and cells. It enhances our country's original innovation ability in micro/nano fluidic system, and establishes the base of techniques innovation for developing bio-chemical analysis techniques and analytical instruments of our country in the future.

Study of High K Material for Extremely Large Scale Integrated Circuit

Research Subject:
Synthesis of metal organic hafnium and zirconium precursor for high k material

Principal Investigator:
Prof. Yi PAN
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Research Content & Progress:
The project focuses on the design and synthesis of metal organic hafnium and zirconium precursor, which includes preparation of the known good hafnium precursor, and three to five new hafnium or zirconium precursor.

Now, we have finished the synthesis of known hafnium or zirconium precursor. The design and synthesis of new precursor are being studied.

Chemical Reaction and Electro-chemistry Polymerization of Organic Conjugating Compounds on Metal Surfaces

Research Subject:
Study of chemical reaction and electrochemical polymerization of organic conjugated compounds on metal surfaces, and the application in adhesion and corrosion protection, to prepare conductive film with high qualities.

Principal Investigator:
Prof. Gi XUE
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Research Content & Progress:
We studied the chemical reactions of organic conjugated compounds of metal surfaces and made a few foundings: 1. the chemical reaction of imidazoe on silver and copper; 2. low-potential electrochemical polymerization of thiophene to prepare conductive polymer films;3. preparation of thin layer of films to improve adhesion and corrosion protection. There is a good potential that the thin film of polymer may be applied as conductive rubber with high anisotropic properties. This study will help the study of molecular orientation.

Basic Research on Bionic Molecular Recognition and Its Application in Biomedicine

Research Subject:

Bionic Molecular Recognition for early diagnosis of cancer

Principal Investigator:

Prof. Huangxian JU

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Research Content & Progress:

This project will aim at the fundamental study on bionic molecular recognition systems such as aptamers, molecular imprinting materials and biofunctional nanoprobes and so on for biomedical application in early diagnosis and warming of important diseases related to human health (especially for malignant tumor). By combining the frontier research achievements in material science, biomedicine, nanoscience, optoelectronics and analytical chemistry, the research works mainly contain 1) revealing the relationship between function and the structure of bionic molecular recognition system and their weak interaction and evolving rules, and establishing the simulation systems for bionic molecular recognition systems; 2) aiming at the biomarkers at different levels to design, synthesize, select the bionic molecular recognition systems and study their function; 3) developing the highly sensitive and specific imaging and sensing methods based on the bionic molecular recognition systems for the biomarkers related to tumors and tumor cells; 4) searching novel specific tumor biomarkers and exploring the new tools for early warming of tumors; 5) establishing the early diagnosis methods of cancer and the data base of aptamers relating to tumor types, and developing new systems with knowledge property right for the diagnosis of cancer.

Quantum Manipulation in Molecular and Spintronic Systems

Research Subject:

Quantum manipulation; Molecular materials; Spintronic materials; Molecular design

Principal Investigator:

Prof. Jinglin ZUO

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Research Content & Progress:

To study quantum manipulation/control in molecular and spintronic systems, some new instruments have been designed and set up recently. For example, the multiple reflection-transmission infrared spectroscopy has much higher signal to noise ratio. With the programmable DNA self-assembling technique, we realize the precise control of nano-devices, especially nano-robots. Through the introduction of barcoding organic molecule onto the nanostructure surface, a diagnostic scheme for the detection of DNA interaction and hybridization process has been developed.

Importantly, we have successfully designed and built a combined molecular beam epitaxy (MBE) and low temperature scanning tunneling microscopy (LT-STM) system. With this system, one can prepare various magnetic nanostructures and in-situ study their structure and magnetic properties. In addition, the magnetic transport behavior can also be studied with a newly built variable temperature magneto-transport system.

From delocalized molecule-orbital and exciton theories, the charging and energy transferring in excited states and quantum manipulation for photo excited state in molecular system are studied. A highly conjugated core-modified Rubyrin with meso-aryl substituents and phenanthrene-fused pyrrole rngs is successfully prepared and it shows intense absorption in near-infrared region, which is useful as molecular switches and sensors. A novel meso-aryl-substituted [14]Triphyrin is synthesized by a facile approach. The ferroelectric thin films based on mononuclear lanthanide enantiomers are fabricated and they display ferroelectric and dielectric properties at room temperature.

——Representative Ongoing Projects

Molecular Mechanism Research on Type 2 Diabetes Occurrence and Development

Principal Investigator:
Prof. Chenyu ZHANG Prof. Jiarui WU
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Research Content & Progress:

We clarify Chinese type 2 diabetes genetic background; figure out mechanism of environmental factors like stress in insulin resistance, cognate interaction of genetic factors and environmental factors, and reveal occurrence and development of type 2 diabetes.

We find out cellular molecules changing regularity in tissues modulating glucose homeostasis in type 2 diabetes and its complications.

Taking metabolism as the theme, we clarify the molecular mechanism of those changes.

We have achieved a lot of important research results with independent intellectual property, including the potential drug target for prevention and treatment of type 2 diabetes; screen and reveal intervention efficacy of certain nutrients in type 2 diabetes development, so as to lay foundation for a novel method of early intervention and to provide a theoretical basis of making new strategy for prevention and cure of type 2 diabetes.

We establish a “Transformational Research “model tailored to Chinese conditions, and combine basal research with clinical application. We advance the development of systems biology for complex disease in China. We cultivate a number of top international diabetes research personnel.

Metabolic Nuclear Receptors Regulate Mitochondria Function and ER Stress, Consequently Affect Cell Metabolism and Function

Research Subject:

Metabolic nuclear receptors; Mitochondria; ER stress; PGC-1a; ATF6

Principal Investigator:

Prof. Chenyu ZHANG
cyzhang@nju.edu.cn

Research Content & Progress:

Metabolic nuclear receptors regulate mitochondria function and ER stress, consequently affect cell metabolism and function. However, the precise mechanism is still unknown. The proposal aims to investigate the role of PGC-1a in liver and vessel smooth muscle cells, and the role of ATF6 in ER stress by using engineered animal models and molecular biologic, chemistry biologic and systems biologic techniques. This study helps us to further understand biologic functions of metabolic nuclear receptors on mitochondria metabolism, ER stress and cell metabolism, and regulatory network of cell metabolism.

