

# General Program

General Program is the main part of the research program category in the National Natural Science Fund. It supports scientists doing basic research on free selected topics within the funding scope of NSFC to conduct innovative research and promote a balanced, coordinated and sustained development of all disciplines.

Applicants should meet the following qualifications:

- (1) Experience of undertaking basic research projects or other types of basic research project(s).
- (2) Senior professional title or a Ph.D. degree, or recommended by two peers holding senior professional titles.

Graduate students are not eligible to apply for the General Program, but part time graduate students may apply through their employers if agreed upon by their supervisors.

Applicants should be familiar with the current situation of relevant research in China and the world, capable of leading a research group to conduct research. Home institutions should have necessary experimental research infrastructure. Applicants should follow the guideline to prepare proposals. The proposed research should be of significance and have research merits, and good theoretical basis, new academic ideas, clear research objectives, specific research contents and feasible research schemes. The number of collaborative institutions for General Program projects should not exceed two, and the duration of General Program projects is 4 years.

In 2012, NSFC funded 16,891 General Program projects with total funding of 12.48 billion yuan and average funding of 738,900 yuan per project, which is 38,100 yuan more than that in 2011. The average funding rate was 19.24%, 0.91% lower than previous year (please see table below for detail). In 2013, NSFC will continue to limit the funding scale for the General Program and maintain the same average funding. NSFC will focus on funding innovative proposals, and give researchers strong support on free explorations in broader disciplinary areas. Applicants are advised to put forward their budget according to actual needs and take account of the funding intensity described in relevant departments of NSFC.

### Funding of the General Program Projects in 2012

Unit: 10,000 yuan

Departments	Applications	Approved				Success rate (%)
		Projects	Funding	Average funding per project	Percentage of the total (%)	
Mathematical and Physical Sciences	5,635	1,515	117,320	77.44	9.40	26.89
Chemical Sciences	7,125	1,585	123,690	78.04	9.91	22.25
Life Sciences	13,240	2,706	203,880	75.34	16.34	20.44
Earth Sciences	6,471	1,668	133,430	79.99	10.69	25.78
Engineering and Materials Sciences	15,746	2,729	218,230	79.97	17.49	17.33
Information Sciences	9,880	1,724	132,820	77.04	10.64	17.45
Management Sciences	4,811	764	41,240	53.98	3.30	15.88
Health Sciences	24,870	4,200	277,390	66.05	22.23	16.89
Total	87,778	16,891	1,248,000	73.89	100.00	19.24

Please refer to the sections of each department for detailed funding information about General Program projects.

## Extended Funding Program for Young Scientist Fund with General Program Projects

In order to promote the fostering of young researchers in basic science, and encourage PIs of the Young Scientists Fund projects to conduct long term, systematic and in-depth research focusing on important scientific issues, NSFC set up the “Extended Funding Program for Young Scientists Fund with General Program Project” (Extended Funding hereafter) for PIs selected from those whose Young Scientists Fund projects are completed with outstanding progress and creative potentials to offer continued support opportunities with General Program.

### I. Eligibility

Applicants meeting the following qualifications may apply for the Extended Funding:

- (1) PIs of Young Scientists Fund awarded in 2010 ending in December of 2013.
- (2) Meeting the basic requirement of General Program projects.

PIs of Young Scientists Fund awarded in 2009 and before may not apply.

## **II. Evaluation procedures**

Starting in 2013, the proposals for Extended Funding will be accepted and reviewed at the same time as the General Programs. Review focuses on the progress of the on-going project of the Young Scientists Fund and reasons for applying the Extended Funding, including proposed research, creativity and scientific merit.

## **III. Notes**

- (1) The Extended Funding is in the category of General Programs and administrated according to the regulations of the later.
- (2) Applicant should prepare their applications according to the outlines of applications for Extended Funding and be sure to select proper application codes. Applications failing to select correct code will not be accepted.
- (3) Applicants with senior professional titles meeting the eligibility for the Extended Funding will be counted in the limitations on number of applications.
- (4) Applicants without senior professional titles will be free of the limitations on number of applications.
- (5) Applicants without senior professional titles or Ph.D. do not need to provide a letter of recommendation. Part time graduate students should provide a letter of consent signed by supervisor explaining the relation between the proposed research and the dissertation, the working time and conditions to ensure for research, etc., with the application form.
- (6) Applicant may only apply for one General Program project or one Extended Funding in the same year.

In 2013, the Extended Funding is planning to be 5% in number of the Young Scientists Fund projects ending in the year. Funding level is the average level of General Program in the relevant science department, and duration is 4 years. Two cooperative research institutions may not be exceeded.

**Special Notes:** Applications for the Extended Funding will be accepted in the concentrated receiving period for 2013. Applications should be submitted online.

**Extended Funding for Young Scientists Fund with General Program Projects in 2012**

Unit: 10,000 yuan

Department	Applications	Approved				Success rate (%)
		Projects	Funding	Average funding per project	Percentage of the total (%)	
Mathematical and Physical Sciences	169	29	2,102	72.48	9.22	17.16
Chemical Sciences	140	25	1,962	78.48	8.61	17.86
Life Sciences	261	48	3,822	79.63	16.76	18.39
Earth Sciences	190	34	2,720	80.00	11.93	17.89
Engineering and Materials Sciences	326	56	4,502	80.39	19.75	17.18
Information Sciences	220	36	2,880	80.00	12.63	16.36
Management Sciences	56	17	890.6	52.39	3.91	30.36
Health Sciences	370	56	3,920	70.00	17.19	15.14
Total	1,732	301	22,798.6	75.74	100.00	17.38

## Department of Mathematical and Physical Sciences

Mathematical and physical sciences are the basic disciplines of natural science, and the precursor and basis for the development of contemporary science. Disciplines in mathematical and physical sciences are peculiar in characteristics, such as big differences between or among disciplines, and pure theoretical research (such as mathematics, theoretical physics, etc.) and experimental studies. Many disciplines feature “mega-science”, such as high-energy physics, nuclear physics, astronomical physics, high temperature plasma physics, etc. They feature rather theoretical studies in deep level structures of matter and involve various fundamental disciplines. The development in mathematical and physical sciences also provides theories, methods and means for other disciplines. Research findings in mathematics and physics play a key role in promoting the progress of both basic and applied scientific disciplines.

Mathematical and physical sciences have extensive interactions with other sciences, for example, with information science, life science and management science, physics with materials science, life science, information science and chemistry, astronomy with earth science, and mechanics with engineering science, material science and earth science. The interactions produce a series of interdisciplinary and cross-boundary disciplines and new research areas have emerged, and at the same time research objects and areas in mathematical and physical sciences are also

expanding.

The Department will continue to increase its support on basic research that takes as its primary goals advancing the disciplinary development, promoting original innovation and training talented researchers and meeting the needs of national long-term development, as well as interdisciplinary research within the Department and with other departments.

According to the NSFC's strategic policy of "supporting basic research, adhering to free exploration and playing guiding role", and the strategic needs of the development of mathematical and physical sciences and the overall plan of project funding, the Department has taken some measures in project funding performance and has strengthened macro guidance in recent years. In 2013, the Department will continue to pay attention to the following aspects:

- (1) Stress on fostering outstanding young talents. In 2012, the principal investigators under the age of 40 in General Program projects reached 41.98%. In 2013, the Department will further increase funding for young researchers and expand funding scale for young applicants, so as to have more young scientists funded to conduct research independently.
- (2) Give more emphasis on creative research and disciplinary development. Multi-level funding to suit the needs of research will be adopted. More funding will be given to studies on developing experimental methods and techniques with innovative ideas aiming to the actual needs, which can be up to 1 or 1.5 million yuan per project. We advise applicant to pay attention to this policy.
- (3) Strengthen macro planning, and give preferential support to special areas so as to promote sustainable development in these areas. In 2013, preferential support will be given to the following areas:
  - ( i ) New concepts and new methods in soft matter studies;
  - ( ii ) Interdisciplinary issues related to mathematics and information science;
  - ( iii ) Research and development of experimental methods and techniques with novel research idea;
  - ( iv ) Pre-research on scientific goals of large-scale national projects;
  - ( v ) Problems driven research in applied mathematics;
  - ( vi ) Radiation protection and radiation physics;
  - ( vii ) Integration and standardization of computational mechanic software.

Please indicate the research directions in the note section of the application

form when applying for these projects, and choose the proper application code.

- (4) As the governmental investment in the National Natural Science Fund is increasing, the average funding for mathematical and physical research projects will also be increased accordingly. Please see the following table average funding intensity for General Program projects for reference. The funding intensity for experimental research projects will be higher than that of theoretical research projects.

**Funding for General Program Projects in the Last Two Years**

Unit: 10,000 yuan

Divisions		2011			2012		
		Projects	Funding	Funding rate (%)	Projects	Funding	Funding rate (%)
Mathematics	Math. I	191	8,267	30.85	199	11,566	30.06
	Math. II	183	7,950	28.19	192	11,113	26.48
Mechanics	Basic problems and methods in mechanics	7	446	31.82	9	667	25.71
	Dynamics and control	62	3,998	28.44	64	5,249	26.45
	Solid mechanics	147	9,569	28.16	163	13,854	25.59
	Fluid mechanics	77	4,984	27.90	75	6,128	24.75
	Bio-mechanics	22	1,452	28.95	26	2,265	25.49
	Explosive and impact dynamics	27	1,798	29.67	31	2,651	26.50
Astronomy	Astrophysics	40	2,938	35.71	41	3,715	33.33
	Astrometry and celestial mechanics	28	1,940	27.45	31	2,754	24.41
Physics I	Condensed matter physics	193	12,758	29.78	204	16,995	26.46
	Atomic and molecular physics	40	2,552	32.00	43	3,414	28.67
	Optics	101	6,599	29.52	116	9,818	26.48
	Acoustics	42	2,827	29.57	41	3,502	27.70
Physics II	Fundamental physics and particle physics	73	4,357	29.08	76	6,048	28.46
	Nuclear physics, nuclear technology and its applications	75	4,937	29.64	90	7,678	29.70
	Particle physics and nuclear physics experimental facilities	65	4,759	31.40	69	6,075	28.75
	Plasma physics	58	3,869	33.53	45	3,828	27.44
Total		1,431	86,000	29.49	1,515	117,320	26.89
Average funding per project		60.10			77.44		

## **Division of Mathematics**

The Division of Mathematics encourages creative research on important issues in the mainstream and frontier of mathematics, explorations of new ideas, new theories and methods in mathematics and interdisciplinary applications, intercrossing of different branch disciplines with mathematics, and applied mathematical research on practical issues. Applicants and research teams are required to have sound research background and capability. Proposal should be prepared based on deep understanding of the current status of the research involved, main issues and relevant research methods and available approaches. The Division encourages researchers to consolidate research team, foster talents and promote academic exchanges through the funded research projects. Research direction adjustment is allowable when needed. In 2013, the average funding will be 600,000 yuan per project.

For basic mathematics, the funding aims at maintaining stable development of research directions where China is traditionally strong and has comparatively large-scale research capability, promoting fast development of research areas that are within the mainstream of international mathematical research but relatively weak in China, and promoting interdisciplinary research among branches of mathematics. Focus is given to algebraic number theory, global differential geometry and low dimensional topology, multi complex variable functional theory and complex geometry, non-communicative geometry and operator algebra, and mathematical physics.

The funding for applied mathematics and computational mathematics gives more emphasis on basic theory and new methods with strong practical background and sound potentials for application. NSFC encourages mathematical modeling of practical problems, analysis and computation, and statistical methods and theory for complex data and mass data, support research on mathematical physical logic and algorithm complexity, discrete probability modeling, optimal algorithm, combinational algorithm and scientific computing. Focus is given to applied researches such as mathematical modeling and theory of new materials, information processing and control, coding theory and information security, mathematical modeling and analysis in environmental and energy sciences, bio information and life system, pathogenesis and control of infectious disease, statistical methods in industry and medical science, data mining and computational statistics, and mathematical methods for economic prediction and financial security.

When applying for interdisciplinary projects, applicants should choose the corresponding mathematical disciplines under Application Code I and the interdisciplinary disciplines under Application Code II.

In order to strengthen funding for problem driven research in applied mathematics, the Division will give preferential support so as to provide a platform for mathematicians and encourage their close collaboration with applied researchers to conduct research closely related to other areas and bring the role of mathematics into full play in advancing the development of science and technology, economy and society. Please indicate "Problem Driven Research in Applied Mathematics" in the note section of the application form.

## **Interdisciplinary Research between Information and Mathematics**

In order to promote interdisciplinary research between mathematics and information sciences, in 2013, the Department of Information Sciences and the Department of Mathematical and Physical Sciences will continue to fund interdisciplinary research that requires joint efforts from information science and mathematics. The funding intensity will be the same as that of General Program projects. The interdisciplinary areas for funding include: mathematical theories in information sciences, mathematical methods in information security, information system and advanced control theory. Key interdisciplinary research orientations to be funded are listed as the following:

### **1. Theory and algorithm of integer representation of real numbers**

Design of the theories and algorithms for the integer representation of real numbers, and the realization of the algorithms by computers and complexity analysis of the algorithm.

### **2. Theory and methods of formalized representation of software systems**

Description and representation, by using the formalization theory and methods, practical software system not only applicable to real time application software systems, but also to interactive, and discrete event software systems.

### **3. Theory and methods of security software systems designing**

Verify both theoretically and practically the advantages of the theory,



algorithm and system architectures of typical software system (system software or application software) analysis, design and development for improving the safety performance of software systems.

#### **4. Theoretical studies on new types of software system architecture**

Study, by addressing the contemporary features and needs of software application, the structure, theory and methods of new software system and define appropriate scientific characteristics in combination with practical software system.

#### **5. Theoretical studies on the validation of software systems**

Study the theory and methods for the validation of software system development so as to ensure the validity of the developed software.

#### **6. Theory and methods of formalized representation of practical engineering projects**

### **Division of Mechanics**

The Division of Mechanics mainly supports research on basic problems and methods in mechanics, studies in areas of branches of mechanics such as dynamics and control, solid mechanics, fluid mechanics, biomechanics, explosion and impact dynamics. The Division supports projects with creative ideas in the frontiers of mechanical research on the one hand and projects closely related to the sustainable development of economy, society and national security, and the development of engineering and technology on the other hand. The Division encourages experimental research using the available experimental facilities and key labs in China and advocates interdisciplinary research conducted by scientists from different disciplines. In 2013, the average funding will reach 850,000 yuan per project.

Research on basic issues and methods in mechanics should focus on theoretical studies on mathematical methods, rational mechanics and physical mechanics, and strengthen the intercrossing with mathematics and physics.

Applications for research in areas of dynamics and control should pay attention to the theory and methods of nonlinear dynamics, strengthen research on vibration and control of complex systems, dynamic modeling and analysis of problems involving the coupling of solid, flexible bodies and fluid, and promote development of non-smooth and multi-body system

dynamics. The Division encourages studies on key issues of dynamics and control problems in major engineering projects, and encourages experimental studies on dynamics and control.

Applications in the area of solid mechanics should give more consideration to intercrossing with physics, materials science, chemistry, information and biological sciences, and strengthen on proposing research topics in major engineering application, expand basic theory of continuum mechanics, and promote the development of multi-scale mechanics and multi field coupled mechanics. Proposals in the such areas will be encouraged as follows: the constitutive theory of materials at macro, meso and micro scales; the theory of strength, damage and failure mechanism; the mechanical behavior of new materials and structures; experimental measurement techniques and representation methods, high performance computational methods; structural optimization, endurance analysis and safety evaluations, and the deformation, damage mechanism and control of rock and soil materials and rock mechanical engineering, etc.

Applications in fluid mechanics should pay attention to studies on the laws and mechanisms governing complex flows. The Division encourages researches on new concept, new methods and new technologies in fluid mechanics, especially new experimental methods and advanced measurement technologies, and continues to support studies on fluid mechanical issues in aerospace and aviation, ship and marine engineering, civil and hydrological engineering, and strengthen studies on fluid mechanical issues in energy, transportation, environment and other high-tech and advanced technological areas.

Applications in biomechanics should pay attention to mechanical problems related to human health and medical sciences, explorations on mechanical laws in life sciences and clinical medical sciences, and studies on new theory, methods and technologies in biomechanics.

Applications for explosive and impact dynamics should closely focus on the safety issues of relevant engineering projects, pay attention to frontier areas and major national needs, and strengthen studies on the dynamic mechanical behaviors of materials, structural response to explosive impacts and detonation mechanisms.

The Department of Mathematical and Physical Sciences continues to support studies on instruments, new experimental methods and techniques

with innovative ideas. Applicants for this type of application should mark “Experimental Techniques and Instruments” in the application form. The Department will keep supporting projects in computational software development, giving stress on the integration and standardization research on the development of the computational mechanics software which may produce independent or shared IPR. Applicants for this type are requested to mark “Computational Mechanics Software” in the application form. Applicants of above two types of projects should have relevant research background.

## **Division of Astronomy**

The Division of Astronomy mainly supports researches on astrophysics, basic astronomy, astronomical instruments and technology. In accordance with the trend of astronomical development in the world and the present situation in China, the Division supports research proposals with emphasis on the development of technology and instrumentation. Studies based on existing observation apparatus or facilities to be built soon in China will be encouraged. The Division promotes the combination of innovative ideas, observation and theories, and studies on new technologies and methodologies for astronomy, especially those closely related to mega-science projects under construction in China. Interdisciplinary research is strongly encouraged so as to gradually build up research teams with special features and influence in international scientific communities. International cooperation and exchange, particularly those using large and advanced facilities abroad for observation and research, will be given much attention.

In the General Program projects funded in recent years, a good balance have been achieved between astrophysics (including cosmology and galaxies, stellar physics and solar physics), basic astronomy (including astrometry and celestial mechanics) and astronomical technology and methods (including the history of astronomy). Young researchers have become the main force in astronomical research and more than half of the awardees are under the age of 40.

In 2013, in addition to strengthening continuous support for projects integrating theory and observation and projects conducted by young scientists, emphasis will be given on interdisciplinary research with physics, space science, etc. Compared with the development in the world, research on planetary physics is rather weak in China, and should therefore be

enhanced immediately. On the basic policy of funding the best ones, the Division encourages research on interdisciplinary studies with particle cosmology, celestial bodies in the solar system, and planetary systems in other galaxies, structure and dynamics of galaxies, infrared astronomy, space astronomical measurement, and astronomical research that addresses the national needs. The priority will be given continuously to researches in basic astronomy, astronomical technology and methods, and to relative small scaled astronomical research institutions. In 2013, the average funding will be 900,000 yuan per project.

In the next few years, the Division plans to give special support to pre-research around the research based on equipment that have already been built or being built, and conceptual studies on new technologies that are urgently needed for large-scale telescope and space exploration, for example, LAMOST, FAST, and HXMT, etc. In 2013, the Division will give preferential support to research related to the scientific goals of LAMOST, i.e., research based on observation data from LAMOST, studies on star abundance, kinematics and physical process in different star families using low dispersion star spectrum samples in large samplings, studies on the complete Galaxy structure and chemical evolutions, studies on large scale cosmic structure and formation and evolution of galaxies using large sampling low dispersion galactic spectrum data, studies on nuclear physical properties of active galaxies using large sampling low dispersion quasar spectrum data, and studies on multi band astrophysics and data processing and analysis methods related to LAMOST observations. For applicant in these research areas, please mark “Research for Mega Science Project” or “New Astronomical Technology” in the application forms.

## **Division I of Physics**

The funding scope of the Division I of Physics covers research on condensed matter physics, atomic and molecular physics, optics, acoustics and new research areas formed between these four disciplines and other disciplines.

According to the current status and requirements of disciplinary development, the Division pays attention to study on experimental methods and techniques motivated by creative ideas, encourages researches in new computational methods and simulation software closely related to experimental physics and explorative types, physical problems in new energy field, key basic physical issues serving national needs, and physical

concepts, physical methods and physical properties in new disciplinary areas. In 2013, the average funding level will be 850,000 yuan per project.

For the funding in condensed matter physics, the Division will pay attention to singular quantum phenomenon in electron related systems, quantum phenomena and quantum effects in various low dimensional and small-scale systems or devices, structural and physical properties of surface, interface and membrane, physical properties of nano systems, advanced technologies and methods of device physics and nano structure characteristics, and physical issues in the structure, performance, preparation and application of advanced functional materials. Encouraged areas include basic physical issues in soft matters, physical issues and experimental methods related to life science, and interdisciplinary issues related to condensed matter physics.

For areas of atomic and molecular physics and optics, the Division encourages researchers to pay attention to atomic, molecular and cluster structures and dynamical process, cold atomic and molecular physics and its application, complex interactions of atomic and molecular systems, interactions between laser and atoms or molecular, physical issues in ultrafast and extremely strong light conditions, propagation process of light in new media and its characteristics, quantum frequency markers, quantum information, physics and methods of precision atomic and molecular spectra and precision measurement, high resolution, high sensitivity and high precision laser spectrum and its applications, and research on basic physical issues in micro nano photonics and surface plasma exciter. The basic research on the generation, transmission, display and application of 3-D optical images will be encouraged. In addition, optical electronics as well as frontier physical issues in optical electronics are also important research areas for funding.