——Representative Ongoing Projects

Investigation on Chemicals of Some Important Medicinal Plants

Research Subject:

Medicinal plants; Constituents; Structure; Activity; Distribution

Principal Investigator:

Prof. Renxiang TAN

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Research Content & Progress:

This project pertains to the fundamental investigation on chemical structure and bioactivity of the phytochemicals from important medicinal plants in China, in order to reveal the scientific connotation of their prevention and treatment of diseases and to provide vital clues to discover drugs. The major findings are as follows: (1) This project finds that medicinal plants with abiotic stress tolerance are rich in flavonoids, phenylpropanoids and other polyphenol components, revealing that a part of polyphenols has significant antioxidant and/or free radical scavenging effects with structure-activity relationship. These findings can explain the adaptability of plants to environment and reveal the pharmacological mechanism of these plans. (2) This project explores the association of antioxidant and free radical scavenging effects of phytochemicals with disease development and traditional use of plants, and finds out a series of xanthine oxidase, monoamine oxidase and nitric oxide synthase inhibitors and reveals the structure-activity relationship of those ingredients. These findings provide important clues to discover the relevant drugs. (3) This project finds that medicinal plants against biotic stresses are rich in antibacterial, insect-resistant, anti-cancer and other active substances, reveals the chemical nature of self-protection of these plants, and demonstrates an effective way to search for new bioactive natural products from the ecological adaptation of plants. (4) With research system created by this program, we find a large number of the new components with biological functions and/or chemical systematic significance, and reveal the important characteristics of chromatography and law of spectroscopy related components. These new findings resulted from the project have generated a total of 208 SCI-indexed papers, which have been cited by others for 1892 times founded in SCI-indexed journals such as “Chemical Reviews” and “Journal of the National Cancer Institute”. This indicates that the project has appreciable creativity, and systematic and distinctive characteristics, which promotes the development of subjects related with plant resources, and organic chemistry of natural products. It also contributes substantially to the international leadership of our country in the field.

Development of Novel Anti-tumor Drug—Tumor-targeting Apoptosis Inducer TRAIL Mutant

Research Subject:

Targeting anti-tumor drug development

Principal Investigator:

Prof. Zichun HUA

huazc@nju.edu.cn

Research Content & Progress:

This study is to develop TRAIL mutant with tumor-targeting capability and high efficacy. The aim of this study is to enhance the anti-tumor activity of TRAIL, to reduce its dosage of use, to lower the cost of the user and to decrease its potential side-effect.

We have finished the design of TRAIL mutant, its cloning, expression and purification. We have assessed its anti-tumor ability both in vitro and in vivo, its tumor-targeting capability, tissue distribution and its signaling pathway analysis.

——Representative Ongoing Projects

Preventative technologies and products for HIV-1

Research Subject:

Entry inhibitors as prevention of HIV-1 sexual transmission

Principal Investigator:

Prof. Zhiwei WU
wzhw@nju.edu.cn

Research Content & Progress:

This program is a part of the country's 11th five-year plan and a major research and development program on HIV/AIDS prevention. The program aims to:

(1) develop a prototype vaginal microbicide for the prevention of HIV-1 sexual transmission using a viral entry inhibitor

(2) establish a comprehensive multidisciplinary research and development platform for anti-viral research and development

(3) facilitate the establishment of standards for microbicide product development and for clinic research and trials.

A Clinical Trial on the Efficacy of Rhein for Treating Patients with Diabetic Nephropathy

Research Subject:

Diabetic nephropathy; Rhein; New drug

Principal Investigator:

Prof. Zhihong LIU

Zhihong-liu@hotmail.com

Research Content & Progress:

The efficacy of rhein (class Ⅰ new drug) for treating diabetic nephropathy (DN) has been studied for more than 20 years. Rhein is a new drug with high efficacy and less adverseness. We have received two Chinese patents (ZL97107137.3, ZL 01108271.2) and one American patent (US 6,197,818 B1). By the supporting of 863 high-tech Programs during the 10th Five-Year Plan, the pre-clinical research of rhein has been completed and was approved by SFDA in 2008 (Approval document no.: 2008L03640, 2008L03643).

"The clinical trial on the efficacy of rhein for treating patients with diabetic nephropathy " (No:2008ZX09101 (050) also supported by high-tech Programs in the 11th Five-Year Plan . Now we have finished the supplement experiments of pharmacology and toxicology. The Phase Ⅰ clinical trial is ongoing. We anticipate to complete the clinical trial by the end of 2012 and be awarded with a certificate of the new drug.

——Representative Ongoing Projects

Clinical Treatment and Related Basic Research on Spinal Deformities

Research Subject:

Treatment and etiological study on spinal deformities

Principal Investigator:

Prof. Yong QIU
scoliosis2002@sina.com

Research Content & Progress:

From late 1990s on, our team have completely committed to establishing spinal correction technique for Chinese patients with spinal deformities. Posterior segmental multi-rod technique was set up for severe spinal deformity. Judging from the clinical and radiological features of the Chiari malformation patients with syringomyelia and scoliosis, we divided them into groups and made up a systemic treatment which harvested good outcomes and caused few complications. After researching on the pathophysiology of the severe scoliosis patients with respiratory failure, we established a multi-means individualized treatment to improve their respiratory function. A safe way for anterior spinal correction was provided after the anatomical and radiological studies. We also developed a minimally invasive spinal correction technique through mini-incision with thoracoscope for thoracic scoliosis. And independently, we set up a minimally invasive anterior correction technique through mini-incision with diaphragm intact for thoracolumbar scoliosis and anterior supportive fusion on the concave side for thoracolumbar kyphoscoliosis. And we reported that the prolongation of latency and the decrease of the amplitude can be used as a signal of the spinal cord ischemic injury when patients underwent anterior spinal correction. Besides, we performed a systemic research on the etiology and pathogenesis of scoliosis. Three risk genes of AIS and the difference in histomorphometry and cellular activity between the anterior and posterior column in AIS patients were found by our team. These findings are very important for the carrying on of early-stage screening, diagnosis and treatment. And our team also provided a mechanism of scoliosis secondary to syringomyelia: The enervation of paraspinal muscles can cause scoliosis. By the way, our team have set up the largest clinical and histological database in China.

The Molecular Mechanism of Premature Ovarian Failure and Biomarkers

Research Subject:
Circadian rhythms

Principal Investigator:
Prof. Ying XU
yingxutravel@gmail.com

Research Content & Progress:
Aiming at the challenge of effective and flexible service composition and coordination for resource sharing and business integration in the Internet environment, this project will conduct researches towards a systematic method of Service-Oriented Computation, featuring independent service development, flexible service composition and coordination, dynamic system evolution, and trusted system operation. Based on the investigators' previous work on software agents, software services and software coordination, the efforts will be focused on an open software service model and its corresponding coordination mechanism that support effective service discovery, structured composition of loosely coupled services, dependable business integration and automatic system evolution. Expected progresses include multi-dimensional service decoupling, service context modeling, probing and fusion, automatic service discovery and composition, autonomic system reconfiguration, service-oriented transaction processing, and trust-based dependability controlling, etc.

Mechanistic Study of Signaling Regulation in Cardiovascular Development

Research Subject:

Development of cardiovascular system

Principal Investigator:

Prof. Zhongzhou YANG

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Research Content & Progress:

Cardiovascular system is the first to be developed and to function, which provides nutrients and oxygen to support the development and growth of all the other organs. Mammalian heart development can be divided into four stages: 1) cardiac specification; 2) heart tube formation; 3)looping and asymmetric development and 4) chamber growth. This project is aimed to elucidate the regulatory mechanisms in heart development with hope to discover novel signaling pathways and novel genes using mice as models.

Major achievements include: Discovery of TGFbeta-regulatory microRNAs that are involved in cardiac remodeling; gaining of novel insights into VEGFR3 signaling in vascular and lymphatic development and regulation; investigation of cardiovascular development in knockout mice of the key genes in IGF1-PI3K-PDK1-PTEN/PP2A-Akt signaling pathway reveals severe cardiovascular defects and pathological heart remodeling and uncovers possible downstream transcription factors. These results indicates essential roles of this signaling pathway in cardiovascular system; discovery of downstream targets of AP2 such as KCTD10. Deletion of KCTD10 in mice causes embryonic lethal with cardiovascular defects.

Research on Service-Oriented Computing Software Models and Software Coordination

Research Subject:

Service-oriented computing; Software models; Software coordination; Context management; Trust

Principal Investigator:

Prof. Jian LU

lj@nju.edu.cn

Research Content & Progress:

Aiming at the challenge of effective and flexible service composition and coordination for resource sharing and business integration in the Internet environment, this project will conduct researches towards a systematic method of Service-Oriented Computation, featuring independent service development, flexible service composition and coordination, dynamic system evolution, and trusted system operation. Based on the investigators' previous work on software agents, software services and software coordination, the efforts will be focused on an open software service model and its corresponding coordination mechanism that support effective service discovery, structured composition of loosely coupled services, dependable business integration and automatic system evolution. Expected progresses include multi-dimensional service decoupling, service context modeling, probing and fusion, automatic service discovery and composition, autonomic system reconfiguration, service-oriented transaction processing, and trust-based dependability controlling, etc.

——Representative Ongoing Projects

Technology, Platform and Applications of Internetware

Research Subject:

Software Engineering, Internetware, Context-Awareness, Self-Adaptation, Trust

Grants from the state:

RMB 7 mil

Principal Investigator:

Prof. Jian LU
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Research Content & Progress:

The goal of this project is to develop a new software methodology featuring the new Internetware paradigm for open computing environments such as the Internet and Cyber-Physical Systems. We also investigate supporting techniques for the methodology and explore their application in industrial practices, with cooperation from HKUST, Datacent Corp., and Donntech. We have proposed an agent-based and environment-driven software model for the Internetware paradigm, and have made progresses in enabling techniques including self-adaption of software systems, context consistency management, service discovery and substitution, mobile agent-based runtime support for Internetware, and comprehensive trust assurance for software systems, etc. Based on these models and techniques, we have developed an integrated software platform for the development, deployment and adaptation of Internetware-oriented software systems. Case studies on the application of the above methodology, techniques and platform in practice have been carried out with collaborations of our industry partners. The results show that these research outcomes can help them in boosting technology innovations and achieving social and economic benefits.

Climate Effect of Large-scale Urbanization in Eastern China and Human Strategy

Research Subject:
Urbanization; Climate effect; Adaptation strategy

Principal Investigator:
Prof. Xiuqun YANG
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Research Content & Progress:
The large-scale urbanization in eastern China, represented by the three mega-city clusters in the Yangtze River Delta, Pearl River Delta and Beijing-Tianjin-Hebei regions, is a driving force and strategy of China's economic and social development. However, such an urbanization also leads to rapid land cover and land use changes and serious air pollution in eastern China. As a regional highly-intensified human activity, it is an important forcing factor of regional climate. The urbanization can form a unique urban climate and relative high-impact meteorological disasters, damaging the urbanized sustainable economic and social development. On the other hand, the coastal urban zone consisting of a number of mega-city clusters in eastern China with its air pollution possesses spatial scale comparable to that of East Asian monsoon. The climate effects of the coastal urban zone may affect the East Asian summer monsoon changes and the pattern of droughts and floods in China, which has become an international forefront of basic science issues. Therefore, it is a key national need to study and understand climate effect of the large scale urbanization in eastern China and further suggest the national strategy for the scale, layout and function of future urbanization in China.