In the area of acoustics, according to the major needs of social development, studies on key fundamental acoustic problems will be encouraged. Physical acoustics and basic research in marine acoustics, ultrasonic and acoustic effect, noise and control, new acoustic materials and devices, acoustic energy exchanger, and issues in information technology, etc. will be in priority.

## **Division II of Physics**

The Division II of Physics mainly supports research on fundamental physics, particle physics, nuclear physics, nuclear technology and its applications,

accelerator physics and detectors, plasma physics, and synchronized radiation methods. In 2013, the average funding will be 850,000 yuan per project.

For fundamental physics, funding will be focused on original studies and interdisciplinary research with other disciplines. Stress will be given to current research frontiers, especially to important theoretical physical issues closely related to experimental studies, and raised from scientific experiments as well as from interdisciplinary considerations.

For particle physics and nuclear physics, the Division will support creative theoretical and experimental research, in particular, the combination of theoretical and experimental studies related to selected large-scale experimental facilities that are in operation, upgrading or to be completed soon both in China and abroad. Funding will be used to guide research towards the understanding of important physical rules related to the latest experimental results, such as the theory and experiments of phenomenology in particle physics and interdisciplinary research of nuclear physics under extreme conditions with nuclear astrophysics and other disciplines.

For support to nuclear technology, accelerator and detector, low-temperature plasma and synchronized radiation, it is hoped that fundamental issues should be drawn from the disciplinary development, national demands and intercrossing with other disciplines, which may facilitate a deeper understanding of physical laws underlying the development of the disciplines and important applications at the same time. Emphasis will be laid on key technologies and innovative ideas in methodology and intercrossing with other disciplines. In addition, the exploration of mechanisms and rules governing the interaction of matter with instantaneous, high energy, high power and strong field radiation (such as charged particles, neutron and electromagnetic fields) are key areas for funding. Attention will be given to new acceleration principles, nanometer micro-beam, high power ion beam, strong current accelerators, plasma radiation source in accelerator and detector and plasma research, and physics and key technologies of all other advanced radiation sources. NSFC gives strong support to new types of nuclear detection technology and method such as large area, high counting rate, high temporal resolution, low cost and weak signals, etc., and relevant studies on nuclear electronics.

For nuclear fusion and plasma physics, more attention will be given to the exploration of new diagnostic means related to large facilities which are in

operation at present or will be built soon. In particular, basic research on advanced magnetic confinement fusion and new approaches to inertial confinement fusion and related fundamental physical problems, and computer simulation and experimental studies of various kinds of plasma will be stressed.

In order to make more efficient use of limited funds, the Division encourages researchers all over China to make full use of large national facilities, small and medium equipment to conduct research, so as to achieve sustainable development in the research. NSFC encourages experimental studies with innovative methods of high resolution diagnosis and detection, and, as well as the development of experimental facilities, detection and diagnosis devices which are important for the development of accelerators and detectors. Applicants may increase the funding request in applications in these areas according to the actual needs. Projects with more young scientists involved in the research team under the same condition will be preferred.

In 2013, the Department of Mathematical and Physical Sciences will make special allocation in General Program to fund special areas with continued support on the innovative development and improvement of instrument, advanced experimental techniques and methods, and radioactive physics, radioactive protection and environmental protection.

## **Department of Chemical Sciences**

Chemical science is to study the change of matters and chemical reactions, and it is a core discipline which is closely intercrossed and permeated with and into other disciplines, such as materials science, life science, information science, environmental science, energy science, earth science, space science and nuclear science. Chemical engineering is aimed to accomplish the transfer and conversion of matters and energy by making use of the principles of basic disciplines, and to solve scientific issues raised in the large-scaled production of chemical materials and products.

The mission of the Department is to facilitate the development of chemistry and chemical engineering, strengthen the capability of original innovation in basic research for promoting the role of chemistry as core science in multidisciplinary research, improve the overall quality and international status of chemical science in China, and foster creative talents and groups

with international reputation. The Department supports researches on the multi-patterns and variety of molecules at different levels and the control of chemical reactions and processes, and enhances the multi-level and multi-scale research at different levels of atoms, molecules, molecular aggregation and condensed state, as well as studies on the complex chemical system. In accordance with major scientific problems raised from the national economy, social development, national security and sustainable development, researches on chemical science and chemical engineering are encouraged for exploring their role in fields of life, materials, energy, information, resources, environmental science and human health. The Department promotes the combination of microscopic and macroscopic research, static and dynamic states, and theoretical research and empirical development of novel experimental methods and analytical technologies. It is also encouraged that the introduction of latest theories, technologies and achievements from other disciplines into the research for facilitating the sustainable development of research in chemical science and chemical engineering, fostering innovation and interdisciplinary studies, and supporting the emerging frontiers in research.

In 2012, 7,125 proposals for free application from 639 research institutions were received by the Department accounting for 12.61% more than those in 2011, and 1,585 proposals were funded with the success rate of 22.25% and the average funding intensity of 780,400 yuan per project. 2013 is the third year of the 12th Five-Year Plan. The Department will continue to promote high quality research in the cutting edge fields, lay stress on in-depth and systematic research work, give priority to interdisciplinary research projects, and take effective measures to support original creative and high risk research. In the process of assessment, scientific merit will always be the core concept, and the balancing, coordinating and sustainable development of all related disciplines will be thoroughly considered for the promotion of the fundamental research of chemical sciences in China at international frontier. In 2013, the funding for the General Program will be between 0.6 and 1.0 million yuan per project, and the average funding intensity per project will be the same level as that in 2012.



### Funding for General Program Projects in the Last Two Years

Unit: 10,000 yuan

Divisions		2011			2012		
		Projects	Funding	Funding rate (%)	Projects	Funding	Funding rate (%)
Chemistry I	Inorganic chemistry	179	10,752	23.96	192	14,984	22.33
	Analytical chemistry	159	9,550	23.87	169	13,186	23.06
Chemistry II	Organic chemistry	274	16,459	22.99	293	22,867	22.16
Chemistry III	Physical chemistry	274	16,459	25.75	293	22,867	23.78
Chemistry IV	Polymer science	167	10,031	26.63	178	13,186	25.07
	Environmental chemistry	164	9,850	22.78	178	13,888	21.81
Chemistry V	Chemical engineering	273	16,399	20.87	291	22,712	19.56
Total		1,490	89,500	23.56	1,585	123,690	22.25
Average funding per project		60.07			78.04		

## Division I of Chemistry

The Division supports research in fields of inorganic chemistry and analytical chemistry.

### Inorganic Chemistry

The Division will give its funding priority for researches on fundamental scientific issues of inorganic chemistry related to materials, life sciences, energy, information, environment and resource, etc.

In the study of synthesis and preparation, inorganic chemistry is aimed to develop new synthetic methods and approaches, reveal reaction mechanisms and rules, carry out function-oriented research on the synthesis, structure and property of new compounds by using of the concept of molecular engineering, strengthen studies on the functional assembly and composition of inorganic materials and relations between structure and property of functional inorganic matters as well as new materials, and enhance studies on devices and properties of inorganic compounds and materials by using of the basic theory and characterizing techniques of physical sciences. The chemical basis of biological effects of inorganic elements, especially research on bioinorganic chemistry beyond molecular level, inorganic bionic processes and bio-macromolecules combined with metal are emphasized.

In recent years, the research quality of inorganic chemistry in China has greatly improved. On the one hand, more and more scientists have paid attention to the creativity of research theme and made outstanding

achievements in some areas. On the other hand, more applicants have emphasized their studies on the synthesis and assembly methods of inorganic materials, mutual relations between structure and property as well as creative academic ideas. However, there are still some problems as follows: a great number of proposals for coordinated chemistry, molecule-based material chemistry and inorganic nano-material chemistry have been funded by the Division. The research contents were mainly focused on synthetic methods and structural characterization, and the study on the reaction process mechanism, relation and rule between the structure and property is going to be enhanced. More proposals are expected in regard to solid inorganic chemistry, especially those on function oriented synthesis and its applied research. As for the proposals of bioinorganic chemistry, more attention should be paid in mechanism study on biochemical process of metal ion or inorganic small molecule. The proposal for basic research and fruitful achievements in the area of radiochemistry should be further improved. The applications for Young Scientists Fund should attach importance to the innovation of academic idea and the independence of research work. The exploratory studies combined with local characteristics will be encouraged by the Division for the Fund for Less Developed Regions.

In 2013, applicants should focus their proposals on the development of inorganic synthetic chemistry and assembly methods, pay more attention to the combination of theory with experiment, and emphasize research on correlated regulations of structure and property of inorganic matters, as well as avoid similar focuses with those on-going Major Research Plan projects on crystal-state functional materials and controllable self-assembly and its functionality. Finally, proposals with creative ideas in the areas of solid chemistry, bio-inorganic chemistry and radiochemistry will be encouraged.

### **Analytical Chemistry**

Analytical chemistry is to study the component and structure of matters and to determine their chemical composite, content and distribution in time and space. It covers wide fields including many sub-disciplines such as spectrographic analysis, electrochemical analysis, chromatographic analysis, mass spectra analysis, NMR analysis, stoichiometry, surface and interface analysis; or inorganic analysis, organic analysis, biological analysis, environmental analysis, pharmaceutical analysis, food analysis, clinical analysis and legal medical test, characterization and analysis of materials, quality control and process analysis, instrument development and its

combining-use technique, etc. as well as newly emerged micro-/nano-analysis, analytical chemistry of chips, omics-analysis, image formation analysis, *in vivo* analysis, on-line real-time analysis, chemo-informatics and bio-informatics, etc. The creative research related to the above areas will also be supported such as new principles, new methods, new techniques, new instruments, new installation, key devices and so on. All in all, those proposals lacking creativity or simple/repetitive method test will not be supported.

Since the 11<sup>th</sup> Five-year Plan, the number of proposals submitted and projects funded by the discipline have been greatly increased. The features are incarnated from the proposals and funded projects as follows: ( i ) The research system has become complex system from simple one, focusing on “-omics” sample and living object, etc.; ( ii ) More profound studies were stressed on unicellular and mono-molecule; (iii) Prospective, foundation and innovation have taken seriously in the research contents; (iv) Research targets have been extended from components of substances to structure, morphology, stereo-conformation and function, meanwhile stoichiometry and chemo-informatics were more emphasized; ( v ) Research is no longer guided by the instrument analysis based on the tradition and simple principle, while nano-science and micro-fluidic controlling techniques, bionics and physics, etc., have been more and more brought into creating new method and new technology of analytical chemistry.

Based on proposals received and projects funded in recent years, the tendencies of disciplinary development are shown as follows: ( i ) To emphasize the research on methodology, intercross-discipline, integration of methods and information processing; ( ii ) To stress the studies on mutual action, signal transformation and action mechanism of related materials; (iii) To pay attention to the development of pre-treatment, separation and identification technologies of complex samples; (iv) To stress the development of instruments, including not only the development of whole set instruments, but also the improvement of key instruments, and upgrade of performance; ( v ) To strengthen the research on new techniques and methods of detection and diagnosis related to life sciences; (vi) To combine analytical chemistry closely with the frontier areas such as functional materials, resource & environment, new-type of energy, exploration of aviation/space and so on; (vii) To bring more important role of analytical chemistry into full play in the national security, national needs and economic development.

## **Division II of Chemistry**

The Division supports research projects in areas of organic chemistry and chemical biology. The research contents of chemical biology can be also found in the guide of other related Divisions.

Organic chemistry is to study the sources and components, the synthesis and preparation, the structures and properties, the reaction and conversion, and the functions and reactive mechanism of organic compounds, which is one of the key disciplines for preparing new substances. New theories, methods and reactions in organic chemistry have promoted not only the development of chemical science, but also the penetration and intercrossing with life science, materials science, energy, information, agricultural and environmental science in a greater extent, which has further pushed forward the progress of organic chemistry and produced many new growing points of discipline. The features of current research in organic chemistry are incarnated as follows: The concept of organic molecular design & preparation, recognition and self-assembly is promoting the development of many scientific fields. Selective reaction (catalytic asymmetric synthesis in particular) as well as activation and conversion of inert chemical bonds have become hot-point issues in the area of organic chemistry. Green chemistry, as an important strategic frontier of organic chemistry, is playing an important role in the field of optimizing utilization of resources and resolving environmental pollution problems. The intercrossing between organic chemistry and life science has provided new research methods and means for studying and recognizing complex phenomena and processes in life systems. The intercrossing between organic chemistry and materials science has promoted the discovery, manufacture and utilization of new functional organic matters. At same time, the discovery and application of new technologies are also promoting the development of organic chemistry.

Continuously supported by National Natural Science Fund, remarkable progress has been made in basic research of organic chemistry in China in such areas as metal-organic chemistry, physical organic chemistry, bioorganic chemistry, natural organic chemistry, asymmetrical synthesis and so on. Besides continually supporting the prevailing areas such as metal-organic chemistry, asymmetrical chemistry etc., the Division will further emphasize basic researches as follows: (i) In the areas of physical organic and organic analytical chemistry, the development of new theory, new method and new idea, and the application of new technologies; (ii) In the area of natural products, the discovery and the synthesis of natural

product with unique structure and important bio-activity discovered in China, the development of new synthesis method and new tactics, as well as the chemical biology of active small molecule based on natural products; (iii) In the area of medicine and pesticide, the drug design based on molecular target, new precursory compound, seeking new target and relation between structure and activity; (iv) In the area of organic functional materials, the study of molecular design, high-efficient synthesis, molecular assembly and innate physicochemical properties with novel structure and property; (v) In the area of super-molecular chemistry, the design of new synthesis acceptor and tectonic unit, molecular recognition, method of self-assembly and function of assembly bodies; (vi) The research and application of new-type catalysts and reagents with high-efficiency/ high-selectivity, so as to promote the development of green chemistry and sustainable chemistry.

### **Division III of Chemistry**

The Division supports research projects in areas of physical chemistry and theoretical chemistry.

Physical chemistry and theoretical chemistry provide the theoretical foundation of chemical sciences. The research contents of physical chemistry and theoretical chemistry have been enriched gradually and the research objects have been extended from simple system to complex system, from mono-molecules, molecular aggregates to condensed states, and from weak interaction between molecules to the formation of chemical bond. By using of experiment means and theoretic methods of physical chemistry, the information could be acquired in terms of molecular structure and dynamic change from ground states to excited states and from steady states to transient states. Research on physical chemistry and theoretical chemistry has the following trends: the combination of macroscopic and microscopic studies, the combination of bulk phase and surface/interface, the combination of static and dynamic states, and the combination of theory and experiment. These trends have been furthered into the study on the regulation of chemical reaction and structure/function of substance. As the intercrossing of physical chemistry and theoretical chemistry with energy science, environmental science, life science, materials science and information science, many new sub-disciplines have been generated. Physical chemistry has been playing a more and more important role in the development of chemistry and related sciences.

Among the proposals received and funded by the Division, catalysis

chemistry is one of the most active sub-disciplines in physical chemistry. In recent years, the number of applications in the area of catalysis has occupied one third of the total in the Division. Studies on electrochemistry and colloid & interface chemistry focused on the intercrossing with materials and life sciences, of which some studies have formed their own features, so the number of proposals concerned and funded was steadily increase. Research areas of chemical thermodynamics and kinetics have been broadened owing to the intercrossing with life science and materials science, and employing microcosmic research means in these areas which has been became a new developing trend. It has become a new growth point that theories and experiment methods of physical chemistry could be used for solving major issues in life science. However, research and development of experiment methods of physic-chemistry and then development of novel instruments must be further strengthened.

The research accomplishment of physic-chemistry and theoretic chemistry in China has drawn more and more attention from the international academic. The Division wishes that applicants should give play to the discipline's professional knowledge, focus on scientific frontiers, meet the national needs, and emphasize creative, systematic and prospective studies for developing new concepts, new theories and methods. The research intercrossing with other disciplines and the basic research with important theoretical significance and potential for application in the areas of energy, environment, materials and biomedicine, will be advocated. Meanwhile, the Division invites researchers of other disciplines to apply for interdisciplinary projects, but applications concerned should stress the scientific problems correlated with physical chemistry in their proposals.

## **Division IV of Chemistry**

The Division funds research projects in areas of polymer science and environmental chemistry.

### **Polymer Science**

Polymer science deals with the synthesis, molecular structure, chain structure, aggregation structure, properties and functions of polymers as well as their processing and utilization, and takes the soft-substance system, including synthetic polymers, bio-macromolecules and super-molecular polymers, as its objects of study.

In the field of polymer chemistry, it needs to carry out further the

synthesizing methodologies of various polymers, polymerizing reaction with controllable structure, molecular mass and distribution of products, bio-synthesizing methodologies and the chemical reaction process involving polymers; to emphasize the polymers synthesized by non-oil resource, and polymers with new structure, such as super-molecular polymers, hyper-branched polymers or dendrimer and their stereo-chemistry; to explore the new system of catalytic and trigger in polymerization reaction; and to develop the mild polymer reaction with high efficiency and high selectivity.

In the field of polymer physics, important directions are as follows: (i) to deepen the understanding of condensed state physics of soft-substances; (ii) to stress the transforming process of polymers in deferent states, such as crystal phenomena, liquid crystals and glassy states and so on, the structure of aggregation state with multi-level and the pathways of its dynamic evolution; (iii) to pay attention to studies on surface and interface, nano microstructure and size effect of polymer; (iv) to enhance studies on the polymer solution and rheology; and (v) to develop the characterizing technique and new theory of polymer, as well as simulated methods by the multi-scale coupling simulation.

In the field of functional polymers, major research directions are: (i) to further understand and develop functional materials and functional system of polymers, e.g. polymers with electric, optic and magnetic properties, polymers correlated with biology, medicine and pharmacology, as well as polymers used in the fields of adsorption, separation, reagents, catalysis, transduction and molecular recognition; (ii) to promote the functional polymer as advance soft-substance used in the fields of new energy, information technology, biomedicine and environmental sciences; (iii) to be good at finding novel emerging points from studies of natural polymers & biopolymers, so as to develop the research on intercross areas between synthesized polymers and biopolymers; and (iv) to stress the studies on environment echo and bionic polymers.

In the field of applied polymer chemistry and physics, major research directions include: (i) to develop the method of polymerization and process control of synthetic resin and other core polymer products; (ii) to explore new principle and new technology in polymer processing; (iii) to be good at extracting important fundamental scientific problems derived from industrial practice; (iv) to pay attention to the basic research on high performance polymer; multi-phase & multi-component system of polymer; chemical fiber,

elastomeric polymer, natural polymer, flame retardant polymer & hybrid polymer, etc.

In recent years, few proposals were received in methodologies of polymeric reaction and structural characterization. Meanwhile, few of proposals are received for the Fund for Less Developed Regions. It is encouraged that young scientists should break out of their original research direction and explore new field in the proposal.

### **Environmental Chemistry**

Environmental chemistry contains the following branches: environmental analytical chemistry, environmental pollution chemistry, pollution-control chemistry, pollution ecological chemistry, environmental theoretical chemistry, regional environmental chemistry and the relation of chemical pollutants with human health. Research on environmental chemistry has been developed rapidly by the aid of comprehensiveness and intercrossing with other disciplines. Now, environmental chemistry is playing an increasingly important role in moving forward the frontiers of basic research, solving national major environmental problems and so on.

Environmental chemistry is mainly to study the existence, behavior, evolving ways, trends and effects of chemicals, special pollutants in various environmental media, as well as chemical principles and methods of controlling them. Recently, the number of proposals has been increasing year by year. Research contents of proposal are gradually opened up from microcosmic mechanism to macrocosmic rule, combined with in-situ work and theoretic computation & simulation, and enhanced the creativity and systematization. But there are certain problems in some proposals, e.g. lack of new idea when selecting theme; less focusing on fundamental scientific issues; without giving prominence to the key points; simple repetition and less clear in technical scheme.

Based on the proposals accepted in recent years, major research orientations include: (i) identification, new analytic principles, methods and technologies of pollutants; (ii) environmental chemical behavior and microscopic mechanism of pollutants in multi-media system, and evolutionary process and mechanism of regional environmental qualities; (iii) forming mechanism and controlling principles of air pollution, polluting chemistry and control of water body environment, polluting process and renovating technology of soils, and technologies and reusable principles of treating solid waste



substances; (iv) green chemical process and environmental efficacy in the utilization of new energy; (v) application and safety of nano-materials in pollution controlling process; (vi) influence of chemical pollutants on ecological environment and human health, and (vii) relations of structure/efficacy and dose/efficacy of pollutants and forecast model of environmental pollution.

The Division encourages applicants to carry out the research on fundamental scientific issues of environment chemistry in areas of existence, behaviour, efficacy and control of pollutants, in consideration of real environment condition and combining with modern scientific means and methods.

## **Division V of Chemistry**

Funding areas by the Division cover two disciplines of the chemical engineering and industrial chemistry.

Chemical engineering and industrial chemistry are to study the motion, transfer, reaction and interrelation in the conversion processes of matter. It is aiming to recognize the phenomena and rules of transfer of matter in the conversion processes and its effect on the reaction and properties of products, develop technologies, flow chart and equipment for the clean and high effective conversion of substances, and establish theories and methods of design, scale-up and regulation and control for use in industrial production. New ideas, concepts and methods as well as their application in chemical engineering and technology will be especially emphasized.

In recent years, Chinese basic research of chemical engineering has made great progress, research teams have been strengthened continuously, research quality has been constantly enhanced, and research ideas have also become more and more innovative and unceasingly opened up. The situation has been changed dramatically compared with that of ten years ago. Basic research on key scientific issues extracted from complex industrial systems and forming step by step systematic theories and key techniques have become a major trend in areas of chemical engineering and industrial chemistry. A lot of new research contents are raised as follows: (i) the observation, measurement and simulation of micro-/meso-structure, interface and multi-scales, beside the measurement and correlation of macro-properties, and more attention on the optimization and regulation of structures, reinforcement of processes and scale-up rules; (ii) the uncommon and extreme processes, beside common systems; and (iii) the chemical

product engineering, beside chemical processing engineering. Nevertheless, there are still some problems: not enough proposals with original creative idea and works with breakthrough, especially those combined with key scientific issues based on national needs are even rare. The Division encourages that researchers in basic research areas, especially in traditional chemical engineering areas, should keep up their defined study direction instead of blindly following hot subjects, and also encourages research intercrossing and integrating with other disciplines.

Under the guidance of the national goals and social needs, the Division will give preferential support to studies on basic theories, key applied technologies and sustainable development in chemical engineering and industrial chemistry for enhancing the overall national comprehensive strength and creative ability. Particular focuses include the followings: (i) on the research of frontier subjects in new and high technologies of chemical engineering and newly emerged disciplines, it should be good at extracting the chemical engineering issues from the intercrossing study of multi-disciplines and emphasize the development and innovation of scientific theory and technological mean; (ii) on studies of key technologies in chemical engineering related to the national economy and people's welfare, it should strengthen systematic basic research and accumulation for understanding the laws, improving existing theories of the discipline and bring the guiding role of basic research into full play.

In 2013, following research areas will be encouraged: thermodynamics and basic chemical engineering data, inorganic chemical engineering, chemical engineering related to metallurgy, chemical engineering related to environment and resources, as well as transfer processes in uncommon condition with creative idea.

## **Department of Life Sciences**

The funding of the Department of Life Sciences covers studies in areas of resources, environment, agriculture, population and health, etc. In recent years, with the support from NSFC and other funding sources and unremitting efforts made by Chinese scientists, research in life science has witnessed rapid progress in China. The number of research papers published by Chinese scientists in international authoritative journals is increasing and the quality of research is improved rapidly.

## Funding for General Program Projects in the Last Two Years

Unit: 10,000 yuan

Divisions		2011			2012		
		Projects	Funding	Funding rate <sup>++</sup> (%)	Projects	Funding	Funding rate <sup>++</sup> (%)
Division I	Microbiology	159+2*	9,60+20*	21.58	163+11*	13,177+165*	20.00
	Botany	183+2*	11,009+20*	24.41	188+11*	15,060+165*	23.61
Division II	Ecology	159+4*	9,551+40*	22.48	163+11*	13,064+165*	21.30
	Forest science	160+4*	9,617+40*	21.44	163+12*	13,035+180*	19.04
Division III	Biophysics, biochemistry and molecular biology	143+2*	8,562+20*	22.73	146+10*	11,716+150*	22.41
	Immunology	65+1*	3,905+10*	22.37	72+8*	5,797+120*	25.00
	Biomechanics and issue engineering	81+3*	4,860+30*	21.93	84+8*	6,836+120*	22.49
Division IV	Neuroscience, cognitive science, and psychology	111+4*	6,660+40*	22.03	122+10*	9,789+150*	22.22
	Physiology, and integrative Biology	70+2*	4,200+40*	22.78	79+8*	6,301+120*	23.84
Division V	Genetics and Bioinformatics	122+3*	7,312+30*	22.69	124+10*	9,957+150*	23.55
	Cell biology	91+1*	5,467+10*	22.94	100+9*	7,993+135*	24.33
	Developmental biology, and Reproductive Biology	70+4*	4,200+40*	23.87	72+8*	5,776+120*	26.49
Division VI	Basic agriculture and crops	178+2*	10,670+20*	19.50	191+13*	15,313+195*	17.89
	Food Science	160+4*	9,612+40*	15.97	164+13*	13,095+195*	16.15
Division VII	Plant protection	121+3*	7,246+30*	22.14	124+10*	9,920+150*	19.25
	Horticulture and plant nutrition	123+2*	7,380+20*	19.53	132+11*	10,536+165*	19.40
Division VIII	Zoology	132+4*	7,938+40*	26.61	133+8*	10,693+120*	27.54
	Animal husbandry and grassland science	98+2*	5,861	20.16	107+10*	8,545+150*	18.14
	Veterinary science	103+3*	6,180+30*	18.66	110+10*	8,805+150*	18.29
	Aquatic science	66+2*	3,960+20*	19.77	69+8*	5,487+120*	20.92
Total		2395+54*	143,750+540*	21.33	2507+199*	200,895+2985*	20.82
Average funding per project		58.92 (60.02**)			75.34 (80.13 **)		

Note: The funding rate in this table contains Extension Program for Young Scientists in 2012.

\* Projects of Small Fund for Exploratory Studies.

\*\* Average intensity of General Program projects in four years.

++ Funding rate includes projects of Small Fund for Exploratory Studies.

The Department of Life Sciences received 13,240 proposals (including Extension Program for Young Scientists), of which, 12,995 were accepted for General Program in 2012, and 2,706 projects were funded, including

projects of Small Fund for Exploratory Studies, with a funding rate of 20.82%, and the average funding intensity is 753,400 yuan per project. Among which, there are 2,507 projects of 4-year General Program, the funding rate is 19.29% and the average funding intensity is 801,300 yuan per project. The Department will emphasize on funding decision according to the research quality and actual need rather than funding in equal intensity in the future. It is also hoped that the home institutions of applicants should pay close attention to academic standard of research and improve the quality of proposals.

The funding of General Program projects will reach 500,000 to 1,200,000 yuan per project in 2013, and the average funding will be the same as last year, therefore the applicants should apply for funding according to the actual need of the research. When writing proposals, in addition to filling in budget form, applicants should attach the detailed description of the budget to the proposal, so as to let peer reviewer and panel expert evaluate. For proposed research having more exploratory nature but with weak research basis, it is suggested that applicants may apply for lower funding. For those having solid research basis and good progress in previous work and requiring more funding to carry out further research, it is suggested that applicants may apply for higher intensity of funding according to the actual need. It should be noted in particular that the budget in proposals will be evaluated by peer reviewer and the panel. Once the proposal is funded, no change is permitted unreasonably in the budget when submitting the research plan, so the applicants should fill in the budget table seriously.

In order to promote the fast growing of young scientists in basic research, and to encourage PIs of Young Scientists Program projects to carry out long term, systematic and in-depth research around one important scientific issue, in General Program from 2012, NSFC begin to give extension funding to PIs who achieved significant progress and shown creative potential in the finished Young Scientists Program project of the same year. In 2012, the department of life sciences receive 261 applications for extension funding (of which 248 accepted), and 48 proposals were supported, the funding rate is 19.35 % (counting by the accepted proposals).

The Department has been actively encouraging researches with innovative academic thoughts, new techniques and approaches, particularly those with original innovative ideas and having the role of prompting the development of related disciplines, and giving high emphasis on proposals of new theories, hypotheses and the intercrossing of subjects based on previous

research over a long period of time. The Department will pay due attention to important frontiers and new emerging subjects in life sciences in the future, and emphasize balanced and harmonious development of various disciplines; and continue to stress on proposals of research concerning aspects of morphology, structure and function of human cells, tissues, organs and systems, and research in immunology, reproduction, development, aging, stem cell and tissue engineering, etc.. Studies will be encouraged on aiming at common and basic issues of life sciences using model of diseases.

The Department encourages scientists to carry out systematic and innovative work focusing on key issues over a long-term period, attaches great importance to project management at later stage, implements the funding policy depending on the performance of funded project, and gives preferential consideration to applicants with good performance in their previous projects under equivalent conditions.

Moreover, considering the problems occurred during the application and peer review processes in recent years, the Department reminds applicants to pay special attention to the following points when writing proposals:

- (1) In the explanation part of *the Guide to Programs* of the Department of Life Sciences and the Division, it has emphasized the funding scope of the division and the categories not to be funded. Therefore applicants should read them carefully according to his/her subject of application. It should be stressed, that the category not to be funded by the division in the *General Program Guide* may apply to other types of programs in the same division.
- (2) In the resume section, detailed information of the applicant and main members of the group is needed, such as employment, education from university or college, period from the start to the end, name of the tutors, etc., and also any previous projects funded by NSFC, results achieved and related papers. Papers published and to be published should be listed separately. As for the papers published, all authors, theme of the paper, name of the journals, year, periodical and page numbers should be provided, and they should also be listed according to the order of treatises, paper abstracts and conference papers, etc., respectively. If the first author is concurrent, please list them by the actual publishing order. As for paper accepted but not published, please enclose the acceptance letter of the journal. Please do not list papers that are only submitted.
- (3) Applicant should elaborate his (or her) research background in detail related to the proposal, and the experiment basis of his (or her) new

- assumption or new hypothesis, relevant results of pre-research, etc. Papers published beforehand should be indicated clearly, and for papers to be published, related data of important experiment results, such as photographs or diagrams of the experiment, etc., should be provided.
- (4) The research schemes, technique paths and methods are the important basis for the reviewers to evaluate the feasibilities of the project. The experiment plan should be complete and accurate, technical paths should be clear and brief. To avoid ambiguity by all means, please prepare optional scheme in case of some key technique scheme failed, and the alternative can be used as a reference by the reviewers.
  - (5) For new proposals based on previous funded projects, applicants should describe the progress in detail, and the difference and connection between their proposals and the former projects. If there is some conjunction with other projects funded, the similarities and differences between them should also be explained. Applicants should not only give enough consideration to the continuity of research contents, but also avoid repetition with previous projects.
  - (6) Concerning applications related to medical ethics, applicants should give the certification of ethic committee from their home institutions or the superior administrative agencies. For research using genetically modified organisms, the source should be indicated, and if donation is needed from other laboratories, the agreement from the donors should be attached.
  - (7) For applications involving international cooperation or with team members living abroad, applicants should offer the agreement or protocol for international cooperation, or the certificate for the affirmation of the members concerned.
  - (8) The home institution and the applicants should assure the accuracy and trustfulness of the information of every item in the applications.
  - (9) The signature of the applicant and the participants should be the same as the one in printed form in the application, please note that the signature and the name in printed form may not be in different languages, like Chinese and English, otherwise, the proposal may be declined.

Applicants should follow the requirement of *the Guide to Programs* and the application syllabus when writing their proposals. Otherwise, the proposals will be rejected or not funded.

## **Division I of Life Sciences**

The funding scope of the Division covers two disciplines, namely,

microbiology and botany.

### **Microbiology**

The Division supports basic research in the area of microbes, including fungus, bacteria, archaea, virus, prion and other microbes. Major funding research fields in this discipline include taxonomy and germplasm resources of microbe, microbe ecology, microbe group behavior, metabolism and physiological biochemistry of microbes, microbe genetics and evolution, microbe epigenetics, the morphological differentiation and its structure and function of microbes, synthetic biology, the interaction of microbes with its host and the environment, the pathogenesis and resistance of pathogen, etc.. Systematic studies aiming at basic biology of microbes are encouraged. Meanwhile, basic and frontier research of life sciences by using model microbes are encouraged.

It can be seen from the applications accepted and funded in recent years in this Division, there is a clear imbalance in the development of different branches in microbiology. There are fewer proposals in the study on mycoplasma, rickettsia, chlamydia, spiroplasma, phage, prion, etc., and the research needs to be augmented and intensified. The Division encourages researches around fields mentioned above, and preferential support will be given. In 2013, the Division will also give preference to areas in the taxonomy of microbes, so as to enhance the cultivation of young taxonomists. The Division will give 5 million yuan in preferential support to such field based on the average funding rate (among them, 1.5 million yuan for Young Scientists Program), and encourage taxonomic researches on bacteria, actinomycetes, and virus.

A great amount of creative achievements have obtained in the field of microbial genomics in China in the past years, and the Division encourage scientists to carry out deep mining and integrative study on microbial genomics resources at home and abroad; the exploration of new techniques and methods used in basic research of microbiology; researches based on single microbe cell, researches in weak areas in China (such as Marine Microbiology, etc.), and interdisciplinary areas of microbiology, as well as frontier research will be encouraged so as to promote balanced development of various sub-disciplines in microbiology.

### **Botany**

The Division supports basic and part of applied basic researches on plants. It

mainly includes studies in areas of structure and function of plants, plant cytobiology, taxonomy (including flora geography), plant evolution biology, paleobotany, plant cell genetics, plant immunity, physiological biochemistry, plant growth, breeding and development, plant reproductive biology, nutrition and substance metabolism, plant germplasm (including conservation and innovation of germplasm), endangered species protection, resource plant (including economic botany); marine/ocean botany, ethno botany, plant and their environment, plant secondary metabolism, plant chemistry and natural product chemistry, as well as the exploration of new techniques and methods in areas related to botany.

It can be seen from the applications accepted and funded in recent years in the area of botany that the development of each discipline has been unbalanced. There are relatively more applications in areas of plant phylogeny, plant incretion, growth and development, and resistance physiology, and therefore the research quality is relatively high. Systematic and creative research should be further strengthened henceforth, and we need to stress on interdisciplinary study. There are less applications in some subjects such as paleobotany, biological nitrogen fixation, respiration, water physiology, mineral elements and the metabolism, organic synthesize and transportation, physiology of seed, plant introduction and acclimatization, plant germplasm, hydrophytes and ocean resources, etc. Applications which have research basis in above-mentioned subjects will be encouraged. We encourage applicants carrying out studies in areas and direction of plant systems biology, plant tropism biology, invasive plant biology, the totipotency in plant cell, molecular basis of plant important property, response of plant to environment change, and data processing technology of “omics” research, etc.

The Division will continue to give preferential support to plant taxonomy in 2013, especially to strengthen the support to young taxonomists. We shall give 5 million preferential support to such areas based on the average funding rate (among them, 1.5 million will support program for young scientists), and encourage applicants to carry out research on species revision of certain families and genus on the world wide range and plant resources research in key areas and special environment. Meanwhile, since research on plant resources is relatively weak, the Division will encourage multidisciplinary and integrated research, and pay attention to key scientific issues during the process of introduction and plant germplasm protection for promoting effective protection and utilization of domestic plant resources of China.



The intercrossing study of botany with other disciplines will be encouraged strongly, especially with mathematics, chemistry, geosciences, ecology, genomics, genetics, metabonomics, bioinformatics and computer science etc. To encourage studies on discovery and development of new instruments, techniques and means in botany, such as new detection technique, high-throughput screening technique, advanced imaging technique, analysis techniques of high efficiency, etc., we encourage applicants to put forward unique or typical scientific issues based on their strength and research basis, and the division will strengthen on supporting projects with obvious creative ideas. In order to make full use of local advantages and resources advantages, and talent training, the Division will encourage collaboration of applicants with institutions or groups having advantages concerned.

## **Division II of Life Sciences**

The Division supports researches in areas of ecology and forest science.

### **Ecology**

Ecology studies the interaction between organisms or between organisms and the environment. It plays an important role in resolving the national ecological issues that are increasingly serious. The subject covers molecular and evolutionary ecology, behavior ecology, physiological ecology, population ecology, community ecology, ecosystem ecology, landscape and regional ecology, global change ecology, microbe ecology, pollution ecology, soil ecology, conservation biology and restoration ecology, and evaluation of ecological safety, etc.

In recent years, significant progress has been achieved in ecological study in China. However, the overall quality of fundamental ecology needs to be improved. The Division will strengthen its support to applications with strong innovative ideas, multidisciplinary research and new growing subjects, support proposals focusing on the basic research frontier of international ecology, closely connected with the national ecological and environmental issues, give preference to researches with possibility of making breakthrough in new theory and method, and strengthen basic research with long-term observation and experiment of field work, and researches on landscape and regional scale.

In 2012, a large number of applications were accepted in fields of ecosystem ecology, conservation biology and restoration ecology, physiological

ecology, pollution ecology, community ecology, globe change ecology, population ecology, molecular and evolution ecology, etc., but comparatively less applications were received in areas of behavioral ecology, landscape ecology. In the future, the Division will strengthen support to microbe ecology; encourage studies on population dynamics of microbes, interrelationships between microbe, animals and plants, and the function of microbe in ecosystems.

The Division reminds applicants to pay attention to the following points:

- (1) The content of research proposal should focus on key points, give clear definition of scientific issues, and pay attention to scientific aspect and feasibility of the research route and approach.
- (2) Proposals regarding to the multidisciplinary and combination studies of the macro and micro ecology should put forward clear ecological issues, and regional research should give emphasis on the combination of the theoretical study with the national need.
- (3) The utilization of new techniques like molecular biology should combine with scientific issues that may not be resolved by traditional ecological methods.

## **Forest Science**

Forest science is to reveal the essence and rules of the biological phenomena by taking forest and xylophyta as its research objects, and carry out the cultivation, protection, management, and utilization of forest resources. Forest science covers studies in fields of forest resources, forest resources information, wood physics, chemistry of forest products, forest biology, forest soil science, silviculture, forest management, forest health, tree genetic breeding, nonwood forest science, landscape architecture, desertification, and water and soil preservation, as well as related new techniques and methods in forest studies.

In recent years, there is a tendency of good growth of basic research on forest, but unbalanced in sub-disciplines. It can be seen from the applications in 2012 that a great number of proposals were accepted on topics around wood physics, the chemistry of forest products, and less applications in some traditional branch like forest resources, forest soil science and forest management, showing a tendency of shrinking. The proposals could not be formulated on important basic scientific issues in some important fields like silviculture and nonwood forestry. Most of the proposals about gene homologous cloning and transformation in forest

genetic breeding belongs to follow up projects, and lack of creativeness.

There are two obvious characters in basic research of forest. The first one is to meet the national needs. Therefore applicants should pay more attention to formulate the important and key scientific issues from the forestry practice. The other is to carry out continuous and in-depth studies regarding to perennial woody plants for a long period of time. In the future, the Division will continue to give priority to support basic research in such core fields like silviculture, the development and growth and heredity improvement of trees, the efficient utilization of forest resources, the health care and interactions of forests with environment, etc.. The Division will encourage scientists to carry out their researches in fields of digital forestry, multi-service function of forest, forming mechanism of wood superior traits, the analysis of the specific growth and development mechanisms of trees by using omics research, which can meet the national needs at the international hot area of research. The Division will strengthen support to shrinking research fields such as silviculture, forest soil science, forest management, and newly established areas as garden planning and landscape architecture. The Division will not accept proposals on pharmaceutical functional verification of effective components in areas of chemistry of forest products and nonwood forest science.

In 2013, applicants should pay attention to the following points:

- (1) To formulate scientific issues on targeted purpose and set the research contents based on national important science and technology requirements for forest science.
- (2) To make the theme simple, specific and clear, and avoid vague and empty wording by all means.
- (3) According to objects and contents of research, fill in the specific application code, and to provide detailed and specific research planning for judging the feasibility of the project.
- (4) The research basis should represent the existed accumulation concerned, research achievements, especially books, papers (corresponding author should marked), patents and awards, detailed order of authors for such achievements should presented.
- (5) To give explanation for the relationship and difference on scientific issues and study contents with other funded projects.

### **Division III of Life Sciences**

The Division covers three disciplines as follows: biophysics, biochemistry

and molecular biology, immunology, and biomechanics and tissue engineering.

### **Biophysics, Biochemistry and Molecular Biology**

The Division mainly supports studies on the structure and function of biological macromolecules, the interaction between macromolecules (including small molecules), the effect and role of the physical environment to organisms, and so forth. The subject of biological macromolecules, especially the structure and function of protein, is a key field of this discipline. Judging from the contents of applications received in recent years, it can be seen that there are more proposals on the structure and function of protein complexes, which have in-depth researches with sound background and accumulation. The proposals accepted on the interaction of biological macromolecules can carry out their research closely connected with important vital movement of cells. There are comparatively high-quality applications in areas of nuclear biochemistry, the structure and function of biomembrane, and transmembrane signal transduction, etc. Proposals in areas of structure computing and theoretical forecasting of large biological molecules and bioinformatics have well reflected the character of the intercrossing of disciplines. Researches on bio-effect and functional mechanisms of ionization and the electromagnetic radiation to organisms, and proteomics are inadequate in depth comparatively. Applications for structure and function research on glycoconjugates and environmental biophysics showed slightly weak basis on the whole. Applications on bioacoustics, biophotonics and space biology are few, and there is a wide range covered by new techniques and methods in the area of biophysics and molecular biology, but applications with positive creative techniques and methods in such fields are few.