Objectives of this project are: (1) to identify local-to-regional climate effect of the coastal mega-city clusters, providing theoretical basis for national urban weather and climate predictions, (2) to evaluate possible impact of the large-scale urbanization in eastern China on East Asian monsoon, contributing to understanding the climate change caused by highly-intensified regional human activities, and (3) to assess negative impact of the climate effect due to urbanization, suggesting the strategy for scale, layout and function of future urbanization in China.

——Representative Ongoing Projects

Environmental Chemical Behavior, Toxic Effects and Early Diagnosis of Ecological Risk for Selected Contaminants

Principal Investigator:
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Research Content & Progress:

Pollution caused by chemical substances in the environment poses serious health risks for ecosystem and human, and it becomes one of the important environmental concerns on human survival and development. Understanding and revealing the change processes and toxic mechanisms of chemical pollutants in the complicated environmental media and method establishments of early diagnosis for ecological risks are the important scientific problems on pollution prevention and control of chemical substances and also major strategic demands of environmental protection in China. Our team carried out a long-term systemic research on molecular structure, environmental chemical behaviours, toxic effects and early diagnosis of ecological risk of selected organic contaminants, heavy metals and rare earth elements (REEs) specifically used as fertilizers in China and obtained innovative achievements on photochemical reactivity, bioavailability, toxic effects and mechanisms and early diagnosis of ecological risks.

We have made a series of breakthroughs on some key scientific issues: computational prediction of environmental chemical behaviour, toxicological mechanism of oxidative damage, and interaction between contaminants and biomacromolecules. Our achievements have been highly regarded by the international counterparts and published as 316 peer-reviewed papers, of which 149 papers have been indexed in SCI database as well as 89 papers in EI database, cited by other studies for 1666 times. Eight representative papers have been positively cited by SCI for 204 times. Our studies were awarded the first prize (in 2003 and 2009) and the second prize (in 2008) in natural science by the Ministry of Education of China. We set up early diagnosis methods of ecological risks based on biomarkers, gained critical threshold values of early damage for some selected contaminants and their criteria values in aquatic ecosystems and resolved the environmental safety issue on long-term application of REEs in agriculture. The works provide theory and method for prevention and control of toxic chemical substances and push forward the development of environmental chemistry and ecological risk assessment.

Research and Demonstration for Improving Water Quality and Repairing Aquatic Ecosystem of Huaihe River Basin

Grants from the state:
RMB 287 mil

Principal Investigator:
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Research Content & Progress:
There are some questions concerning the Huaihe River basin, as that the water resources is lacking, that the mechanisms and policies of water environment management are not perfect, that the pollution controlling and emission reducing are difficult, and that the aquatic ecosystems is deteriorating. We need to build a demonstration zones for controlling pollution in Jialuhe River Basin and reduce agricultural non-point source pollution in Shayinhe River Basin, to improve the water quality of the demonstration zones fundamentally. The industrialization of advanced wastewater treatment and reuse technology are coming true for the wastewater of chemical, printing or dyeing, papermaking and other industries. We make breakthrough in some key technologies such as comprehensively controlling of toxic pollutants in typical industrial wastewater, preventing groundwater pollution, ecological restoration and eco-scheduling. We establish a number of technology platforms to control water pollution in the Huaihe River Basin and become an administrative team for controlling pollution. Construction technology and management system for controlling pollution provide an important guarantee for sustainable economic development, energy conservation and safe drinking water in the Huaihe River Basin.

This project emphasizes on the River Basin co-ordination, integration of achievements, and performance management. It plays the local role and realizes the industrial target. Moreover, it independently developed magnetic renewable adsorbent resin to the depth treatment of tail water and drinking water security as the core sets of processes, technologies, products and equipments, focusing on the key technologies of the Huaihe River Basin for source pollution control, toxic and hazardous pollution control, and water ecological restoration.

Warning Technologies for the Risk of Major Environmental Pollution Incidents

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Research Content & Progress:

To meet the requirement on the control of the major environmental pollution incidents in China, the project is aimed at the development of general technologies for the risk warning of major environmental pollution incidents, and the formation of the integrated technical system that could be used in the risk warning of chemical industrial parks, megacities and drinking water resources. Based on the selection of typical pollutants involved in the pollution incidents, physical models of multimedia transformation and transportation of typical pollutants in water and soil are established to simulate their environmental processes and to estimate related parameters. Digital models incorporated with 3S technology are developed for fast and accurate risk prediction and warning. The overall risk assessment including vulnerability assessment, risk characterization, post accident assessment, and effectiveness assessment of emergency measurements are investigated, and the selection technology for the key nodes in risk control is proposed. The indicators and criteria appropriate for risk warning and prediction are constructed.

Research and Engineering Application of Novel Technology for Treating Wastewater from Chemical Industrial Park

Principal Investigator:
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Research Content & Progress:

In this project, common key technological problems in the systematic control of water pollution of chemical industrial parks including technologies, equipments and water affair management of wastewater treatment had been addressed to for more than ten years. Primary research contents of this project are as follows:

(1) Association rules between water-quality characteristics of chemical industrial wastewater and the suitability of pretreatment technologies were studied systematically, then series of pretreatment technologies for chemical industrial wastewater with high toxicity, high salinity, high colority, high ammonia-nitrogen and big fluctuation of water quality were developed, and the modular decolorization reactor, and ECQ series of equipments of electrocatalysis flocculation/oxidation /reduction were invented;

(2) Based on the statistic principle of Bayesian dispersion and continuity, the expert system of water affairs management for the charge and the operation of chemical industrial park was developed, whose comprehensive judging reference consisted of the characteristic factor identification of point source pollution in chemical industrial park, the dynamic monitoring of key parameters of source strength and the biological utilization of characteristic factor of pollution;

(3) The artificial regulation mechanism of the microorganism community in the biotreatment of the mixed wastewater from chemical industrial park was studied, then the accelerant of microorganism activity and the novel technology for wastewater treatment of multiple circulation cooperating with bioaugmentation were invented, and core equipments for wastewater bioaugmentation treatment were developed, such as the modified biological fluidized bed, the intermittent composite particle bed and the fast installation membrane bioreactor with resistance to contamination.