The funding priorities for following proposals in the future will be given:

- (1) Proposals will be encouraged for the methods of structure computing and forecasting of large biological molecules and complexes, protein crystallography, nuclear magnetic resonance spectrum, bio-mass spectrometry, electronic microscope, etc. to study the structure and function of protein and complexes. Biological studies will be encouraged on the protein complexes and membrane protein structure, and the development of new structural biology methods for the structure determination and function study of proteins and other large bio-molecules.
- (2) Applications for the interaction between macromolecules during signal

transductions of cells, for instance, the interactions of proteins of important linkage on the core signal pathway and route, new component appraisal and discovery in signal transduction network, exploration of the function of signal transduction pathway, etc.

- (3) Researches on the biochemical mechanisms of covalent modifications and structural evolution process of proteins and nuclear acid, and their biological functions.
- (4) Studies on the multi-function and regulation mechanisms of non-coding RNA and interaction with proteins in various life processes of activity.
- (5) Molecular mechanism studies of the regulation of glucose, lipid metabolism.
- (6) Applications with new methods and ideas from mathematics, information sciences, and Interdisciplinary subjects, to carry out researches on bioinformatics, systems biology or integrative biology.
- (7) Applications for polysaccharide and glycoconjugates will be moderately encouraged.
- (8) Applications on the mechanisms of environmental physical factors to organisms, and research on the effect of space factors to organisms in micro gravity, space radiation conditions will be moderately encouraged.
- (9) Researches on the exploration of new techniques and methods in biophysics, biochemistry and molecular biology studies will be encouraged.

## **Immunology**

Immunology is a subject of science to study the structure and function of immune system of organisms. The main supporting area of the Division include immunobiology, immunogenetics, reproductive immunology, mucosal immunology, vaccine, antibody engineering, and new techniques and methods of immunology, etc. The research contents involve gene expression and regulation, structure and function of immune molecules; the differentiation, develop, adhere, migrate, tissue distribution of immune cells and sub-cells and their regulating mechanisms; the molecular and cellular mechanisms of innate immune response and host defense; adaptive immune response and immune tolerance, cell and molecular mechanisms of immune surveillance and immune modulation; the molecular and cellular basis of immunodeficiency or abnormal immune response; immune heredity; nerve-endocrine-immune network; immunological mechanisms of reproduction and pregnancy; the function and mechanisms of mucosal immunity and local immunity; researches of basic immunology problems during the manufacture of vaccine; studies of antibody engineering;

evolution and comparative immunity; plant innate immunity; scientific problems on the establishment of new techniques and methods and new research system of immunity.

The research scale of immunology in China has expanded rapidly in recent years, and the research level increased gradually and the international influence obviously enhanced, for some applicants, the creativeness on topic selection, academic thoughts, and research approaches are getting close to the international research status, and can analyze and formulate scientific hypothesis base on his/her former studies, and put forward reasonable research plan to check the hypothesis, and to drive the primitive innovation by the breakthrough of key scientific problems.

It can be seen from the applications in 2012 that problems still exists as follows:

- (1) More applications just followed the track of international hot spot, but fewer researches have their own typical features based on the long-term accumulation of the same direction.
- (2) The research object is too broad and the scientific problems is not clearly identified.
- (3) Lack of possibility analysis if the experimental technique route failed and the relevant design of resolve and alternative ones.
- (4) Lack of substantial subject intercross, etc.

In 2013, the Division will continue to strengthen the functional and mechanism study, and encourage basic research relating to the structure of immune system and function abnormal, immunological study based on practice; high light the establishment of new methods and techniques in immunology study, to encourage the systematic and dynamic observation of the migration and interaction of immune cells within the body by using real time dynamic imaging, internal imaging, single-celled imaging and other new techniques; encourage studies by means of model animals, and pay attention to the integrative study from molecular, cell to individual level, so as to get in-depth understanding of the complex structure and function of immune systems; and encourage subject cross study and also proposals conducive to the development of subject growing point.

### **Biomechanics and Tissue Engineering**

This subject is a branch intercrossing of life science with other area. The funding scope covers biomechanics, biorheology, biomaterials, tissue

engineering, bioelectronics, biological photo and imaging, bionics, nano-biology and new techniques and methods in biological system engineering.

In area of biomechanics and biorheology, research mainly focus on the coupling of mechanics-biology with mechanics-chemistry on cell-subcell-molecular level, the mechanical property and its mechanisms on system-organ-tissues aspects, etc., as well as mechanical simulation and modeling. In 2012, the number of the applications in areas of biomechanics and biorheology were increased compared with last year, and most of the proposals funded have good research basis and creativeness.

In the area of biomaterials, studies have gradually possessed features on functional design and multi-functions of biomaterials, the interaction of biomaterial with cells and tissues, new techniques on modification and surface treatment of materials, and its surface-interface study of biological characteristics, active molecular vehicle and controlled release, and other biomaterial study, and studies in areas above have formed their features gradually. In the future, the Division will continue to encourage applications on the study of new function, new effect of biomaterials etc.

The funding scope of tissue engineering mainly covers: tissue engineering studies of skin, bone and cartilage, nerve, blood and myocardium, muscle and tendon, liver and cholecyst, pancreas, kidney, urocyt, etc.. Moreover, applications in researches on transplantation of stem cells, tissue regeneration, and bio-artificial organ are in increasing tendency yearly, but there are fewer applications in tissue engineering of vital organs and in bio-artificial organs, therefore the Division will value and encourage actively applications in this research field.

Bioelectronics chiefly covers bio-signal detection and recognition, functional analysis of bio-signals, and biosensor. In the field of biological photos and imaging, it covers studies in the imaging of organism system, bio-signal and photos, biological information system, component and instruments used for bio-system detection and imaging. In 2012, there are fewer applications in areas of bioelectronics, bio-photos and imaging, bionics, new techniques and methods in the biological system engineering research, etc. This Division will encourage scientists to put forward their applications in such fields with well basis of accumulation. There are still more applications in nano-biology, among them, many of the proposals have been funded with well basis of accumulation and specific scientific

problems. It is becoming the mainly funding areas in the self-assembled and modulation of nano structure based on organism systems, targeted and multifunctional nano-delivery systems, and biological effect and safety of nano materials gradually. The Division encourages research proposals to resolve basic scientific issues of bio-systems by using advanced physical and chemical methods, such as nano-probe, nano-imaging techniques, and etc.

The Division will continue to encourage scientists to carry out basic research of systematic and disciplinary intercrossing in the fields of biomechanics and tissue engineering, and researches aiming at key scientific issues in the process of important tissue/organ reconstruct engineering, as well as interdisciplinary studies, especially long term, systematic and in-depth study of basic research on tissue/organ replacement and repair, on engineering reconstruct and transformation of regeneration.

## **Division IV of Life Sciences**

The funding scope of this Division covers two subjects: neuroscience and psychology, physiology and integrative biology.

### **Neuroscience and Psychology**

This discipline is to study the structure and functions of nerve system, investigates the essence and rules of human cognition and mental activity, and is one of the most challenging area of natural science, and one of the most important subjects in life sciences. The goal of this discipline is to explain the structure and function of human brain on each and every level, mind mechanisms of recognition activity, and the material basis of human behavior and psychological activities.

The funding scope of neuroscience covers molecular neurobiology, cellular neurobiology, developmental neurobiology, system neurobiology, sensory systems neurobiology, computational neurobiology and other researches concerning neuroscience. The main areas supported in the area of psychology include cognitive psychology, physiological psychology, medical psychology, engineering psychology, developmental and educational psychology, social psychology, and applied psychology. Cognitive neuroscience covers the brain structural and nerve basis of cognition, learning and memory, language, attention and consciousness, cognitive language and cognition simulation, etc.



It can be seen from the proposals submitted and projects funded in 2012 that most of the applicants have certain basis of scientific accumulation, and can propose scientific problems from their basic research. The proposals funded possess a broad selection of topics, for example, there are more applications funded in sensory perception (include analgesia and pain, vision, hearing, feeling, flavor and scent, etc.), the living and apoptosis mechanisms of nerve cells, development and regeneration, material transport regulation and nerve mechanisms of addiction, which have good basis of research comparatively, and there is a obvious improvement in supporting of the nerve mechanisms in fear, dysphoria and depressive research. In the future, the Division will continue to encourage basic research of systematic work relating to neurobiology, encourage exploring research with subject intercrossing, research of new techniques and methods related to basic research of neurobiology, and invite applications of computing neurobiology and system neurobiology combined with systems study and analysis of computing theory.

In the field of psychology, there is a large increase of applications in areas of applied psychology, medicinal psychology and educational psychology (increased over 40% compared with 2011). Topic selection incarnated Chinese characteristics, including the effects of culture to neuropsychological mechanisms of social cognition processing like aesthesia, count, self-referential processing, and empathy, etc., and the nerve mechanisms of unique Chinese language processing, and the nerve mechanisms study of psychological problems by using nerve imaging techniques etc. However, proposals in applied, engineering and social psychology are lack of creativeness or not concise in scientific problems; and the research basis is weak comparatively, some of the proposals still stay in the stage of questionnaire investigation. At present, the following studies should be urgently strengthened such as the combination of cognitive psychology with neurobiology mechanism; the intercrossing mechanisms between genetics, environment and psychological behavior; psychological mechanisms study by using medicinal psychology and application psychology method to explore social hot problems concerned. The Division will continue to promote the combination of nerve imaging techniques and cross-cultural psychology, concretely facilitate the cooperation of different research groups across nations and culture, and invite applications in fields of applied, engineering and social psychology putting forward the studies by their self-superiority and features, so as to promote the balanced development of psychology.

Cognitive science is to study the biological basis of cognitive process, values the nerve mechanisms of mental activity, and is one of the interdisciplinary subject on neuroscience with psychology. In 2012, proposals supported in brain structure and its nerve basis have well basis of research, but there are few applications concerning the high grade function of brain (such as consciousness, reasoning, and decision making etc.), and there is a lag behind compared with the international level, and lack of substantive subject intercross study, lack of the theoretical model and related experimental study which could make greater influence internationally. The research ability of applicants in cognitive simulation and new techniques and methods related should be further improved. In the future, the Division will continue to encourage intercross subject study cognitive-related; study to reveal the mechanisms of advanced function of brain with well basis; the exploration of various cognitive functional change of brain from the angle of cognitive development; and the neuro-feedback cognitive study based on the understanding of brain advanced functions.

### **Physiology and Integrative Biology**

Physiology is one subject to study the phenomena of normal life activities, principles and regulation, The objects of this discipline is to investigate the rules and mechanisms of various normal life phenomena and activities, the effect of environmental change to organisms and the mechanisms of homeostasis, and to reveal the significance for every physiological function at the overall life activities for the regulation at different levels of organisms. Integrative biology is to study the function, structure and metabolism, and their interaction on cell, tissue, organ and whole individual level, to depict quantities and predict biological function, phenotype and behavior, and to investigate the operating law of information flow.

The main funding scope covers cell physiology, systems physiology, integrative physiology, caducity and biorhythm, nutrition and metabolizes physiology, exercise physiology, special environmental physiology, comparative physiology, human anatomy, human tissue and embryology, and integrative biology, and studies concerning physiological mechanisms of healthy and disease on the field above. Among them, comparative physiology is to study the physiological function features and its development rules of phylogeny and ontogeny under differential stages and under various environment by using comparative methods, and the research achievement of comparative physiology will provide more broad and solid basis of scientific theory for the study of human physiology and the medical

treatment and pharmaceutical practice.

In 2012, there was an obvious increase of applications in systems physiology (circulation, aspiration, digestion, urinary, and reproduction physiology, etc.), and also in exercise physiology, integrative physiology (as regulation and adaptation of organisms, neuron-endocrine immune modulation, incretion and metabolic regulation, etc.), and there is a rapid increase in cell physiology, nutrition and metabolizes physiology, caducity and biorhythm, human anatomy, and human histology and embryology, etc.. Most of the projects funded in 2012 had sound research background and specific scientific issue. The main research contents were related to the following themes: the function and regulating mechanisms of ion channels and receptors under different physiological conditions, the interaction between cell-cells of different tissues and their physiological significance, physiological function of signal molecules in cardiovascular and nerve system, the nerve adjustment of gastrointestinal function, the cell physiological regulating mechanisms of the occur and develop of germ cells, the molecular mechanisms of movement to energy metabolisms and improvement of organ function, and the stress response and its adaptive mechanisms in multi-levels under special circumstance, etc. Applications, which are only focused on the phenomena observation, record depiction, merely “omics” screening, or lack of necessary former research basis, may not be supported.

In the future, the Division will continue to encourage integrated research on the multi layers of molecular, cell, tissue, organ and systems; physiological regulating mechanisms study of caducity and biorhythm, encourage functional integrative and regulative mechanisms study between different systems in systems physiology; physiological functional study by using advanced animal models or different model animals; and the application of research achievement in fields of mathematics, physics, chemistry and information science into the study of physiology for promoting the intercross and convergence of integrated biology with systems physiology and cell physiology, so as to make new breakthrough in theory and techniques.

Please note in particular that applications concerning researches about plants, microbes, traditional Chinese medicine, wild animals (except comparative physiology) and livestock related are not accepted in this Division.

## **Division V of Life Sciences**

The funding scope of the Division covers three subjects as follows: genetics, bioinformatics, cell biology, and developmental biology and reproductive biology.

### **Genetics and Bioinformatics**

Genetics is to study the inheritance and variation of organisms. Modern genetics is to study the structure and function, transfer and variation laws of gene and genome. Bioinformatics mainly explores new algorithm and statistical methods by using computer techniques and information techniques, analyzes bio experimental data, assures the biological significance within the datum, and develops new instrument of data analysis in order to obtain and manage various types of information.

The main funding scope of this subject covers plant genetics, animal genetics, microbe genetics, molecular genetics, human genetics, population and evolution genetics, statistical genetics, behavioral genetics, genomics, epigenetics, biostatistics and bioinformatics, genetic regulation network and systems biology, etc. In genetics, the Division will support with emphasis on the study of genetic basic laws by using model organisms, and molecular mechanisms of gene expression regulation; the identification, analysis of key gene function and its regulating rules; genetic diversity, the relationship of phenotype and genotype, the function of genotype in the prediction of complex traits and complex diseases, etc.; and the evolution model and mechanisms of genetic variation for important populations. The Division encourage the development of genetic operating system and new techniques and methods in biogenetic breeding, the study of gene route and regulating network on the interaction between gene and gene, gene and environment, phenotype and functional abnormal control by using obtained genetic datum and information; and basic research on genetic rules by using special resources, include artificial selection, formation and evolution of important traits, etc.. Studies on gene expression and regulation, as well as epigenetics are the hot spots in the area of genetics, including research on nucleic acid and histone modification. The Division suggests that applicants should pay attention to the combination of researches on the expression regulation of gene and related biological significance. A few of applications were concerned in areas of animal genetics, microbe genetics, and quantitative trait genetics, and lack of exploration and creativeness in method, which should be strengthened further.

At present, new generation of sequencing techniques has brought about new challenge and opportunity for the study of modern biology. Therefore, on the one hand, the Division encourages scientists working for the development of new techniques and method for large scale data analyses, and exploring rules of biological significance and discussing research methods of functional Network. On the other hand, the Division encourages applicants to carry out research from the key point of genomic structure, function and evolution, by using species with completion of the whole genome sequencing. Studies on bioinformatics may pay more attention to the integration and analysis of mass data, functional genomes, biological networks, and systems biology, etc.

The Division will strengthen its support on the exploration of new theory and methods and interdisciplinary study in areas of genetics, genomics, bioinformatics, and computation biology.

### **Cell Biology**

Cell biology is to study the basic rules and mechanisms of life activity of cells. Modern cell biology is mainly aimed at revealing the structure, function, phenotypes and regulation mechanism at molecular, cellular and individual levels within organisms, and highly values systematic research by using different new techniques and methods to subtle molecular regulating mechanisms and complicated regulating network of various life activities of cells in time and space, as well as studies on cytological mechanisms of phenotype and functional abnormal occurrence of organisms.

Research areas supported in cell biology mainly include cellular and organelles structure, components and their assemblage mechanisms, regulation mechanisms of cell growth, division, and cell cycle, differentiation and polarity of cells, aging, death of cells, movement of cells, cell signal transduction, extra cellular matrix, vesicle transportation (include endocytosis and exocytosis), respiration and metabolism of cells, interaction between cell and cell, cell and environment, cell and microbes, new techniques and methods used in cytology, and other cytological issues relating to medicine and agriculture.

Researches on the structure and function of cells and organelles are the main aspects to be supported. Applicants are encouraged to carry out integrated studies on the mechanisms of synthesis, modification, degradation, localization, and translocation of protein with the aggregation, dissociation,

location of its components, and the activity diversification with time and space of protein complex during the process of cell signal transduction with dynamic change mechanisms of life activities of cells. Highlight will be given to studies on basic cytobiology by using cell models or combine with model organisms, and incorporate with techniques and methods of genetics, developmental biology, chemical biology, and biophotonics, etc..

Among the applications accepted in 2012, there were fewer applications in areas of structure and function of cells and organelles, cell growth and multiplication, extra cellular matrix, cell substance transportation, cell metabolism, and research of new methods in cytobiology. Since those areas are important in cell biology and have certain foundations in related researches in China, the Division will give preference to applicants who present their proposals with scientific issues from their previous research on these aspects.

In 2013, the Division will continue to stress researches on functional and mechanism issues, highlight the utilization of various new research techniques and methods in the study of cell biology, actively promote the development of cell in situ and real time dynamic techniques and methods, and highly value integrated researches from molecular to cellular and individual levels, so as to reveal different molecular mechanisms closely linked with cell function and biological effect and network control.

### **Developmental Biology and Reproductive Biology**

The funding scope of this discipline covers 3 research fields including developmental biology, reproductive biology and stem-cell biology, in order to explore the basic rules of gametogenesis, fertilization, embryo development, the occurrence and growth of various organism tissues and organs.

The key biological issues in animal (include human) developmental biology concern the determination of embryo polarity; the inducement and differentiation of germ layers; cells fate determination; morphogenesis of tissues and organs; Organ homeostasis maintain and regeneration; abnormal development and related diseases; evolution of development mechanisms and influence of environment to development, etc..

The key biological issues in plant developmental biology concern mechanisms of organogenesis and cell differentiation, especially the

molecular regulating mechanisms study of fertilization, zygotic activation, the development and nutrition of embryo and endosperm, and the occurrence of reproductive organs; resolution of signal transduction of flower induction and gamete development; the study of the maintain of stem-cells and its function of growing point; and the exploration of the relationship between development and evolution.

The key biological issues in reproductive biology concern sex determination and gonadal differentiation; the fate determination, migration, multiplication of primordial germ cells; the occurrence and maturation of gamete; the interaction of germ cells and somatic cells; the sperm-egg reorganization and fertilization; early embryo development and implantation; and apomixes; genetics, epigenetics, environment and the reproductive health; the occurrence mechanisms of diseases relevant to reproduction; the security of assisted reproductive techniques; and the regulating role of reproductive endocrinology.

Key scientific issues in stem cell biology include: the multiplication of stem cells and their maintains of pluripotent; the directional differentiation of stem cells; the multiplication and differentiation potential of somatic stem cells; stem cells and micro-environment; immunogenicity of stem cell; trans-differentiation of cells; stem cell and tissue and organ engineering, etc..

Modern developmental biology and reproductive biology emphasize on the continuity of development and dynamic process of change, emphasize the collaborate function of multi-cells and multi-genes, value the relationship of development and diseases, and encourage the exploration of molecular regulating mechanisms of development and reproduction by using model organisms. Applications will be encouraged on the creative development of research methods and systems, as well as the establishment of model diseases concerning development and reproduction, so as to provide basis for clinical transformation. In the field of plant development and reproduction, applications of basic research will be encouraged to providing theoretical guidance for modern molecular breeding.

## **Division VI of Life Sciences**

The funding areas of the Division cover basic agriculture and crops, and food sciences.

## **Basic Agriculture and Crops**

The Division mainly supports basic researches targeted at systems of crops-environment. The research emphasizes on the laws of crop growth and development, the interaction of crops with environment, the genetic improvement of crops, and the production and related issues which cover the subjects of basic agriculture, crop cultivation and farming system, physiological ecology of crop, germplasm resources, genetic breeding of crops and crop seed science, etc.

The key aspects of crop science today are as follows: the germplasm and gene resources of crops, genetic and molecular mechanisms of important crop property formation, the interaction between crop and environment, the super high-yield theory of crop, rules of resource utilization, and the quality control of crop seed and yields. The Division will encourage scientists to carry out researches driven by scientific issues based on the important demand of national food security, environmental protection and sustainable development in the above areas. The Division will encourage basic research with the combination of modern genomics, bio techniques, bioinformatics and crop science for targeting on scientific frontiers of crops and the national future demands of agriculture industry. Studies on crop information science, which combine information techniques, computing biology, systems biology with crop science, will be promoted.

Researches on crop physiological ecology and cultivation regulation carried out around the high-yield, fine quality, high efficiency, the resilience production of crop, and as well as the high efficient utilization of resources will be encouraged. The cultivation, physiological and genetic research by using crop varieties and their parental materials which are broadly used in production and studies on germplasm resources innovation and related mechanisms by using new techniques and methods (like atomic energy, etc.) will be also encouraged.

It can be seen from the applications in recent years that there was an increase in number of proposals with basic issues on topics meeting the nation demand of agriculture, an obvious increase in interdisciplinary studies around basic agricultural issues, and a diversified distribution of home institutions of applications. However, problems still exist as the following: (i) Researches on crop genome are generally concerned, but not enough on further exploration of mechanisms of physiology and genetics; (ii) Attention is paid to work in the international frontier, but not enough on close combination with practical issues of national agricultural production;



(iii) Systematic and sustainable studies are weak in most of the applications.

Applications should take crops and crop products as their research objects, and the intercrossing with other subjects should not depart from the principal object, otherwise they will not be accepted. The Division will encourage the close combination of new theory, techniques with traditional methods, laboratory work with field experiments, and give preferential support to continuous and systematic work.

The Division does not fund applications with research objects like agricultural animals, animal products, forest and woods, and model plants of *Arabidopsis thaliana*, etc., the applicants should fill in the application code correctly to the secondary level or the third level; otherwise they will be not funded.

### **Food Science**

Food science, which is an interdisciplinary subject with the close combination of theory and application, is to essentially study physics, chemistry, biology, nutrition and safety properties of food and food materials, and principles of food storage processing, as well as the theory and methods enhancing the nutrition value of food and security. Food science includes food biochemistry, food flavor chemistry, food nutrition, food properties of matter, food materials science, food hygiene, food inspection, food processing, and food microbiology, etc., which are integrated with the theory and method of biology, chemistry, physics, agriculture, medicine, material and engineering sciences, etc..

Food science mainly supports basic researches by the Division based on food and its stuff as research objects of this discipline. The main scope of funding is concerned on basic food science, food biochemistry, food nutrition and health, biological basis of food processing, food storage and fresh keeping, food safety and quality control.

Problems existing in proposals in 2012 include: (i) Some of the proposals excessively emphasized on the technology and product development; (ii) Research contents of few proposals departed from the funding scope of food science; (iii) Some of the application were not rigorous and specific; (iv) lack of continuity for some of the applicants; (v) loose research contents, or not enough concentration on basic key scientific issues, etc.; (vi) some proposals were lack of creativeness, or lack of in-depth research, for

example, many applications in food nutrition emphasized much on active ingredients extraction, separation and primary functional evaluation of food; and some of the proposals in food inspection emphasized much on the suppleness apply in various fields.

In 2013, the Division will give its priority to important scientific issues concerning the national nutrition and health, and restricting the development of Chinese food production. The proposal with higher creativeness, and continuous and systematic work, as well as the substantive multidisciplinary study will be encouraged. In food nutrition, the Division will support with priority the study of interaction between food components, molecular nutrition, dietary patterns and human health, etc.; in the field of food inspection, emphasis will be given to support the theoretical basic research on the establishment of new techniques and methods. The Division will not accept applications mainly referring to food technology, processing technology, food development, chemical modification and studies related to the prevention and cure of diseases, and drug development, and not accept proposals mainly referring to growth, development and metabolic physiological studies of plant and animals; and preclinical experimental research directly using human body will be not funded.

## **Division VII of Life Sciences**

The funding scope of the Division covers two subjects: plant protection, and horticulture and plant nutrition.

### **Plant Protection**

Plant protection is mainly to study biological characteristics, rules of occurrence and damage of crop disease, insect pests, weeds, rodents and other pests, and their interaction mechanisms with crops and environment, and the theory and methods of monitoring and early warning, prevention and control. There is a cross-integration between botany, zoology, microbiology, molecular biology, ecology and other subjects of biology with environmental science, chemistry and chemical engineering, and food security, etc. The funding areas of plant protection include plant pathology, agricultural entomology, agricultural weeds, agricultural rats, plant chemical protection, biological prevention and cure, quarantine of agricultural pests, invasion biology, and biological techniques of plant protection etc.

In recent years, basic research of plant protection is rapidly developed in the world, attaching great importance to theory and approach innovation of the

prevention and cure of crop pests. The whole genome sequence assay of some important crop pathogenic bacteria, fungus, nematodes and insects have been completed, a number of pathogenic genes of important pathogen and crop disease-resistant genes have been identified, and molecular mechanisms of the interaction between pests and their hosts have been understood. The theory and techniques system of commercializing utilization of transgenosis disease-resistant, pest-resistant, and medicine-resistant crops and gene engineering microbial insecticides have been preliminarily formed. Important progress has been made in basic research of pest drug resistance and new mechanism of action and target, which combine with the modern analytical separation and biomimetic synthesis techniques, and promoted the discovery of lead compound and infochemicals of new biogenic pesticides; remote sensing, GPS, GIS and computer techniques have been widely used in the research of forecast and prediction of plant pests. However, basic research of plant protection in China is relatively weak, and especially there is a large gap in basic research of functional genomics of important pests, mechanisms of pest's virulence and crop resistance, mechanism of pest disaster and the interaction with environmental factors, and creation of new pesticides and efficient utilization, etc. compared with developed countries.

It can be seen from the applications in 2012 that many applicants could grasp the research progress at home and abroad, and pay more attention to concrete scientific problems from the practice of agricultural production, and to the scientific significance and application potential in topic selection, and the creativeness of academic thoughts and research methods have also been improved, the research basis of early stage is more solid, and the composition of proposals is more normalized.

But following problems still exists: ( i ) Quite a number of applications just critically trace or imitate research concerned at home and abroad, or grafting one research method (or material) to another material (or method), and lack of creativeness; (ii) for some of the research contents, it only give emphasis on the simulation of conditions in laboratory, especially overemphasize the research in molecular levels, but less focuses on the field research and verification; (iii) some of the applications are lack of the concretion of scientific problems, and the research contents are too broad, and lack of in-depth studies, and systematic and consistency of research is not firm.

In 2013, the Division will continue to encourage researches oriented to

national security of food, quality of agricultural products, and eco-environment, and researches on key scientific issues from agricultural production, studies on mechanisms of reciprocity of crop-pest-environment (biotic and abiotic) at microscopic or macroscopic level, as well as scientific issues concerned on the rules of occurrence, disaster, monitoring and forecast, prevention and control of pests, and the basic and applied basic research of pesticide toxicology and its safely utilization. Special attentions could be paid to new scientific issues, combining with the factors of the national features to study the adjustment of industrial structure, crop varieties alternation, improvement of cultivation measures and the global climate change, so as to provide theory, method and techniques resolving the practical issues of the national agricultural production. The close combination of new theory and methods with traditional methods, and laboratory work with field experiment are encouraged. The preferential support will be given to continuous and systematic research. Excellent proposals will be funded in the field of agriculture weed, farm rats and other harmful organisms, diseases and pest forecasting science etc. The Division supports applications which focus their study on crop pests and their environment (biotic and abiotic) as its object, and the prevention and control of pests as its scientific purposes. Otherwise applications will not be funded by the Division. Applications taking woods and model plant arabidopsis as main research objects will not supported. Applicants should correctly fill in the application code to the last level.

### **Horticulture and Plant Nutrition**

The funding scope of this discipline covers two subjects in horticulture and plant nutrition.

The funding scope of horticulture covers pomology, olericulture, and fruit science, ornamental horticulture, horticultural facilities, post-harvest biology of garden crops and food mycology. In recently years, there is a rapid development of basic research in horticulture in China; Chinese scientists have made vigorous progress in identifying, evaluation and utilization of germplasm resources on population, individual, cell and molecular level of garden crops. The development and utilization of omics, especially International genome sequencing plans for cucumber, tomato, potato, wild cabbage, Chinese cabbage and citrus, etc., which were organized or participated by Chinese scientists, will further stimulate the study on Chinese horticulture crops germplasm. Great development has been made in the study of mechanisms of quality formation and regulation of garden crops,

response mechanisms to non-living adversity, mechanisms of organ generation, development and regulation of horticultural products, mechanisms of rootstock-scion interaction, the formation and regulation of unfavorable components of horticultural products, the biological mechanisms and regulation of fruit ripening and senescence, biological basis and regulation of color, pattern, scent, florescence of ornamental crops, etc.

The funding scope of plant nutrition covers the heredity of plant nutrition, physiology of plant nutrition, manure and fertilizer science, nutrient resources and recycling, crop-soil interaction and regulation, resource utilization of farmland water and soil etc. Currently, basic research on plant nutrition has combined the developing frontier of the subject with the national needs on agricultural resource environment, and strengthened the cross study of the interaction of plant-soil-microbe, the coupling mechanism study of high efficiency use of plant nutrition elements and water resources. It will be encouraged to study the functional genomic, genetics and physiology of plant nutrition, which were formed by the combination of plant nutrition with modern biotechnology; the combination of plant nutrition with information techniques, etc., to carry out quantitative study in the process of soil-crop system; the new theory and method in manure and fertilizer science, and the exploration and sublimation of modern plant nutrition theory from practice of traditional agricultural production.

In 2012, problems of application of horticulture chiefly exist as follows:

- (1) There are a large number of proposals pertaining copying and tracing researches, not enough creativeness and systematic study.
- (2) Some applications stressed only on solving practical problems and applied technology of production, but lack concentration of scientific issues, and the relevant previous research basis is weak.
- (3) Only seek the advancement of research approach and method, not enough consideration of feasibility and effectiveness.
- (4) Some of the proposals just seek the hot spot of research, but fewer applications focusing on scientific problems rose from the agriculture industry development requirement of the nation, and provided with too broad themes and many contents.

Main problems in the applications of plant nutrition are as follows:

- (1) There are many applications stressing on molecular biology study of plant nutrition, but not enough in-depth study on mechanisms in physiology and genetics of plant nutrition.

- (2) Emphasizing the mechanism of crop activating and utilizing of soil nutrient on individual level under nutrient stressing conditions, but not in-depth study on efficient nutrient utilization under intensification conditions.
- (3) The weak basic research on nutrient resources and fertilizing science.

In 2013, the Division will continue to encourage research on scientific issues based on national agricultural practice and agricultural industry development, and close combination of new theory and methods with traditional methods, and give preference to original, continuous and systematic research. In this field, the Division will support proposals which tack horticultural crops as their research objects, put forward the scientific problems by the features of horticulture crops, and production yield, quality, fastness, efficiency, security and constancy as their research goals. Otherwise, they will not be funded by the Division. Some of the proposals chiefly studying the interaction mechanisms of plant and pathogen by using garden crops as its materials of experiment are more suitable to apply in plant conservation or other related subjects.

In the field of plant nutrition, the Division will encourages studies on the nutrition recycling and regulation under intensification conditions, the genetic, physiological and molecular mechanisms of nutrient efficient utilization of crops, the interaction and regulation of crops-soil-microorganism, and the coupling mechanisms of water and fertilizer of soils and its effectiveness to crops; and actively support excellent researches in areas of muck and fertilizer science and researches targeted to nutrition mechanism of micro-element. Applications using forest and model plant *Arabidopsis* as its research objects will be not funded. The applicants should correctly fill in the application code to the final level.

## **Division VIII of Life Sciences**

The funding scope of the Division covers following four disciplines: zoology, animal husbandry and grassland science, veterinary science and aquatic science.

### **Zoology**

Zoology is to study the life phenomena and rules of activity in animal morphology, taxonomy, physiology, behavior and evolution. The development of molecular biology, bioinformatics and computer techniques and theory and techniques of related subjects has enriched the research

contents of zoology. Studies on animal diversity, ontogeny and phylogeny, co-evolution and phenotypic evolution, animal behavior and adaptability have become hot research areas. Research on animal taxonomy, zoogeography and resource exploitation, and conservation biology has been deepened and integrated continuously. Laboratory animal science has acquired recognition.

Applications in recent years showed that applications in some subjects have their own research features, acquiring significant effluence internationally in some aspects. It can be also observed from peer review and panel evaluation that the themes, designs and even the creativeness of academic thoughts of the proposals have been greatly improved. But some problems still exist. For example, the depiction of justification for the projects and feasibility of technical routes are ignored in some of proposals due to deliberately seeking the creativeness; some applications describe too simple about the early experimental accumulation, or insufficient description of detailed research progress and contents; some applications lack of scientific problem or hypothesis with explicit definition, or set very high or oversized objectives. The budget for project is impractical in some proposals.

In the future, the identification and description of unknown taxon and species of animals, revised study of known species of animals will remain the main funding area in the field of classical taxonomy. Animal phylogeny and zoogeography, as well as the life history, which are focused on evolution, are key research areas today. The Division will encourage researches on animal physiology, animal behavior, and the establishment of model animals, etc. Support will be strengthened for researches on conservation biology for endangered animals, the sustainable utilization of important resource animals, and related biological researches for important alien invasive species and bio-safety. Basic research of zoology for specific species in China and fragility of western and remote areas will be encouraged continually.

The Division will pay more attention to basic research on zoology; encourage original exploration based on animal resources and regional features in China, with the application of new theory and techniques. Interdisciplinary studies will be encouraged.

### **Animal Husbandry and Grassland Science**

Animal husbandry and grassland science is to study the growth,

development, feeding and breeding of domestic animals, and the utilization of animal products, and grassland plant resources, good quality and higher yield forage grass and the synthesized utilization of resources for maintaining pasture conditions and increasing productivity of grass and livestock.

In areas of animal husbandry and grassland science, the Division supports basic researches on resources, genetic breeding, reproduction of livestock and poultry, nutrition of monogastric animals, poultry nutrition, ruminant nutrition, feedstuff, behavior of livestock, environment and animal husbandry engineering, grassland and grazing, grass germplasm and breeding, grassland environment and disaster, forage production and processing, sericulture and apiculture, etc.

Applications accepted and funded in 2012 cover every area of this discipline, among which, majority of applications focused their studies on mining excellent genes of typical domestic animals of the country and their functional genome, molecular genetic breeding, reproduction and development model, molecular mechanisms of regulation, new theory and methods related to molecular nutrition, and the development of fine grass germplasm resources and fine variety cultivation, the livestock of low emission, and the interaction of animal husbandry development and its environment. Studies concerned have formed their characteristics in some aspects. More and more scientists paid attention to international and domestic cooperation and exchange, and independent intellectual property rights further.

In the near future, the Division will give priority to studies on excellent gene mining of typical livestock, poultry, grass, silkworm and bees of China, and their functional genome and epigenetics, basic research on agricultural animals and the genetic breeding of grazing, and the domestic animal reproduction, as well as the livestock healthy reproduction, and the high efficiency utilization of feedstuff and forage resources. The Division will also give moderate preference to researches on the behavior and welfare, environment of domestic animals and pollution, grassland pasture, grassland environment and disaster, sericulture and apiculture, etc.

In 2013, applicants should pay attention to the following points: (i) The applications should take livestock, poultry, grass, silkworm, and bee as their research object, and interdisciplinary studies with other subjects should not depart from the main research aspect above, otherwise the proposal will be



not funded in this discipline; (ii) For themes selection, please choose key scientific issues, not only grasp the new research progress at home and abroad, but combine the previous research work as well.

### **Veterinary Science**

Veterinary science is to study the occurrence, development, diagnosis, prevention and cure of animal diseases. The research covers animal diseases, zoonoses, public hygiene, eco-environment, laboratory animals, food security, medicinal industry, etc., and many new interdisciplinary areas.

The Division supports basic researches on animal infectious diseases, zoonoses, most common diseases and comparative medicine, which take animal diseases as its objects of research. The funding scope covers: basic veterinary science, veterinary pathology, veterinary immunology, veterinary parasitology, veterinary microbiology, veterinary epidemiology, traditional Chinese veterinary, veterinary pharmacology and toxicology, clinical veterinary science and veterinary public health.

Proposals accepted and funded in 2012 covered all subjects of this discipline. Among them, majority of applications were focused on basic veterinary, veterinary epidemiology, and clinical veterinary. Most of them could aim at the international frontiers, and highlight the creativeness in the selection of their research themes, but problems still exist in the application. Some applications kept their mind only on the international hotspot, but not enough concentration of scientific issues need; and lack of enough value to basic research on traditional Chinese veterinary, veterinary pathology, and clinical veterinary science, etc.

The Division will continue to encourage studies on the epidemiology, pathogenic biology, mechanisms of pathogenic infection and immunity about important animal epidemic diseases and zoonoses, meanwhile, strengthen researches on the basic veterinary immunology, the R&D of new veterinary drugs, the on non-infectious disease of animal populations, food hygiene of animal source, and related research on new or recurrent infectious diseases, and give moderate preferential support to studies on anatomy, histology and embryology, physiology of livestock, animal biochemistry, veterinary pathology, and clinical veterinary science, etc.

In 2013, the Division requests that applicants take animal diseases as their main research objects, and intercrossing studies with other disciplines

should not deviate from the research objects; otherwise the applications will be not funded by this discipline. The Division reminds applicants specially that the application for experimental studies of highly pathogenic animal bacteria should be strictly abided by related decrees and regulations concerned in China, and meet the basic safety requirements for carrying out studies with animal pathogenic microbes.

### **Aquatic Science**

Aquatic science is to study basic rules of the development, growth, breeding, genetics, physiology and immunology of aquatic animals and plants, and their breeding ecology, breeding engineering, nutrition and foodstuff, control of diseases and pests, and the protection and utilization of aquatic resources, etc.

The main funding scope in this discipline covers basic aquatic biology, the genetic breeding of aquatic organisms, aquatic resources and conversation, the nutrition and feed science of aquatic organisms, aquatic breeding, the immunology and control of diseases and pests, breeding and fishery engineering, and new techniques and methods of aquatic biological research.

In 2012, proposals were accepted and funded by the Division in areas of immunity and control of diseases and pests of aquatic organisms, aquatic basic biology, genetic breeding of aquatic organisms, as well as aquatic resources and conversation etc. Relatively in-depth studies were conducted on important economic traits of aquatic animals, molecular characters of important pathogens and their pathogenesis, etc., and have formed their own research characters and superiority in some aspects. It can be seen from peer review and panel meetings that the creativeness of academic thoughts of proposals were obviously improved generally. However, there were a few applications concerning important scientific problems of aquaculture and the concentration of specific scientific issues need to be increased.

In 2013, the Division will request applicants to focus their studies on research fields of aquatic science, and aim at the frontier and important needs of production. The intercrossing study on aquaculture subjectively with other disciplines will be encouraged. Applicants should choose key scientific issues based on new development of subjects concerned at home and abroad, and their research background, aim at scientific problems, focus on original innovation, and avoid over stressing on R&D for technology but ignoring key scientific problems. The Division will strengthen funding level

to proposals with obvious creative academic thoughts, encourage applicants carrying out cooperate research with superior institutions and groups related, so as to give fully play of the region and resource advantages, and enhance the personnel training.

The research areas encouraged in this Division cover the genetic laws and functional genome of important economic traits of breeding varieties, epidemiology, pathogenesis of important pathogen and the immune mechanisms of host, molecular basis and regulating mechanisms of reproduction and development of chief breeding organisms, and the regulation and mechanisms of nutrient utilization and metabolism of aquatic animals. The Division will give moderate preference to basic research on the interaction between breeding and ecological environment, resource conservation, basic research on new model and techniques of aquaculture, etc.

## **Department of Earth Sciences**

Earth science studies the origin and evolution of the planet Earth system. The Earth sciences include geography, geology, geochemistry, geophysics and space physics, atmospheric and oceanic sciences, as well as the interdisciplinary research among these disciplines and other fields.

The above sub-disciplines of Earth science are the core and basic factor for the progress of earth science. The General Program is aiming to promote the balanced and harmonized development for all disciplines of earth science, facilitate original innovation and expend the frontier of research, and hence to build up a robust basis for the development of the Earth science.

In 2012, the Department received 6,281 proposals for the General Program submitted from 666 institutions. Among them, 1,634 were funded with a total budget of 1.3 billion yuan, with a success rate of 26.0% and an average budget of 800,000 yuan for individual project. Among the funded projects from the General Program, 1,322 (59.3%) are from universities and 635 (38.9%) from research institutes. The PIs of 971 projects (59.1%) are younger than 45 year old. There are 151 interdepartmental and interdisciplinary projects, and the proportion of interdisciplinary projects supported by different divisions inside the Department of Earth Sciences is even higher. Small Fund for Exploratory Studies with 1 year research is set up for highly exploratory, innovative and high risk projects or projects with uncertainty. Altogether, 12 proposals were approved as the Small Fund for

Exploratory Studies projects in 2012 and 3 million yuan were allocated.

The criteria for the selection of General Program projects in 2013 are as follows:

- (1) Innovation and academic value of the overall research approach;
- (2) Research capability of the applicants;
- (3) Clear stated scientific issues and well defined ideas;
- (4) Availability of necessary research basis and conditions.