A Study of Water Pollution Control and Wastewater Treatment Techniques and Comprehensive Demonstration in the Huai River Basin

Principal Investigator:
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Research Content & Progress:

It has been recognized that in the period of "Eleventh Five-Year Plan", the following are the major water pollution problems in the Huai River Basin: serious point source pollution, more predominant non-point source pollution, lack of natural baseflow, existence of a large number of dams, part of the rivers and lakes being the main passing channel as well as water storage for the east route of China's South-North Water Transfer Project (SNWTP) as the basin experiences rapid economic development. In dealing with these problems, the Huai River project focuses on cost-effective pollution load reduction techniques of heavy polluting industries and agricultural non-point source pollution control, integrated water quality – quantity utilization, restoration of the degraded wetlands in the Nansi Lake, and key techniques and demonstration for decision-making of water quality improvement and integrated management of water environment. The project aims to 1) achieve breakthroughs in techniques of wastewater treatment techniques of major polluting industries and the basin's pollution control techniques; 2) to substantially reduce pollution load in key industries and the basin, 3) to reduce probability of large-scale unexpected pollution events in the basin, 4) to protect water quality in the east route of the SNWTP by raising the water in the Nansi Lake to Type Ⅲ water. The results from this project will build a solid foundation for further effort in dealing with the water pollution of the basin in China's "Twelfth Five-Year Plan" and "Thirteenth Five-Year Plan".

Up to now, significant progress has been made in various aspects of the project. The main progresses include: 1) Selection and establishment of key demonstration projects and allocation of part of the matching fund (some of the demonstration projects have almost been finished), 2) More than 20 small-scale and middle-scale pilot tests have been carried out ; 3) More than 10 patents have been applied and a number of scientific papers have been published, and 4) Two software packages have been developed and one field working station has been constructed.

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Professor Chen has long been engaged in the study of surfacial geochemical processes and global change, including geochemical processes of Asian eolian dust during production, transportation and sedimentation and their paleoenvironmental implications, biogeochemical cycles of elements, carbon fixiation by minerals and geochemical methods.
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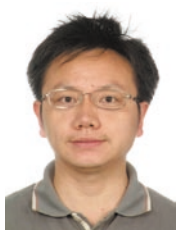

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High-energy processes and radiation properties of interstellar expansive and explosive motion. Related areas are supernova remnants, stellar wind bubbles and superbubbles, X-ray emission of stellar clusters, diffuse X-ray emission of galaxies.
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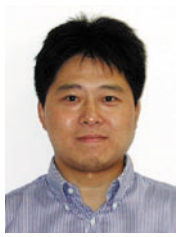

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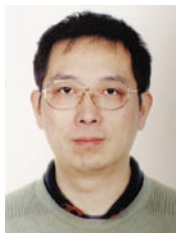

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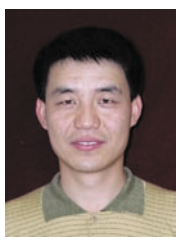

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1. Synthesis, characterization and application of organometallic compounds, especially those of Group 13 metals;their application includes: as MOCVD precursors, as catalysts in organic synthesis; as light emitter.
2. Metal or their compounds mediated organic reactions including palladium -catalyzed reactions of organic halides, copper or nickel mediated reactions; metal mediated asymmetric organic synthesis.
3. Ultrasonic accelerated organic reactions.
Email: yipan@nju.edu.cn

Prof. Ruwen PENG
State Key Laboratory of Solid State Microstructures
School of Physics
Research Interests:
1. Plasmonics and nanophotonics;
2. Photonic excitations in photovoltaic solar cells;
3. Photonic crystals and quasicrystals;
4. Phononic transport and thermal conductivity in low-dimensional systems.
Email: rwpeng@nju.edu.cn

——Chief Professors

Prof. Hourong QIN
Department of Mathematics
Research Interests:
1. Algebraic K-theory and its applications in number theory;
2. The arithmetic of elliptic curves and its applications.
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Prof. Xiaojun QIU
The MOE Key Laboratory of modern acoustics
School of Physics
Research Interests:
1. Audio acoustics and its signal processing;
2. Noise control;
3. Communication acoustics;
4. Active noise control.
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Prof. Yong QIU
Medical School
Research Interests:
1. Pathogenesis of idiopathic scoliosis; 2. Study on hereditary susceptibility of idiopathic scoliosis; 3. Pathogenesis of scoliosis associated with Chiari malformations; 4. Pathogenesis of scoliosis associated with neurofibromatosis; 5. Etiology of congenital scoliosis; 6. Three-dimensional correction for spinal deformities.
Email: scoliosis2002@sina.com

Prof. Hongqiang REN
State Key Laboratory of Pollution Control and Resource Reuse
School of Environment
Research Interests:
Basic research on principle and application of bioaugmentation process for bio-refractory, toxic and hazardous industrial wastewater treatment; Research on dynamic change and regulation of microbial community in wastewater biotreatment; Research on the phosphorus removal through the phosphine production by anaerobic microbe.
Email: hqren@nju.edu.cn

Prof. Zhongzhou REN
School of Physics
Research Interests:
Nuclear Physics and nuclear astrophysics, quantum chaos, quantum field theory.
Email: hqren@nju.edu.cn

Prof. Bin SHI
School of Earth Sciences & Engineering
Research Interests:
Dynamics of Urban Geology and Mitigating Geohazards.
Email: shibin@nju.edu.cn

Prof. Yi SHI
School of Electronic Science & Engineering
Nanjing State Laboratory of Microstructures
Research Interests:
1. Silicon-based nano- fabrication, -electronics, and –optoelectronics;
2. Growth, characterization, and device applications of semiconductor heterostructure films;
3. Synthesis, integration and applications of functional nanowires.
Email: yshi@nju.edu.cn

Prof. Weiyin SUN
State Key Laboratory of Coordination Chemistry
School of Chemistry and Chemical Engineering
Research Interests:
Coordination chemistry and supramolecular chemistry: design and synthesis of supramolecular architectures with specific properties and specific topologies; Bioinorganic chemistry: design and synthesis novel organic ligands and their metal complexes.
Email: sunwy@nju.edu.cn

Prof. Zhiwei SUN
Department of Mathematics
Research Interests:
Combinatorial number theory and those combinatorial problems related to groups or fields, including: Combinatorial congruences and Bernoulli and Euler numbers, covers of the integers by residue classes and covers of groups by cossets, restricted sumsets in additive combinatorics, zero-sum sequences in abelian groups, and various applications in number theory and combinatorics of Alon's polynomial method.
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Prof. Renxiang TAN
State Key Laboratory of Pharmaceutical Biotechnology
School of Life Sciences
Research Interests:
Natural product chemistry & Medicinal chemistry.
Email:rxtan@nju.edu.cn

Prof. Zhemin TAN
The MOE Key Laboratory of Mesoscale Severe Weather
School of Atmospheric Sciences
Research Interests:
Atmospheric frontal dynamics, boundary layer dynamics, mesoscale and storm-scale dynamics, tornado dynamics, data assimilation and predictability.
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Prof. Dacheng TIAN
State Key Laboratory of Pharmaceutical Biotechnology
School of Life Sciences
Research Interests:
Molecular and genome evolution, plant resistance evolution and synthesis, insertion/deletion genetics, and epigenetics.
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——Chief Professors

Prof. Bogen WANG
State Key Laboratory of Solid State Microstructures
School of Physics
Research Interests:
Currently, my research interests focus on the transport properties of charge and spin in mesoscopic systems by using Keldysh Green's function technique and the design of new electronic devices.
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Prof. Huitian WANG
State Key Laboratory of Solid State Microstructures
School of Physics
Research Interests:
Nonlinear optics, Nanophotonics, All solid-state lasers, Photonic Micromanipulation, Left-handed materials.
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Prof. Jianjun WANG
State Key Laboratory of Pharmaceutical Biotechnology
School of Life Sciences
Research Interests:
Neurobiology (Neurobiology of cerebellum and central motor system).
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Prof. Mu WANG
State Key Laboratory of Solid State Microstructures
School of Physics
Research Interests:
Physics of interfacial growth; fundamental mechanisms of crystallization, aggregation and pattern formation; Novel Physical properties of nanostructured materials.
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Prof. Qianghua WANG
State Key Laboratory of Solid State Microstructures
School of Physics
Research Interests:
Strongly correlated electron systems and superconductivity.
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Prof. Rucheng WANG
State Key Laboratory for Mineral Deposits Research
School of Earth Sciences & Engineering
Research Interests:
1. crystal-chemistry & geochemistry of accessory minerals and potential indications of geological processes; 2. granites & associated mineralization of W, Sn, REE, Nb-Ta, Li, Be in South China; 3. crystal chemistry of clay minerals.
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Prof. Wei WANG
State Key Laboratory of Solid State Microstructures
School of Physics
Biophysics and condensed matter physics:
1. Protein folding dynamics; biological function related dynamics of proteins; protein aggregation; interactions between the biomacromolecules (short peptides) and surfaces of solids and nano-partciles; 2. Dynamics of biological networks, such as gene regulation networks and neuronal networks; 3. Nonlinear science, the nonlinear behavior in condensed matter physics, such as chaos, soliton and pattern formation.
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Prof. Xinlong WANG
The MOE key Laboratory of modern acoustics
School of Physics
Research Interests:
Linear and nonlinear acoustic wave propagation in periodic and complex media and structures; Solitary waves: their formation and creation; Complex signal processing with applications to underwater sound and speech analyses.
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Prof. Zhenlin WANG
State Key Laboratory of Solid State Microstructures
School of Physics
Research Interests:
Fundamentals in optical analog of strongly correlated systems; Dynamic ultrafast control of optical processes; Single photon sources; Coupling of light with photonic and plasmonic cavities.
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Prof. Zhilin WANG
State Key Laboratory of Coordination Chemistry
School of Chemistry & Chemical Engineering
Research Interests:
Our researches focus on the catalytic mechanism of human arsenic methyltransferase, and in particular the effects of transit metals and selenium on the structure-functional relationship of human arsenic methyltransferase and its mutants; and screening for inhibitors of HIF proline hydroxylase and its regulation of the signal transduction of HIF. Meanwhile we show great interest in development and application of novel Nano-Bio sensors.
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Prof. Di WU
School of Modern Engineering and Applied Sciences
Research Interests:
My research is focused on the deposition and characterization of perovskite oxide thin films and artificial structures, particularly those showing interesting magnetic, ferroelectric and multiferroic properties. Particular interests include: ferroelectric and multiferroic thin films, stain effects in epitaxial heterostructures and interface coupling in perovskite superlattices.
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——Chief Professors

Prof. Jichun WU
State Key Laboratory of Pollution Control and Resource Reuse
School of Earth Sciences & Engineering
Research Interests:
Hydrogeology, Groundwater Flow Modeling, Groundwater Pollution Modeling and Remediation, Water Resources Evaluation and Management, Water-Soil Interaction, Contaminant & Heat Transport in Porous Media, Numerical Simulation Techniques, Stochastic Analysis of Flow and Solute Transport Phenomena, Uncertainty Analysis, Salt Water Intrusion, Land Subsidence.
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Prof. Xinglong WU
State Key Laboratory of Solid State Microstructures
School of Physics
Research Interests:
Nanostructured Materials; Electronic States and Photoluminescence; Raman Scattering.
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Prof. Zhiwei WU
Medical School
Research Interests:
HIV infection and antibody immune response, HIV entry mechanism and vaccines, anti-viral research and microbicides research and development.
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Prof. Xinghua XIA
The MOE Key Laboratory of Analytical Chemistry for Life Science
School of Chemistry and Chemical Engineering
Research Interests:
Electrocatalysis/bioelectrocatalysis, chemistry of materials, micro/nanofluidics.
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Prof. Daiqian XIE
The MOE Key Laboratory of Mesoscopic Chemistry
School of Chemistry and Chemical Engineering
Research Interests:
Theories and computations of potential energy surfaces and bounds and quasibound rovibrational states of molecules, photodissociation dynamics and molecular collisions.
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Prof. Baowen XU
State Key Laboratory of Novel Software Technology
Department of Computer Science and Technology
Research Interests:
Theories and computations of potential energy surfaces and bounds and quasibound rovibrational states of molecules, photodissociation dynamics and molecular collisions.
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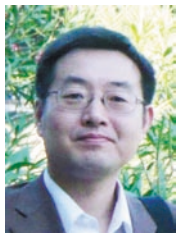