During the selection of the proposals, it should be acknowledged that the importance of the basic or traditional disciplines, strengthened the weak or endangered disciplines, maintained the international status of the privileged discipline or fields in China, promoted the disciplines which are still weak in China yet predominant in the world, encouraged the intercrossing, integration, infiltration and synthesis among disciplines, improved the development of the frontier and basic sub-disciplines, fostered the development of the sub-disciplines closely related to experiment, observation, data integration and simulation, and recognized the importance of the intercrossing of the earth science and other disciplines.

While advocating innovations, the accumulation of research work should be emphasized. Under the same condition, preferential support will be given to those applicants who have a good accumulation of previous studies and high-quality results obtained from their recent completed projects, as well as who apply to continue their studies. Applicants are required to address the relation between the proposed research work and their accomplished projects. In regard to the exploratory, unforeseeable and long-term running for basic research, special attention will be focused to the high risk, interdisciplinary and frontier research. Scientists will be encouraged to face the great challenging scientific issues and to carry out risky and exploratory research. The intensity of individual grants will be stable in 2013. Average funding for individual project will be 600, 000 yuan to 1,500,000 for 4 years.

### Funding for General Program Projects in the Last Two Years

Unit: 10,000 yuan

Divisions		2011			2012		
		Projects	Funding	Funding rate <sup>++</sup> (%)	Projects	Funding	Funding rate <sup>++</sup> (%)
Division I	Geography (including soil science and remote sensing)	443+5*	29,041	21.30	538+3*	40,158	21.11
Division II	Geology	332+2*	24,671	29.10	385+4*	33,118	30.30
	Geochemistry	125+4*	9,261	34.10	148+1*	12,433	32.11
Division III	Geophysics and space physics	164+1*	11,806	26.50	190+1*	15,670	27.80
Division IV	Marine science	173+1*	12,203	27.40	197+1*	15,999	27.42
Division V	Atmospheric science	137+4*	9,808	29.80	164+2*	13,332	29.59
Total		1,374+17*	96,790	25.90	1,622+12*	130,710	26.01
Average funding per project		69.59 (70.14**)			79.99 (80.4**)		

Notes: \*The number of projects of Small Fund for Exploratory Studies for 1 year.

\*\*Average amount for individual projects with a full term (not including Small Fund for Exploratory Studies projects).

++ Success rates include the projects of Small Funds for Exploratory Studies.

In 2012, the Department of Earth Science received 190 proposals from 101 institutions for Extended Funding for Young Scientists Fund Program, applying for a total budget of 175 million yuan. During the reviewing process, the progress of the last grant and the rationale for the continued grant were considered. After the panel discussion, 34 proposals were supported with total funding of 27.2 million yuan. The largest individual grant was 1 million and lowest was 690,000 yuan. Among these projects, 22 were interdisciplinary grant among different departments and 4 were interdisciplinary grant within the department.

## Division I of Earth Sciences

The funding scopes of the Division I include physical geography, human geography, soil science, remote sensing and geographic information system, and environmental geography.

The main research focuses of the Division I are aimed at the understanding of evolution processes, spatial heterogeneity and interaction mechanisms of natural and human elements in the terrestrial surface system. The main

purposes of physical geography are concentrated on interactions of modern natural environmental elements and their spatial heterogeneity, especially on evolution processes at multiple tempo-spatial scales. The main purposes of human geography are concentrated on spatial structure and distribution and their driving mechanisms of different modern human elements. As the linkage of natural and social sciences, human geography emphasizes on natural background of spatial structure organization of regional human elements, and its interrelationship with human science. Landscape geography emphasizes on the land surface structures and their types impacted by complex actions of natural and human elements, especially on the scaling-effects of the complex actions. Direction of environmental change and prediction emphasizes on the evolution of human-earth relationship since Quaternary period, especially during historical period, and the comprehensive contrasts and contemporary processes of environmental change proxy indicators in high resolution and short time scales to provide essential theories, methodologies and basic data for the prediction of future environmental changes. Soil science is an independent discipline for understanding of pedogenic processes and spatial distribution, exploration of chemical, physical and biological mechanisms of soil function changes caused by the intensive utilization of human and scientific foundation of reasonable use and management of soil resource. It emphasizes on the material cycle and the interactions with organisms inside the soil system, as well as the changes of soil environment and quality. Geographic information science is a discipline of acquiring, processing, managing, interpreting, analyzing and presenting geographic tempo-spatial information of terrestrial surface assisted by the modern technologies of remote sensing (RS), geographic information system (GIS) and global position system (GPS). As an important branch of Geography, environmental geography emphasizes the eco-environmental impacts of large infrastructure building, the emission of greenhouse gases and the migration, transformation and differentiation of pollutants. Natural hazards and risk research, as a new field, emphasizes the risk assessment of natural hazards, and the environmental impacts of public security affairs. Furthermore, Division I also supports the researches about evolution of renewable resources, assessment of natural resources, the regional sustainable development and other related directions.

Terrestrial surface is an area where the interactions among the hydrosphere, biosphere, atmosphere, pedosphere and lithosphere are most frequently happened. Thus, it is the key of interpreting the complicated terrestrial surface system by using the earth systematic scientific principles. Since researches about the terrestrial surface system expand to both micro- and

macro- scales, it is a trend to use the methodology and technology of data acquisition and analysis derived from other related disciplines, which promotes the development of the research about the terrestrial surface system.

In 2012, the Division I received 2563 applications for General Program projects, among which 541 projects including 3 projects of Small Funds for Exploratory Studies were supported with a total funding of 401.58 million yuan. The funding rate including projects both of General Program and Small Funds for Exploratory Studies was 21.11%, and the average funding was 745,000 yuan for each project excluding projects of Small Funds for Exploratory Studies and 742,300 yuan for each project including projects of Small Funds for Exploratory Studies. The research fields of these funded projects were fallen into Geography including physical geography, human geography, landscape geography and environmental change with 215 projects, soil science with 111 projects, RS, GIS, geodesy and cartography with 118 projects, processes and effects of pollutants, regional environmental quality and safety with 72 projects, and natural resources, regional sustainable development with 25 projects.

## **Division II of Earth Sciences**

The funding areas of the Division II include geology, geochemistry and environmental geology.

### **Geology Including Environmental Geology**

Geology including environmental geology is the knowledge system about the composition, structure and evolution of the solid earth. The task of modern geology is not only to elucidate the structure, the material composition and the mechanism controlling the transition of materials of the solid earth, as well as the history of the environment and life evolution recorded by these materials, but also to reveal the agents and processes which modify the surface of the earth. The knowledge of geology can also be applied to explore the utilizable energy, water and mineral resources, to disclose the relationship between geological processes, life evolution and human activities, and to protect the earth environment and mitigate geo-hazard.

The introduction of plate tectonic theory has brought about revolutionary changes to the understanding of the Earth. The complexity of the continental dynamics, especially the periodical convergence and dispersion of the

continents and supercontinents, is further raising new themes for the advancement of plate tectonic theory. The development of mantle plume theory in recent years has closely linked the deep activities together with surface phenomena of the solid earth.

The enhancement of abilities to obtain and analyze data has become a major driving force to promote the development of geological science. The improvement of instrumentation, such as high precision, in-situ and real-time analysis of the terrestrial materials has enhanced the ability to determine the composition and evolution for the earth's specimen. The utilization of seismological technology, remote sensing technology and satellite observation of the Earth has deepened the understanding of the structure of the earth. GIS, GPS and RS technologies have improved the quality of geological mapping and are realizing the real time monitoring of plate motion, earthquake and volcanic activities. Computer simulation has made possible for the analysis, simulation and predication of important geological processes. Crusts drilling techniques and high-temperature-pressure experimental technologies have also greatly promoted the development of geology.

Profound changes have taken place in the research subjects, models and methodologies of geological science owing to the emerging new framework of earth system science and the strong demand for the sustainable social and economical development. The concept and rationale of multi-sphere interactions and interface processes have been strengthened in the geological science. The role of geology has evolved from its traditional function of disclosing the records of the earth's history to the prediction of the earth's future environment, due to the accumulation of improving capability to obtain critical data. The theory on the formation and exploration of the mineral resources and fossil energy, the environmental changes under the intervention of human activities, as well as the mitigation of geological hazards have been major challenges to geologists. New interdisciplinary fields, such as geo-biology, are developing fast due to the close correlations between geological science and life science established by the discovery of the critical role of life activities in the geological processes. With the development of the deep space exploration in China, more and more attention will be paid on the research of composition, physical property, structure, origin and evolution of the planet and correlation with the earth.

The geological research encourages characterized proposals of basic research on fundamental theory based on field and site observations by



using of the abundant materials and data recently acquired and accumulated by the geology-related agencies and institutions. Multidisciplinary approaches, such as the application of the concept, theory, technology and methodology of mathematics, physics, chemistry as well as biosciences, are encouraged to study geological issues. International collaboration, which may combine the privileged local geological features, is encouraged to promote the progress of geological theories with global scientific views. Young scientists are encouraged to submit proposals to benefit their research career.

In 2012, 1,309 proposals for General Program projects were received and 389 were funded with a success rate of 30% and an average funding intensity of 850,000 yuan per project. The distribution pattern of the funded projects among main research fields is as follows: projects in areas of paleontology, stratigraphy and sedimentology account for 18% of the total funds, projects in areas of mineralogy, petrology, volcanology, economic geology and geo-mathematics for 21%, projects in areas of petroleum geology and coal geology for 11%, projects in areas of structural geology, Precambrian geology and regional geology for 10%, projects in areas of Quaternary geology and environmental geology for 13%, and projects in areas of hydrogeology and geo-engineering for about 27%.

The predominant defects in the applications in 2012 are as follows: The proposed topic is too broad to support by the General Program, the raised arguments fail to focus on the scientific frontier or be poorly addressed, the research content fails to state the scientific significance clearly and thus failed to demonstrate the necessity for the research work, and as well as key issues to be attacked are vague due to defectively designed scientific and technological approaches. In some proposals, the description of research methods and technological outlines is very general and there is a lack of essential feasibility on key approaches.

## **Geochemistry**

Geochemistry is a subject of studying the chemical composition, chemical process and chemical evolution of the Earth as well as the other planets. It mainly focuses on the regularities of the distribution, centralization and decentralization, migration and transformation of chemical elements and substances in the earth's surface system coerced by human activities and multi-layer interactions in the earth's history using the tracing and dating theory and methods of elements, molecules and isotopes. The characteristics

of modern geochemistry are:

- (1) Research objects have developed from the composed substances and chemical reactions of the deep earth to the interactions of different spheres and their boundaries, focusing on the integration of macro-research of the Earth's deep processes and interior structure with high-resolution and high-sensitivity research of geochemical properties and spatial-temporal evolution.
- (2) The environmental geochemistry and biogeochemistry of the Earth's surface system have been the important research fields of this subject due to the uniqueness of geochemistry in understanding the mechanism of chemical evolution in the Earth system.
- (3) Research methods and techniques have shifted from statically semi-quantitative description to dynamically quantitative simulation, focusing more on the evolution laws of four-dimensional space and time.
- (4) It has paid attention not only to the reconstruction of ancient geologic events of long-time scales in the past, but also to geological processes of short-time scales and forecasts of the future.
- (5) The superposition of natural processes and human activities, as well as the integration of chemical and biological effects, has been emphasized in the research of supergene processes and environmental changes of the Earth.

Funding strategy of this subject is not only to promote the coordinated development of different branches of geochemistry to encourage the studies of fundamental theory and model foundation of geochemistry, but also to broadly support the frontiers of geosciences such as the evolution of the Earth and other planets, the changes of ecological environment, the evolution and origins of life, and to raise the value of the basic research of energy and water sources and mineral resources with important application prospects, as well as natural disasters, and to encourage the multi-discipline researches of environmental sciences, ecology, biosciences and other subjects of geosciences, guided by geochemistry.

In 2012, the average funding rate for General Program project including the projects of Small Fund for Exploratory Studies was 32.1%, with an average funding excluding the projects of Small Fund for Exploratory Studies of 838,000 yuan per project. The funding rate and the average funding of General Program extended from Young Scientists Fund Program were 21.4% and 693,000 yuan per project. Large differences in funding rates and proportions of the projects exist in different disciplines of geochemistry for the General Program projects excluding the General Program extended from

Young Scientists Fund Program: For environmental geochemistry, the application occupied 45.0% and its funding rate was 27.6%; For biogeochemistry, the application occupied about 16.2%, with a funding rate of 25.3%; For ore deposit geochemistry, organic geochemistry and petrologic geochemistry, the application occupied 16.8% and its funding rate was 43.6%; For isotope geochemistry, the application of occupied 12.7% with a funding rate of 44.1%; For trace element geochemistry, experimental and calculation geochemistry, isotope and chemical chronology, cosmochemistry and comparative planetology, the application occupied 12.9% and their funding rate was 28.3%.

The main problems in the previous project applications are (i) only to emphasize the importance of research field, but fail to clarify the innovation of their research ideas and scientific value of the research based on the project contents; (ii) to take long-term goal as the feasible stage goal of the project; (iii) unable to refine the innovative scientific issues to be resolved in spite of a well chosen research object or content; (iv) the research approaches are unspecific and not closely integrated with the research objectives, (v) the scientific issues are unclear enough due to the pure pursuit of the application of some new technologies and methods, or the exhaustive pursuit of research methods and means leading to the lack of a solution to the targeted problem, and lack of feasible demonstration to the key technology.

## **Division III of Earth Sciences**

The funding areas of the Division III include geophysics, space physics and geodesy.

### **Geophysics**

Geophysics, which include direct observation and theoretical studies on the basic physical fields of the Earth, for instance, seismic, gravity, magnetic field, heat flow, etc., is not only essential for effectively understanding and further protecting the Earth, but also the foundation for scientific breakthroughs of earth sciences. Moreover, explorative study on geophysics theory has important significance for the understanding of internal structure of the Earth and its dynamic process, resources exploration and disaster alleviation.

### **Space Physics**

Rapid progresses in space physics have been made in recent years,

especially in multi-level energy transferring and coupling, and the comprehensive theory framework of the disturbance of solar-terrestrial system. In addition, studies on the interaction between the solar wind and the atmosphere of the moon and planets are also initialized. These progresses provide a foundation for rapid development of space weather. Proposals dealing with scientific issues in these fields are encouraged.

## **Geodesy**

In recent years, aeronautics, astronautics and geodesy have witnessed rapid development due to significant improvement of the precision and spatial resolution of observation and relevant theories of data-processing, and thus have become one of the most important branches of geophysics. Researches based on such development, including the development of the observation system, model and theory of data-processing, are encouraged through the General Program.

Geophysics, including solid-earth geophysics, space physics and geodesy, utilizes the theories and methodologies of physics and mathematics to understand the Earth and the solar-terra space as well as the corresponding physical processes. These studies play an important role in solving the emergent problems of resources, environment and natural hazards for the sustainable development of the society.

In 2012, 687 proposals for General Program in geophysics and space physics were received and 191 of them were funded with a success rate of 27.8% and an average funding of 820,000 yuan per project. In addition, 1 projects of Small Fund for Exploratory Studies was funded with funding of 250,000 yuan. The funding is distributed in the following major research areas: geodesy (26.2%), solid-earth geophysics (27.2%), exploration geophysics (19.9%), space physics (23.0%) and experiment and facilities (3.7%). 15 proposals for Extended Funding for Young Scientists Fund Program and 3 were funded with a success rate of 20% and an average funding of 740,000 yuan.

In recent years, the Division awarded more innovative projects, which results in fruitful achievements. In the near future, encouragement for innovative ideas and cultivating team leaders will be continued as the major task of the Division. Besides continuous support to fundamental research, more efforts will also be given to new growth and pioneering studies, specifically those regarding to breakthroughs of well-defined scientific

issues. Support will be focused on frontiers of space weather, satellite gravity, environmental geophysics, experimental geophysics, geophysics of the Earth's deep interior, and comparative studies of the Earth and other planets, as well as the theory of seismic wave propagation. Special attention will be given to the application of new technology, innovative tools and especially new observational data to the study of geophysical and space systems.

## **Division IV of Earth Sciences**

The primary funding areas of the Division IV include marine science and polar science.

### **Marine Science**

Marine science is a discipline studying sea water and seabed, and various processes at interfaces between ocean and atmosphere, and between sea water and coastal estuaries, including physical oceanography, marine geology and geophysics, marine chemistry, biological oceanography, marine environmental science, coastal estuaries, marine engineering, marine monitoring and survey techniques, marine remote sensing, integrated coastal zone management and other branches. Basic science, such as mathematics, mechanics, physics, chemistry and biology have been continuously applied to marine science. Meanwhile, new and high technologies, such as space technology, information technology, biotechnology and deep-diving technology, have been continuously applied to marine science. These have opened a new frontier in marine science. Research within this new frontier is also encouraged by the Division.

Marine science conduct the comprehensive research, characterized by the accumulation of observational and experimental data, the application of new and high technologies, the development of simulation models, and the tendency towards globalization and internationalization. The advance of marine science can make social and economic development achieve sustained benefits from ocean resources, which is an important measure of national scientific and technological strength. The current strategic position of marine science has been leveled up greatly with a tendency toward "global change" and "deep-sea research", forming a new pattern extending from the shore to the interior ocean and from the shallow water to the deep ocean.

Marine science is essentially based on observation. The promotion of its

academic thoughts and research abilities depends on long-term observation and data accumulation. Therefore, the Division encourages scientists to participate in the NSFC Open Ship-time Project to obtain more continuous, systematic and comprehensive data. The project aims at encouraging scientists to conduct *in-situ* observation and laboratory analysis using new technologies and methods focused on the scientific issues to be investigated, and provide technical support for exploiting new research fields and new results. In order to promote a balanced development of marine science in China, it is also encouraged that scientists may join in existing cruise plans carried out by other agencies to do research on the deep ocean.

To meet the demands of research projects in ocean observation, NSFC initiated the pilot Open Ship-time Sharing Project. An additional application form for ship time should be attached if it is necessary to the proposals for NSFC program if needed. The application for ship time is required to describe the contents, plans and expected data outputs of the proposed observations in detail. Applicants are suggested to pay close attention to the bulletin and announcements for cruise timing in 2013.

In 2012, 1,429 proposals for marine science were received and 396 proposals were funded. The total funding amounts to 214.14 million yuan. Among the awards, 198 projects are the General Program with a success rate of 27.42% and the average support of 808,000 yuan per project, 5 projects are the General Program that is the Extended Funding for Young Scientists Fund Program projects with a success rate of 16.67% and the average support of 802,000 yuan per project, 189 projects are the Young Scientists Fund with a success rate of 28.7% and the average support of 254,000 yuan per project, and 4 projects are Fund for Less Developed Regions, with a success rate of 21.05% and the average support of 537,500 yuan. Similar to the past few years, most proposals are focused on biological oceanography, environmental oceanography, marine geology and physical oceanography, which together account for approximately two-thirds of the total submitted and funded proposals. The number of funded proposals has little change in the fields of marine chemistry, estuarine and coastal research, ocean engineering, marine monitoring and investigation, and marine remote sensing. However, the number of proposal in marine physics, which is an important funding direction in marine science including acoustics, optics and electromagnetic, were relatively small and hence the least share of funding was awarded.

Compared with previous years, the average quality of proposals submitted in

2012 was improved, especially in terms of the topic selection and design. The main deficiencies of the submitted proposals are reflected in vague description of what specific questions to be investigated and how to solve the questions, and the proposals are lack of clear-cut scientific questions although the importance and relevance to the national needs are relatively well described. Some proposals are remained at old problems and old methods without creativity.

### **Polar Science**

Polar science is a discipline studying various natural phenomena, including the processes and changing rules peculiarly in polar region as well as its interaction with other components of the earth system. It is a comprehensive discipline consisting of several sub-disciplines including polar biology and ecology, polar oceanography, polar space physics, polar atmosphere science and climatology, polar geology, geophysics and geochemistry, Antarctic astrolithology, polar glaciology, polar mapping and remote sensing science, polar management and information science, polar observation and engineering technology, etc.. For the past few years, significant progress has been achieved in international polar research. However, it is still the weakest area in earth science. Comprehensive and intercrossing study is current trend in polar science, which is focused on the key scientific issues on global change and sustainable development for carry out, research on large-scale interactions of the five spheres in the polar region as well as their interactions with the middle and low latitudes. Polar science in China should develop research by focusing on key scientific issues such as global change and sustainable development based on the accumulation of existing research.

In 2012, 69 proposals on polar science were received and 33 were funded, with a success rate of 47.8%. Among the awards, there are 16 projects for the General Program and 17 projects for the Young Scientists Fund.

### **Division V of Earth Sciences**

The primary funding areas of the Division V include meteorology, atmospheric physics, atmospheric environment and atmospheric chemistry.