Prof. Jun XU
State Key Laboratory of Solid State Microstructures
School of Electronic Science & Engineering
Research Interests:
Amorphous and Nanocrystalline semiconductors and their device applications.
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Prof. Qiang XU
State Key Laboratory of Pharmaceutical Biotechnology
School of Life Sciences
Research Interests:
Selective regulation of immune responses, especially T cell-mediated immune response; Pathogenesis of cancer metastasis and its therapeutic agents; Cellular and molecular events based on small molecule compounds.
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Prof. Xisheng XU
State Key Laboratory for Mineral Deposits Research
School of Earth Sciences & Engineering
Research Interests:
How subcontinental lithospheric mantle has been formed and modified throughout Earth history; the temporal and causal relationships between mantle events and crustal evolution; generation and evolution of granites in southeast China.
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Prof. Ying XU
National Resource Center for Mutant Mice
Research Interests:
The first focus of my lab is to investigate the properties of the central pacemaker by studying these mutation animal models. The second focus of my lab is to search new genes involved in circadian clock mechanism. The third focus of my lab is to study functional consequence of disrupting circadian rhythms by analysis of these unique animal models combining with other genetic models.
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Prof. Gi XUE
State Key Laboratory of Coordination Chemistry
School of Chemistry and Chemical Engineering
Research Interests:
Electrochemical synthesis of conductive polymer, functional polymeric composites; Entropy induced conformation transition, phase separation, gelation, crystallization and glass transition of polymers.
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Prof. Hong YAN
State Key Laboratory of Coordination Chemistry
School of Chemistry and Chemical Engineering
Research Interests:
Design, synthesis, catalysis and biological activity of organometallic compounds containing carborane units.
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——Chief Professors

Prof. Xiuqun YANG
Institute for Climate and Global Change Research
School of Atmospheric Sciences
Research Interests:
Dynamics and predictability of the East Asian monsoon system variability on multiple timescales.
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Prof. Yonghua YANG
State Key Laboratory of Pharmaceutical Biotechnology
School of Life Sciences
Research Interests:
1. Plant Molecular Metabolism and Biotechnology;
2. Molecular Ecology of Plant-Microbes and Biosafety.
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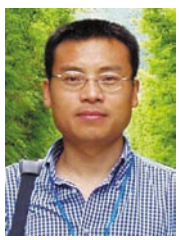
Prof. Zhenyu YANG
State Key Laboratory for Mineral Deposits Research
School of Earth Sciences & Engineering
Research Interests:
The paleopositions and tectonic affinity of Chinese mosaic blocks (including, North China block (NCB), South China block, Tarim and Tibetan blocks); timing and mechanisms of the Tibetan plateau growth related to the penetration of Indian plate into paleo-Asian continent.
Email: yangzy@public3.bta.net.cn



Prof. Zhongzhou YANG
National Resource Center for Mutant Mice
Research Interests:
Using mouse models, we study the mechanisms in heart development and disease pathogenesis to explore therapeutic methods and develop effective drugs. Our research is focused on the role of PI3K-AKT signaling pathway in cardiac development and disease aiming to uncover novel efficacious means and drugs to improve the situation of heart defects and pathological remodeling through targeting this signal transduction cascade. In addition, we investigate epigenetic regulation in heart development and disease.
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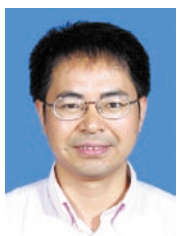

Prof. Zhujun YAO
State Key Laboratory of Coordination Chemistry
School of Chemistry and Chemical Engineering
Research Interests:
Total synthesis of natural products and chemical biology, medicinal chemistry of bioactive compounds from traditional Chinese medicine, and cell imaging.
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Prof. Huicheng YIN
Department of Mathematics
Research Interests:
Nonlinear partial differential equations, Mathematical theories in fluid dynamics.
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Prof. Jiangong YOU
Department of Mathematics
Research Interests:
Dynamical Systems, Partial Differential Equations, Spectrum Theory of Schrodinger Operators.
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Prof. Yang YU
State Key Laboratory of Solid State Microstructures
School of Physics
Research Interests:
Superconducting quantum devices and superconducting qubits; Using Josephson junctions as tools to investigate nonlinear phenomena.
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Prof. Chenyu ZHANG
State Key Laboratory of Pharmaceutical Biotechnology
School of Life Sciences
Research Interests:
MiRNA, Mitochondrial Function and Cell Metabolism.
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Prof. Rong ZHANG
Nanjing State Laboratory of Microstructures
School of Electronic Science & Engineering
Research Interests:
Semiconductor heterostructure materials, devices and physics; Semiconductor spintronic materials and devices; Solid state lighting and energy-saving devices; Semiconductor photovoltaic devices.
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Prof. Weiyi ZHANG
State Key Laboratory of Solid State Microstructures
School of Physics
Research Interests:
Mainly in condensed matter physics: including low temperature physics, electronic and magnetic properties of perovskites, photonic band gap calculation in modulated structures.
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Prof. Hongbo ZHENG
Institute for Climate and Global Change Research
School of Earth Sciences & Engineering
Research Interests:
Past global changes.
Email: Zhenghb@nju.edu.cn