Atmospheric science is to study various phenomena and their changing regulations occurring in the atmosphere so as to serve the mankind. In recent years, with the introduction of Earth system science and sphere interaction concepts, atmospheric science enters into a new historical phase of development. The atmosphere is one of the most active spheres in the Earth

system. Its changes are affected and controlled by other spheres in the system and celestial bodies such as the Sun, at the same time the response of the atmosphere to the changes simultaneously results in direct impact on the ocean, terrestrial surface, ice and snow, as well as the ecosystem on the Earth. The atmosphere plays an important role in the interaction among different spheres of the Earth system, and regulates the whole behavior of the Earth system with the interaction of other spheres. Therefore, beside the study of dynamical-physical-chemical process within the atmosphere, atmospheric science currently focuses on the comprehensive researches on the essence of the atmospheric change in terms of the interaction among hydrosphere, lithosphere, cryosphere, biosphere, human activities and global climate, the regulation of climate system and theories and methods of climate change prediction, the regulating technology and measures affecting local weather, the impact of human activities on weather, climate and environment system, and the influence of weather, climate and environment system change on human society. Atmospheric science deepens the study on its various sub-directions, and pay more attentions on the interaction of different spheres, the comprehensive, integrated, modeling and systematical studies on various processes based on the integration of different methods such as observation, analysis, theory, simulation and prediction, study on issues of global climate and environment change, and its impacts, prediction and adaptation, as well as the optimization of human life-supporting environment and human orderly activities, the interdisciplinary study which could provide the scientific basis for the human impact and the sustainable development of society.

In 2012, the Division received 561 proposals for the General Program and 166 projects were funded with the success rate of 29.59% and the average funding intensity of 803,100 yuan per project including 2 projects for the Small Fund for Exploratory Studies with 250,000 yuan per project.

In 2013, the Division will continually encourage proposals for exploratory and original basic studies in areas as follows: (i) the various phenomena, processes and mechanism in atmosphere, and the physical-chemical-biological processes of the substance and energy interaction between the atmosphere and other spheres by applying new ideas, methods, advanced equipments and technologies infields of mathematics, physics, chemistry, biology and information science; (ii) applications regarding to disastrous weather, atmospheric dynamics, atmospheric physics, atmospheric chemistry, atmospheric environment, atmospheric detection and remote sensing and stratosphere, mesosphere, geophysical fluid dynamics



and boundary layer turbulence; (iii) the climatic change and its relevant extreme synoptic and climatic events; (iv) new theories and methods for weather forecasting and climate prediction; (v) applied research on the data received by satellite remote sensing and other sources; (vi) analysis and applied research on the data received from the large scientific experiments and science plans being initiated, conducted or already completed, as well as large observation network established in China and aboard; (vii) basic research on the utilization of water, wind and solar resources in the air; (viii) research on the principle and method for meteorological observation and data analysis.

## **Department of Engineering and Materials Sciences**

Engineering and materials sciences provide necessary and significant S&T supports for the assurance of national security, the improvement of people's living standard and the sustainable development of the society and economy. Aiming at frontier science and meeting the national strategic demands of the social and economic development as well, research in the field of engineering and materials sciences should pay full attention to scientific creativity and innovation, especially original creativity and innovation with independent intellectual property rights, in order to raise China's international competitiveness in science and technology and to achieve a sustainable development of the society.

The Department will continue to strengthen its support to interdisciplinary areas and the exploration of frontiers and encourage original innovation, integrated innovation and re-innovation based on the absorption and digestion of existing knowledge, while considering the common features in the fundamental research of engineering and materials sciences. At the same time, the Department will pay attention to key scientific issues resulting from engineering application, especially those researches with such great significance that the industrial development can be promoted and international competitiveness be raised.

### Funding for the General Program Projects in 2012

Unit: 10,000 yuan

Divisions		Projects	Funding	Funding rate (%)
Division I of Materials Sciences	Metallic materials	215	17,185	18.16
Division II of Materials Sciences	Inorganic materials	303	24,205	17.59
	Polymer materials	221	17,650	17.91
Division I of Engineering Sciences	Metallurgy and mining science	268	21,425	16.88
Division II of Engineering Sciences	Mechanical engineering	560	44,830	17.39
Division III of Engineering Sciences	Engineering thermo-physics	214	17,100	17.95
Division IV of Engineering Sciences	Civil engineering and environment	527	42,150	16.85
Division V of Engineering Sciences	Water research and ocean engineering	225	17,970	17.10
	Electrical engineering	196	15,715	16.90
Total		2,729	218,230	17.36
Average funding per project		79.97		

In 2012, the Department received 15,746 proposals for General Program including 326 Extension Funding for the Young Scientists Fund Program, which is an increase of 18.00% compared with that in 2011, and among them, 2,729 were supported including 56 Extended Funding for the Young Scientists Fund Program with a total funding of 2,182.3 million yuan. The average funding is 799,700 yuan per project and the success rate is 17.36% (19.58% in 2011) .

### Division I of Materials Sciences

The Division supports fundamental research on metallic materials. Research proposals should present the merits of the proposed fundamental research clearly, including objectives and scientific significance of the project, suitability of the methods to be employed. Proposals should target either to advance the materials science in cutting-edge areas or to promote developments in the relevant areas that meets the national demands.

The funding spectrum of the Division covers compositions, microstructures, phases, surfaces and interfaces, scales effect, impurities and defects in metals, alloys, metal matrix composites, intermetallic compounds and metal-like materials, and their influence on mechanical, physical and chemical properties and performance; basic issues in the preparation and processing of metallic materials; including heat treatment, casting, forging,

welding and cutting; basic issues in the strengthening and toughening, deformation and fracture, phase transformation and alloy design; fundamentals in energy materials, environment-friendly materials, biomaterials, and materials in transportation, aeronautic and astronautic industries; interaction mechanisms of metallic materials and environment, damage, functional degradation and consequent failure mechanism, recycling mechanism and relevant fundamentals; theoretical fundamentals on metallic materials; development of theoretical methods, calculating methods, modern analysis and test methods incorporating basic and applied basic researches of metallic materials.

In 2012, the Division received 1,184 proposals for the General Program, including 20 proposals for the Extended Funding for Young Scientist Fund Program, 17% more than a year earlier. Totally, 215 projects were granted, including 5 under the Extended Funding for Young Scientist Fund Program, with an average funding of 799,300 Yuan per project and a success rate of 18.16%.

It is noticed that the areas of metastable metals and alloys, functional materials and surface engineering kept the leading place in term of the amount of proposals. It is hoped that researchers pay attention not only to the frontiers and the hot areas, but also to other fundamental issues with scientific merits and creative ideas, especially those common key issues beyond materials systems. In addition, some attention should be paid to the new understanding of classic issues in basic materials. Applications in the field of composites and surface engineering should focus on scientific problems and proposing unique ideas. Applications with a cross-disciplinary background should focus on issues within the funding spectrum of the Division.

The Division will continue to support basic research with creative ideas in all aspects in the funding spectrum specified above. New ideas revealing basic mechanism will be encouraged with respect to the Key Program areas supported in recent years. The Division also encourages and supports cross-disciplinary and multi-disciplinary research in which metallic objectives and materials science should be the mainstream, especially in such areas as energy, information and biology. The Division will continue to prioritize those well-established research groups and institutions with good infrastructures in the field of metallic materials science and engineering. It will also continue to encourage and support young researchers to put forward creative thoughts and ideas, and researchers to carry out deeper

research based on their previous good work.

## **Division II of Materials Sciences**

The Division mainly supports fundamental researches on inorganic non-metallic and organic polymer materials.

### **Inorganic Non-metallic Materials**

The fundamental and applied basic researches on various inorganic non-metallic materials are supported by the Division. With the development of material design theories and the innovation in fabrication technologies, lots of new inorganic non-metallic materials have been discovered, including high-temperature superconducting ceramics, smart materials, bio-medical materials, energy materials and nano-materials etc., which have greatly stimulated the researches in related areas. At present, in the field of research on inorganic non-metallic materials, functional materials are developed towards high efficiency, high reliability, high sensitivity, smartness and functional integration; and structural materials tend to possess compounding, high toughness, specific strength, high wear-resistance, high-temperature endurance, low cost and high reliability. Meanwhile, conventional materials are also being remolded, upgraded and developed. More and more attention is given to the applications of inorganic non-metallic materials in information technologies, life science, energy and environmental science etc.

In 2012, the Division received 1,723 applications for General Program, including 38 applications for Extended Funding of Young Scientists Fund Program, with an increase of 16% compared with last year. 303 projects were funded including 6 for under Extended Funding of Young Scientists Fund Program with an average funding of 798,800 yuan per project, reaching a funding rate of 17.59%.

Through a review of all submitted proposals in the past three years, it is noted that, in addition to an annual increase in the number of applications, the researches related to inorganic non-metallic materials cover a wide range with significant interdisciplinary nature. Among the applications in 2012, researches on functional materials accounted for 54.24% of the total. These applications unfolded many innovative ideas and induced the hot-spots of research on various areas including nano-materials, piezoelectric and ferroelectric materials, carbon and super-hard materials, photoelectric information functional materials, composite materials and photo-catalysis

materials and so on, among which applications from photoelectric information functional materials (about 21.56 % of the total in 2012) ranked above all the others in recent years. There were also many applications from new energy materials, display materials, bio-medical materials, in which the creativity needs to be enhanced. The applicants for the structural ceramics were relatively concentrated and accounted for 6.3% of the total, with an in-depth developments in high-toughness, easy processability, high reliability and low cost fabrication by new techniques. A comparatively large number of proposals were also received for composite materials based on inorganic non-metallic materials, and the number of proposals on functional composite materials was much more than before. But in term of the quality, a significant number of them can be classified as follow-up, low level repetition, lack of innovation, lack of research base and lack of study on inorganic non-metallic materials. The Division will support research with creative and innovative ideas, and the substantial interdisciplinary research of inorganic non-metallic materials with other related fields.

The Division encourages synthetic research and related applied basic research on novel inorganic non-metallic functional information materials based on domestic resources; researches on low-dimensional and nano-materials, including new fabrication techniques, property characterizations, novel effects and applied basic physical and chemical researches; basic research on the materials with external field induced phase variation and related applied basic research; research on the surface, interface, connectivity and compatibility of composite materials; research on gradient functional materials and in-situ composite materials; basic research on “structure-function” integrated composite materials; research on material synthetic techniques for high-performance, low-cost and high reliability materials; research of the composition, structure, performance and characterization on smart materials, new energy materials, bio-medical materials and eco-environmental materials; basic theoretical research on the design and corresponding fabrication technique for inorganic non-metallic materials (at macro-, meso- and micro-scales, respectively); and applied basic research on the improvement and remolding of conventional inorganic non-metallic materials based on new theories, with new techniques or through new processes.

### **Organic Polymer Materials**

In the field of organic polymer materials science, the Division mainly supports researches on following areas:

- (1) For general polymer materials, the focus is on the implementation of high performance, functional properties and low cost.
- (2) The relationship between machine forming and congregation state textures.
- (3) Functional polymer materials and organic solid functional materials.
- (4) Biomedical polymer materials.
- (5) For polymer-based composites, the stress is on high performance and interface control, etc.
- (6) Special polymer materials and engineering plastics.
- (7) Polymer materials related to environment, energy resource and resource utilization.

In 2012, the Division received 1,234 proposals for General Program, with an increase of 16.0% compared with that in 2011, among them, 19 proposals were within the Extended Funding for the Young Scientists Fund Program. 221 applications were granted with a success rate of 17.91% on average and an average funding of 798,600 yuan per project, wherein 5 projects were within the Extended Funding for the Young Scientists Fund Program. The relatively more proposals were concentrated in the following research fields: opto-electronic functional materials, biomedical polymer materials, polymer blend and composite materials, functional inorganic/organic composites, and eco-environmental polymer materials, etc.

Basic researches are encouraged by the Division in the following fields: general polymer materials with high performance or functional properties or low cost, functional polymer materials and organic solid functional materials, preparation science and technical processes for polymer materials, biomedical polymer materials, organic nano-materials, intelligent materials and bionic polymer materials, eco-environmental polymer materials including natural polymer materials, environmental-friendly polymer materials, renewable polymer materials.

The Division highly encourages indigenous innovation and interdisciplinary research.

## **Division I of Engineering Sciences**

The Division supports fundamental researches in the domain of oil, mining, metallurgy and materials science, mainly related to resource exploitation, safety science and engineering, mineral engineering and physical separation science, materials and metallurgical physical-chemistry, ferrous and

nonferrous metallurgy, material preparation and fabrication, eco-environment of mining and metallurgy, and resource recycling, etc..

In 2012, the Division received 1,588 proposals for the General Program, including 26 proposals within the Extended Funding of Young Scientists Fund Program, with the increase of 28%; wherein, 268 proposals were granted, including 4 proposals within the Extended Funding of Young Scientists Fund Program, with a success rate of 16.88% on average and an average funding of 799,400 yuan per project.

In recent years, the research hotspots for the Division have been focusing on the exploitation of oil and gas, rock mass mechanics of mine and strata control, safety science and engineering, mineral processing, material preparation and fabrication. Meanwhile, there have been just a few applications in fields of metallurgy and chemical engineering, reaction engineering and this situation did not much improved in 2012.

The current development trends of the discipline funded by the Division are as follows: (i) The more extensive subjects and multi-scale spectrum studies are carried out simultaneously. With the continuous development of basic research and modern technological advances vigorously, the phenomenological theory as the key base of the discipline funded by the Division has been increasingly developed to an accurate and quantitative microscope knowledge system because the novel methods and techniques of other disciplines have been used constantly for reference. The accurate control of full scale from microscope, middle scope to macro scope is becoming the research trends whether from the raw mineral to the recycling of resources, or from materials to products, even to equipment and macroscopic resource optimization. (ii) Interdisciplinary differentiation and amalgamation have been strengthened, such as cross merging of life science, informatics, mechanical science, chemistry, materials science and managerial science, etc., emerging new research fields such as resource recycling science, non-pollution process engineering, green catalyzing engineering, bio-metallurgy, environmental bio-chemical engineering, bio-chemical mining, computing metallurgy and physical-chemical metallurgy, metallurgical informatics and electro-magnetic metallurgy, etc.. (iii) Relationship between fundamental research and technology development is getting increasingly closer, such as the meta-synthesis of equipment for mining and metallurgy, monitoring and controlling of system, metallurgical reaction engineering science and systems engineering, and metallurgical ecological technology, etc. More and more new technologies

and new development of the products derived from the further study of fundamental science and the updating and innovation of basic knowledge. (iv) More and more quick application and permeation of new scientific discoveries, new theories and new technology have been witnessed in such fields as laser, microwave, plasma etc., which made development in application and most of them achieve industrialization. (v) Basic research, applied basic research and technology development have been closely linked and integrated. The fundamental research has become more importance increasingly.

Focusing on the fundamental research, the Division will fund researches on process and engineering, and will continuously promote interdisciplinary research and the exploration of novel methods. More attention will be paid to the basic research with characteristics of our resource that could enhance our competitiveness in mining and metallurgy industry. Researchers are encouraged to work systematically and consistently in their specific fields to form their own research features. Priority will be given to fundamental researches with theoretical importance, potential application and perspectives, which might be the new fields for knowledge creation, and to young scientists who have creative capabilities and good domestic and international cooperation background.

Encouraged research areas: exploitation and utilization of difficult-to-produce reserve resource; safety science especially basic theory and method to solve life safety in mine industry; environmental protection theory and methods in the resource exploitation; new theory and methods of energy saving and emission reduction in metallurgy process; physical chemistry of industrial waste and general utilizing of resource; interface science in material preparation and processing; the application of modern information technology in material preparation and processing.

## **Division II of Engineering Sciences**

The Division supports fundamental research and fundamental in the areas of mechanical science and manufacturing science.

Mechanical science is a fundamental technology science aimed at functional comprehension, quantitative description, and performance control of various mechanical products. Its main objective is to study characteristics of mechanical systems and develop the knowledge and technology required by mechanical systems to create new design theories and methods. Mechanical



science includes the mechanism and robotics, mechanical driving and transmission, mechanical systems dynamics, strength theory of mechanical structures, mechanical tribology and surface technology, mechanical design theory and methodology, mechanical bionics, and so on.

Manufacturing science is mainly to study various manufacturing theories, methods, technologies, processes, equipment, and systems related to manufacturing products which meet design requirements and enhance customer value with higher efficiency and lower cost using more intelligent methods. It includes components machining, forming, manufacturing systems and automation, mechanical metrology and measurement instruments, MEMS/NEMS, green manufacturing, intelligent manufacturing, and so on.

At present, the major focus areas of mechanical science and manufacturing science are as follows:

- (1) Fundamental research aimed at national strategic requirements and the frontiers of disciplinary development, as well as potential industrial applications.
- (2) Research on the integration of sustainable design and manufacturing for environmentally-friendly, resource-saving, and high-efficiency use of energy.
- (3) Research on the innovative design, manufacturing principles, and measurement theories for the ultra, high-precision, high-tech and special (large/heavy) equipment and instruments, including processing mechanisms, theories, and technologies for prototypes.
- (4) Research on the manufacturing methods and design of extreme conditions, for instance, in the size from macro to meso, to micro, to nano, and to multi-scale, and the parameters from conventional to extraordinary or extreme conditions.
- (5) Multi-interdisciplinary research crossing mechanical sciences, electronics, hydraulics, acoustics, optics, magnetism, information science, multi-physics coupling analysis, and design methods.

In 2012, 3,221 proposals for the General Program including Extended Funding for Young Scientists Fund Program were received, with an 17.21% more than the previous year. Of the proposals received, 560 were funded including 9 proposals within the Extended Funding for the Young Scientists Fund Program. The average funding intensity was 800,500 yuan per project and the approval rate was 17.39%.

Based upon its mission, the Division will continue to support researches with fundamental, frontier, explorative and innovative features, support fundamental research that has achieved innovative results and needs further in-depth work, and encourage continuous in-depth research in a specific field. The Division will also encourage substantial and profound interdisciplinary research, especially fundamental mechanical research involving multi-disciplinary areas such as electronics, information, biology, materials, and medical science, with the main objective to solve scientific problems in mechanical field.

To ensure that principal investigators fully focus on their ongoing research projects, the Division may discourage them from applying for new projects during the implementation of their ongoing projects. Young researchers are not expected to participate in proposals irrelevant to their research fields.

### **Division III of Engineering Sciences**

The Division supports fundamental research in fields of engineering thermo-physics and energy utilization that involves in engineering thermodynamics, refrigeration and cryogenics and dynamic characteristics of thermodynamic systems, aerothermodynamics, heat and mass transfer, multi-phase flow, combustion, thermo-physical properties and measurement, and renewable energy utilization, as well as other fundamental and innovative researches related to engineering thermo-physics and energy utilization.

Proposals in recent years demonstrate that research in fields of engineering thermo-physics and energy utilization is very active. The research contents have gone deeper, research objectives more extensive and research achievements with wider applications. In 2012, the Division received 1,192 proposals for General Program including 29 within Extended Funding for the Young Scientists Fund Program with the increase rate of 12%. Totally, 214 were supported including 5 within Extended Funding for the Young Scientists Fund Program, with the success rate of 17.95% and the average funding intensity of 799,100 yuan per project. .

The main development trends of the discipline are as follows: ( i ) Research on the basic issues has been deepened from macro-level to meso-level and micro/nano-level, from isolated studies to coupled studies, from common parameters to parameters under ultra- or extreme conditions, from routine thermo-physical problems to random, unsteady, multi-dimension,

multi-phase and complicated thermo-physical problems and intercrossing research in the discipline. Moreover, research becomes more quantitative and precise; (ii) Research themes has been crossed over traditional disciplinary borders and integrated with related disciplines, for example, physics, chemistry, life science, information science, materials science, environment and safety. Researches in the following areas are active: the mechanism of new type thermodynamic cycles and non-equilibrium thermal dynamics, refrigeration and low temperature engineering, dynamics, optimization and control of complicated systems, turbulence properties of internal flows and properties and control of unsteady flows, porous media and micro-scale heat and mass transfer, radiation and heat exchange by phase transformation, clean, supersonic and micro-scale combustion, thermo-physical problems in the prevention of disasters, mechanism of interaction between phases and thermo-physical model in multi-phase flow, new principles and methods in thermo-physical measurement, and new thermo-physical principles in renewable energy transformation and utilization.

The Division will give priority to fundamental researches with theoretical importance, potential application and prior prospect, which might be the new fields for knowledge production, continuously promote interdisciplinary studies and the exploration of novel methods, and encourage original ideas and creations. The Division requests applicants to provide detailed information on their research achievements obtained in all previous NSFC projects and the list of papers published on international and domestic journals in recent years. All the information provided must be impersonal and true, which will directly affect the evaluation and approval of the applications.

It is noted that applications in the fields of energy saving and storage, renewable energy and alternative energy must be in connection with basic engineering thermo-physical principles.

## **Division IV of Engineering Sciences**

The Division's funding scope mainly covers architecture, environmental engineering and civil engineering. The development trend of architecture is to study the development of region, city and building, and the innovation of construction techniques from the viewpoint of human-environment relationship, as well as the basic theory, methods of planning and design, and construction technology innovation based on sustainable development

strategy. The environmental engineering research is focused on the water or air pollution control and quality amelioration, as well as theories and methods for the treatment, resourcelized and harmless disposal of various pollutants and wastes. Civil engineering stresses that studies should be closely combined with engineering practice to investigate basic theoretical issues and solve foresight key technological issues arising from engineering construction. The interdisciplinary interaction, application of advanced experiment and information technologies and adoption of new materials, new structures and new technologies are the major features in the development of these research fields.