——Chief Professors

Prof. Limin ZHENG
State Key Laboratory of Coordination Chemistry
School of Chemistry and Chemical Engineering
Research Interests:
Metal phosphonate chemistry; Low dimensional magnetic materials; Switchable magnetic materials.
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Prof. Jilin ZHOU
The MOE Key Laboratory of Modern Astronomy and Astrophysics
Department of Astronomy
Research Interests:
Formation and dynamics of Solar system and extrasolar planetary systems, nonlinear celestial mechanics.
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Prof. Zhihua ZHOU
State Key Laboratory of Novel Software Technology
Department of Computer Science and Technology
Research Interests:
Artificial Intelligence, machine learning, data mining, pattern recognition, image retrieval, evolutionary computation.
Email: zhouzh@nju.edu.cn

Prof. Junjie ZHU
The MOE Key Laboratory of Analytical Chemistry for Life Science
School of Chemistry and Chemical Engineering
Research Interests:
Zhu mainly works in nanoanalytical chemistry, including the synthesis and characterization of functionalized nanomaterials, bioelectrochemistry and nanoelectrochemistry, optical analysis of nanomaterials, regulation and manipulation on microfluidics chips by nanomaterials, bio-application of nanomaterials.
Email: jjzhu@nju.edu.cn

Prof. Yongyuan ZHU
State Key Laboratory of Solid State Microstructures
School of Physics
Research Interests:
Dielectric superlattices, Nonlinear optics, Metamaterials, Plasmonic crystals.
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Prof. Zhigang ZOU
Nanjing State Laboratory of Microstructures
School of Physics
Research Interests:
the conversion of solar energy into hydrogen and the application of photocatalyst on environment clean; photocatalytic reduction of CO_2 and artificial photosynthesis; photocatalytic biomedicine materials and photobiology synthesis; novel film solar cell; fuel cell with high efficient and low price; photoluminescent materials and white-light-emitting system with low price.
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Prof. Jinglin ZUO
State Key Laboratory of Coordination Chemistry
School of Chemistry and Chemical Engineering
Research Interests:
Functional Coordination Chemistry; Organometallic Chemistry; Molecular conductors and molecular wires; Molecular ferromagnetic semiconductors and molecular spintronics; Single-molecule magnets and chiral molecular magnets.
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Nobel Prize Winner Invited

Prof. Aaron Ciechanover
The Chemical and Biopharmaceutical Science Research Institute

In 2011, Aaron Ciechanover, an Israeli scientist and the winner of Nobel Prize in Chemistry set up the Chemical and Biopharmaceutical Science Research Institute at Nanjing University and assumed the role of dean. The institute has signed settle-in agreement with Jiangsu Life Science & Technology Zone to build a high-level cross-disciplinary platform of life science, pharmaceutical and basic medicine. New pharmaceutical will be invented by probing into pathological process with the tool of organic chemistry..

——Chief Professors

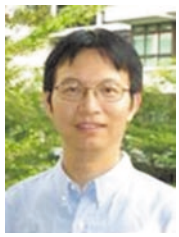
Professors Recruited under "Program of Global Experts" (1000 Plan)

Prof. Guigen LI
The Chemical and Biopharmaceutical Science Research Institute
Research Interests:
Asymmetric synthesis of drugs and precursors; Asymmetric catalysis; GAP (Group-Assistant-Purification Chemistry)and green chemistry; New reagents and reactions.
Email: guigen.li@ttu.edu

Prof. Xiaodong SONG
School of Earth Sciences & Engineering
Research Interests:
Seismic wave propagation and application of seismic observations in modeling and imaging the structure and dynamics of the Earth's interior: determination of the inner core rotation, mapping the fine structures of the inner core anisotropy, the inner core-fluid core boundary, and lateral variation of core-mantle boundary; the structure of crust and upper mantle in China and east Asia and the tectonics of the region. Approaches include waveform modeling and seismic tomography.
Email: xdsong@nju.edu.cn

Prof. Huabing WANG
School of Electronic Science & Engineering
Research Interests:
Superconductor electronics (fabrication, characterization, design, application, and nonlinear dynamics of superconductor electronic devices); Terahertz electronics (detection and generation); New superconductors; Hybrid electronic devices.
Email: hbwang@nju.edu.cn

Prof. Xueping WANG
Department of Mathematics
Research Interests:
My research domain is partial differential equations and mathematical physics. I mainly study spectral problems for differential operators arising from quantum physics (such as eigenvalue distribution, quantum scattering and inverse scattering, quantum resonances, N-body problems, semiclassical analysis and Born-Oppenheimer approximation), using tools from microlocal analysis and functional analysis. My recent interest is on spectral and microlocal analysis of non-selfadjoint operators.
Email: xue-ping.wang@univ-nantes.fr



Prof. Yingcun Xia
School of Business
Research Interests:
Financial time series analysis, nonparametric dimension reduction, risk management.
Email: staxyc@nus.edu.sg

Prof. Yongbing XU
School of Electronic Science & Engineering
Nanjing State Laboratory of Microstructures
Research Interests:
Spintronics, magnetic nanomaterials, magnetic data storage, microelectronics, thin film growth, and nanofabrication.
Email: yongbing.xuyork@gmail.com

Prof. Ming XUE
The MOE Key Laboratory of Mesoscale Severe Weather
School of Atmospheric Sciences
Research Interests:
Mesoscale meteorology and dynamics, Numerical weather prediction, ensemble forecasting, numerical simulation, ensemble and variational data assimilation, radar meteorology, typhoon and hurricane prediction and dynamics, computational methods, numerical model development.
Email: mxue@ou.edu

Prof. Fengming ZHANG
State Key Laboratory of Solid State Microstructures
School of Physics
Research Interests:
Photovoltaic Solar Energy, Spintronics, nano-magnetism.
Email: zhangfm@nju.edu.cn

Prof. Youkuan ZHANG
State Key Laboratory of Pollution Control and Resource Reuse
School of Environment/ Research Center of Water Science
Research Interests:
• Effects of anthropogenic activities on basin-scale water cycle and environment and their assessment;
• Surface water and groundwater interaction;
• Groundwater flow and solute transport in heterogeneous media;
• Scaling issues in precipitation, runoff, soil moisture, and groundwater;
• Groundwater in fractured rocks..
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