In 2012, the Division received 3,128 proposals for General Program including 73 Extended Funding for the Young Scientists Fund Program with the increase rate of 20%. Totally, 527 were supported including 12 Extended Funding for the Young Scientists Fund Program, with the success rate of 16.85% and the average funding intensity of 799,800 yuan per project.

In architecture, emphasis will be given to new scientific issues arising from urban construction, scientific method in urban planning and building design, and the exploration and innovation of new technologies and new methods. Research on environmental engineering will emphasize key scientific issues related to new theories and technical bases of new high-efficiency and low-consumption technologies, which includes water purification, wastewater treatment and utilization, municipal water supply and drainage system, urban refuse disposal and utilization, air cleaning and air pollution control and renovation of the polluted water environment. In civil engineering, more attention should be paid to innovative research on design theories and methods of complex structures. Key scientific issues on the following topics are encouraged: new structure systems and performance design theories, disaster effect and civil infrastructure failure mechanism and performance control, modern structure experiment, on-spot measurement and digital simulation technology. In the area of geo-technical engineering, researchers should focus their attention on the engineering properties of soil under complex conditions, and invalidation mechanism and control methods of geotechnical engineering. In traffic engineering, the emphasis will be on the research of planning theory and key construction technology in traffic infrastructure.

## **Division V of Engineering Sciences**

The Division is mainly responsible for funding projects in areas of

hydro-science and water research, hydraulic engineering and ocean engineering, and electrical science and engineering.

### **Hydro-Science and Water Research, Hydraulic Engineering and Ocean Engineering**

The Division supports research in three areas of hydro-science and hydraulic engineering, geotechnical engineering and hydro-power engineering, as well as coastal and ocean engineering. The research themes include hydrology and water resource, water/soil science and irrigation engineering, hydro environment engineering and water eco-system research, dynamics of river and coast and sediment research, soil/rock mechanics and geotechnical engineering, hydraulics and hydro-informatics, hydraulic structural engineering, coastal and offshore engineering, and naval architectures and ocean engineering.

One of key tasks is to study the impact of climate change and human activities on hydrological cycling, extreme flood and drought disasters, and water resources management in the field of hydrology and water resources. Main research focuses in water/soil science and irrigation engineering include the transfer and interaction of water, heat and chemicals in farmland, mechanism of crop water-saving and high-efficient irrigation and drainage scheme and their ecological and environmental impacts. Physical, chemical and biological processes related with hydrological cycling and their responses to large projects are research focuses in the field of hydro environment engineering and water eco-system research. Since water is closely correlated with economy, society, environment and energy, the inter-disciplinary and integrated research is encouraged in the fields of water resources, hydro environment and water eco-system research. The research of river and coastal hydrodynamics and sediment dynamics is focused on the fundamental theory of sediment transport, river and estuarine evolutionary, and sediment problems related to large hydraulic works. The key growth field of hydraulics consists in the subjects related to water disaster mitigation and eco-environmental protection. The current emphasis of hydro-machinery is on the transit process. Hot research topics in the field of soil/rock mechanics and geotechnical engineering include constitutive modeling of geo-materials, multi-fields and multi-phases coupling, mechanism and process control of deformation and damage, and mechanism and prevention of geo-hazards. New breakthroughs need to be made in the basic research on hydraulic structural engineering under complicated conditions. Environment-friendly and function-based design is an important

trend of development in the field of new hydraulic engineering materials. The recent hot research topics in coastal engineering include: port and waterway engineering, marine resources and offshore energy development as well as environment protection, disaster prevention and mitigation in extreme situation; In ship and ocean engineering, more emphasis are put on the motions and response theory of ship and marine structures, new hull form design theory, deep-sea probing technology and relevant theory of deepwater resources exploitation, numerical experiments and field test technology, new type underwater sound transducer and communication technology.

In the year of 2012, 1,316 proposals were received for General Program and 225 projects were granted with an average funding of 798,700 yuan per project and a success rate of 17.1%. According to proposals in recent years, the proposed themes have extended gradually and tended to be more interdisciplinary, and the proposals have been increasing year by year in this discipline. In 2012, relatively more proposals were found in research fields of ocean engineering, soil/rock mechanics and geotechnical engineering, water environmental engineering and eco-water system research, while less proposals in hydraulics and hydro-informatics, hydraulic machinery and coastal engineering.

### **Electrical Engineering**

The subject of electrical engineering includes two parts: electric (magnetic) energy science, the interaction between electromagnetic fields and materials. The related research fields include, not least, the electrical energy conversion (mutual conversion between electric power and other kinds of energy) and its control, electric machine and its control, power system and its automation, power electronics, superconducting technology, pulse power technology, high voltage and electrical insulation technology, engineering dielectrics, discharge and plasma technology, electromagnetic biological technology, environmental electro-technology and electromagnetic compatibility, electric drive and motion control, communication and information for power system, and so on. Furthermore, the two parts share some common basic research contents, such as electric network theory, electromagnetic field theory, electromagnetic measurement technology, and so on.

In 2012, 1,160 proposals were submitted for General Program including 29

proposals within Extended Funding for Young Scientists Fund Program, and 196 proposals were funded. The average funding was 801,800 yuan per project and the success rate was 16.90%.

With the requirements of national energy security and sustainable development, the originality research innovation is encouraged. Priorities will be given to the following proposals: those on research principles, methodology and approaches in the field of electrical engineering; those attaching importance to the experimental verification and the scientific aspect and quantification of experimental research.

In the domain of electric energy science, priority is given to new theories and new technologies apparatus of high efficiency, flexibility, safety and reliability, and environmental friendly for electrical energy conversion, transmission and utilization. The research fields include power generation of new energy and renewable energy, smart grid, wireless power transfer, high efficient conversion and utilization of electric energy, power electronic converters and integration, electric drive and motion control (including electric vehicle, railway traffic, ship and aircraft), superconducting electrical technologies, pulse power technology, efficient power consumption and also the involved information technology, control theory and method for electrical engineering.

As to the domain of electromagnetic field and interaction between electromagnetism and matter, priority is given to new phenomena, exploration of new principles, and the establishment of new models and discovery of new applications. These include safety and reliability of power apparatus, novel high power electronic devices, new dielectrics and its application in electrical engineering, measurement of electromagnetic characteristics, coupling between electromagnetic pulsed energy and its applied objects, discharge theory and high active plasma generation, interaction between electromagnetic field and bio-matter, processing and utilization of biologic electromagnetic signals, and complicated transient electromagnetic fields.

## **Department of Information Sciences**

The Department of Information Sciences funds researches in areas of the generation of signals, acquisition, storage, transmission, processing and utilization of information. Based on the trends of disciplinary development

and social progress, the following priorities are set for funding: nano electronics and bioelectronics, radio wave transmission and new types of antenna, information acquisition and information processing, future communication theory and system, space communication network and system, space information processing and application, key issues in theoretical computer science, computer software, computer system configuration and storage system, key technologies in computer application, computer network and distributed computing system, network and information security, bionic sensing and advanced sensors, modeling, analysis and control of complex systems, basic theory and application of intelligent science, advanced robot technology and application, basic research on semiconductor integrated chip system, quantum communication, quantum computation, basics of quantum information technology, optical information display and processing, advanced laser technology, biomedical optics, next generation network and applications, cognitive science and intelligent information processing, etc. Preferential support will be given to basic researches that meet social demands and have far-reaching importance in promoting the national economic and disciplinary development.

Scientific and technical issues in information sciences are increasingly interdisciplinary in nature. Therefore, the Department pays great attention to proposals for interdisciplinary researches between information science and mathematics, physics, chemistry, life sciences, medical sciences, materials sciences, geosciences and management sciences, and so on. The Department encourages cooperative research among scientists with different backgrounds and knowledge to put forward cross-disciplinary research proposals. It also encourages scientists to combine theory with practice and explore basic theory and key technical issues that have important application potentials for national economy and security. The Department will continue to give preferential funding to proposals that have a good background of international cooperation in order to encourage scientists to conduct substantial international cooperative research with scientists abroad in frontier areas of information sciences.

In 2012, the Department received 19,657 applications in total, in which 9,880 applications are for General Program, an increase of 15.06% over that in 2011, and funded 1,724 projects with a total funding of 1.3282 billion yuan. The average funding is 770,400 yuan per project (592,800 yuan per project in 2011). The average funding rate is 17.45% (18.76% in 2011). Some projects involve interdisciplinary research with mathematics and health. The Extended Funding for Young Scientists Fund Program with



General Program Projects started in 2012 funded 36 projects with funding rate of 16.38%. In 2012, the average funding per project for General Program will be about the same as last year, and the funding period will be 4 years.

In 2013, the PIs of those projects making important progress will be given preferential support towards their new applications.

The Department of Information Sciences encourages creative basic research that is different from traditional research ideas, and welcomes researchers conduct discussions and studies on relevant topics.

### Funding for General Program Projects in the Last Two Years

Unit: 10,000 yuan

Divisions		2011			2012		
		Projects	Funding	Funding rate <sup>++</sup> (%)	Projects	Funding	Funding rate <sup>++</sup> (%)
Division I	Electronics and technology	126	7,559	16.94	154	12,153	17.38
	Information and communication system	137	8,074	19.00	129	9,720	17.71
	Information acquisition and Processing	161	9,410	20.59	170	12,728	17.69
Division II	Theoretical computer science, computer software and hardware	157+3*	8,845	19.32	137+11*	10,875	17.35
	Computer applications	211+3*	11,853	18.92	214+16*	16,856	17.07
	Network and information security	144+3*	8,180	18.65	154+14*	12,368	17.54
Division III	Control theory and control engineering	174	10,165	19.39	173	13,599	17.51
	Systems science and system engineering	47	2,743	18.08	58	4,498	15.72
	Artificial intelligence and intelligent systems	128	7,503	18.42	137	10,742	16.95
Division IV	Semiconductor science and information devices	130	8,632	18.59	141	11,715	17.71
	Information optics and photoelectric devices	96	6,422	18.40	109	8,918	17.87
	Laser technology and technical optics	92	6,064	18.80	107	8,648	18.58
Total		1,602+9*	95,500	18.76	1,683+41*	132,820	17.45
Average funding per project		59.28			77.04		

Notes: \* Projects of the Small Fund for Exploratory Studies.

++ Success rate includes projects of the Small Fund for Exploratory Studies.

## **Interdisciplinary Research between Information Sciences and Mathematical Sciences**

In 2013, the Department of Information Sciences and the Department of Mathematical and Physical Sciences will continue to fund interdisciplinary researches that require combined efforts from information sciences and mathematical sciences. The funding will be about 600,000 yuan per project. The areas to be included are mathematical theory in information sciences, mathematical methods in information security, information system and advanced control theory.

Encouraged (but not limited to) areas of interdisciplinary researches are:

### **1. Theory and algorithm of integer representation of real numbers**

Design the theory and algorithms of the integer representation of real numbers, to realize the algorithm by computer, and to give complexity analysis of the algorithm.

### **2. Theory and methods of formalized representation of software systems**

Describe and represent, by using the formalization theory and methods, practical software systems applicable not only to real time application software systems, but also to interactive, discrete event software systems.

### **3. Theory and methods of designing security software systems**

Combining typical software system (system software or application software) analysis and design, study the theory, algorithm and system structures of improving the safety performance of software systems, and verify the advantages of the theory, algorithm and system structures both theoretically and practically.

### **4. Theoretical studies on new software system structure**

By addressing the contemporary needs of software application, study the structure, theory and methods of the system structure of novel software and to sum up appropriate scientific characteristics in combination with practical software system.

### **5. Theoretical studies on the validation of software systems**

Establish the theory and methods on the validation of software system development so as to ensure the validity of the developed software.

### **6. Theory and methods of formalized representation of practical engineering projects**

In 2012, 427 applications were received for the projects of interdisciplinary research between Information Sciences and Mathematical Sciences and funded 89 projects with average funding of 600,000 yuan per project and the funding rate of 20.84%. It should be noted that previous proposals were lacks of fundamental nature and challenge, and did not show complementary role of information science and mathematics. This type of project will supports only exploratory research having substantial interdisciplinary nature with information sciences so as to promote the development of interdisciplinary studies between information and mathematics. Applicants to this category should provide appropriate application codes in the application form. This category belongs to free exploratory research, and is supported only under the category of General Program.

## **Division I of Information Sciences**

The Division mainly funds basic research in areas of electronic science and technology, information and information system, information acquisition and processing and related interdisciplinary areas.

Researches in areas of circuit and system, electronic science and technology, magnetic field and wave, as well as electronics and applications. Funding areas mainly cover the design, test and verification of circuits and system, diagnosis, reliability, micro-nano circuit and system design theory, methods and technology and low energy consumption design method, power, radio electronic circuit and system design theory and method, high frequency switch power change system, circuit and network theory, low power consumption communication electronics, electromagnetic theory and computational methods in electromagnetic fields and waves, characteristics of electromagnetic field and waves in new types of media, scattering and back-scattering, mechanism of interaction between electromagnetic field and wave and objects, electromagnetic compatibility and electromagnetic environment, electronic wave transmission and antenna, micro wave optics, tera hertz technology, transient electromagnetic field theory and application, vacuum, surface, membrane, superconducting, quantum, plasma, molecular and nano electronics in physical electronics, electromagnetic effect in bioelectronics, biochips, medical information detection, medical imaging navigation and key medical instrument technology; information processing and analysis in bio informatics, detection and identification of cell and bio molecular information, information network and analysis in bio systems, modeling and simulation of bio system functions, methods and technology

of bionic information processing; sensitive electronics and physical, chemical, bio and bio chemical sensors, properties of new types of sensitive materials and sensors, and sensor theory and technology.

Researches on the theory and key technologies for information transmission, exchange and application in fields of communication and information system. The main funding areas include informatics, signal coding, channel coding, network service theory and technology, information system modeling and simulation, communication network and communication system security, diagnosis and evaluation, cognitive wireless in information theory and information system; wireless, spatial, underwater, multimedia, optical, quantum, computational, transducer network communication theory and technology, new network access technology, mobile wireless internet technology, and new mobile communication theory and network, future information network theory and transmission mechanism, network communication theory and system, etc.

Information acquisition and processing related to the theory, methods and applied technology of information sensing, acquisition and processing. The main funding areas include the processing of signals, multidimensional signals and array signals, and radar, sonar, remote sensing and voice signals in signal theory and signal processing; mathematical theory and methods in information acquisition and processing, and information acquisition mechanism and technology, weak signal detecting and processing, detection and imaging system in information detection and processing, image processing and interpretation, integration of multi sensor signals, multimedia information processing and presentation, 3-D stereo audio video, bio information processing and medical information acquisition and processing at molecular, cellular and system levels, space and network information processing, etc.

In 2012, the Division received 2,576 proposals for General Program, and funded 453 projects. The funding rate is 17.58% and the average funding intensity is 763,800 yuan per project.

In 2013, the Division will continue to support researches in areas of basic theory and key technologies that are significant to the national security in areas of detection and imaging technologies, detection data decoding, normalized interpretation of multisource and multi spectrum data, bio-information acquisition and processing and space information acquisition and processing, under water information acquisition and

processing, electromagnetic environmental effect, network information acquisition and processing, communication system security, electromagnetic vortex communication, ambient intelligence communication, wireless multi domain recognition communication, green communication, under water communication, internet of things and internet of energy resources. The innovative and cross-disciplinary research and exploratory studies with good prospects will be supported that may have some risk and are non-consensus, emphases will be continually given to the performance and results in project evaluation and preferential funding will be given to the projects which have scored outstanding achievements in previous research. Preferential support will be given and encouraged to the projects which could open and share their research results, and research on the design of software and hardware on the opening data base; it is encouraged the combination of theory and practice to focus on innovation and to study and solve basic problems in important application areas, so as to improve China's research capabilities in this discipline.

## **Division II of Information Sciences**

The Division mainly funds researches in areas of basic theories, basic methods and key techniques related to computer science and technology and relevant interdisciplinary areas.

Computer science and technology is one of the most active, fast-growing and widely influential areas in information sciences. The important trend of computer science and technology development is to obtain super speed, large storage, large data, high performance, high reliability, easy interaction, networking, intelligent and universal applicability. Applicants are recommended to pay attention to these new features in this Division.

In 2013, the Division emphasizes that proposals are encouraged to focus on key scientific issues and technologies in computer science, and original, fundamental and far-sighted research. We encourage researches on the theory of computer science, architecture and system software, software engineering and software methodology, computer network, information security, natural language interpretation, data engineering and knowledge engineering, computer graph and imaging processing, multimedia and virtual reality, man-machine environment, mobile computation, embedded computation, pattern recognition and machine learning, bio information processing, computation intelligence, etc. The Division also stress on funding of new computation theory and algorithm, information and physics

integrated system, and man-machine coordinated computation, etc.

In 2013, the Division will continue to support collaborations with researchers in areas of life sciences, medical sciences, mathematics, physics, chemistry, geosciences, mechanical engineering and management sciences to make joint explorations on new ideas, new theories, new technology and novel approaches in interdisciplinary areas so as to promote the mutual development of computer science and other sciences. The Division especially encourages and support scientists to address those basic issues that are well known internationally for their complexity and significance and of strong exploratory nature, so as to increase the level and impact of computer science research in China.

In 2012, the Division received 3,158 proposals for General Program, and funded 546 projects (including 41 one-year small grant projects). The success rate is 17.29% and the average funding is 777,900 yuan per project (734,400 yuan if small grant projects are included).

It should be noted that such problems as lack of basic science problems, lack of clear scientific topics, lack of originality in research ideas, lack clear application background and lack of clear research goals still existed in proposals received in 2012. It is suggested that applicants should aim at the national needs and research frontiers in the discipline, select fundamental, explorative and key scientific issues, and strive to make innovations and breakthroughs so as to make important achievements.

### **Division III of Information Sciences**

The Division mainly funds basic research and far-sighted research for the national economy and national security in areas of control theory and engineering, systems science and system engineering, artificial intelligence and intelligent systems, etc.

Research funded in the area of control theory and engineering includes control theory and applications, trouble shooting and system service, system emulation and evaluation, navigation, guidance and telemetry, sensor technology and sensor network, multi-information fusion, etc.

Research funded in areas of systems science and system engineering includes system modeling and analysis, system dynamics and application, system simulation and visualization, emergence and laws of the evolution of

complex systems, system biology, system reliability and applications, engineering system design and optimization, engineering system scheduling and decision making, internet of things and supply chain, etc.

Researches funded in areas of artificial intelligence and intelligent systems covers pattern recognition and machine learning, network information processing and utilization, artificial intelligence and knowledge engineering, robotics and robot technology, bionic sensing and bio information processing, cognitive science and intelligent information processing, etc.

In 2012, the Division received 2,164 proposals for General Program and funded 368 projects. The success rate is 17.01% and the average funding intensity is 783,700 yuan per project. Some projects are related to interdisciplinary areas with mathematics.

Statistics of recent years show that the following areas are becoming hotspots in application and research: intelligent and self-adaptive control of complex systems, unified production process control of energy saving, pollution reduction, low consumption and safety, intelligent traffic and save driving aid, coordinated control of multi autonomous system, genetic network analysis and regulation, quantum system analysis and regulation, control and finite dimensional approximation of infinite dimensional system, data or mode based system analysis and control, data based diagnosis and system maintenance; network system analysis and control, advanced navigation and guidance theory and techniques, new types of transducers and bionic sensing, optimal dispatching management of large engineering systems, analysis and optimal design of complex supply chain system, basic theory and applications in intelligent power grid and internet of things, new theory and methods of pattern recognition, object identification and tracking in complex background and interference, natural language understanding and syntax computation, oral language identification and understanding in complex scenarios, new theory of computer vision and realization of high performance system, sparse representation and compress cognition, online machine learning methods of complex dynamic data, poly-particle information computation theory and applications, web information detection, searching, processing and application, advanced robot system and unmanned autonomous system, robot modular theory and technology, bio information acquisition, processing and applications; brain-machine interface theory and application, cognitive science and computation models. In addition, the Division gives due support to farsighted and interdisciplinary researches such as modeling analysis and control of micro-nano scale systems,

modeling, analysis and control of hypersonic aircraft, navigation and guidance and control in deep space and deep ocean exploration, and agricultural information technologies, etc.

In 2013, the Division will continue to encourage and support interdisciplinary research with mathematics, mechanics, mechanical engineering, semiconductors, optics, energy, environmental science, management, biology, neuroscience and psychology, etc.

## **Division IV of Information Sciences**

The funding scope of the Division covers semiconductor science and information devices, and optics and photo-electronics.

The main scope of funding for semiconductor science and information devices includes semiconductor crystal and membrane material, design and test of integrated circuits, semiconductor photo electric devices, semiconductor devices, semiconductor physics, integrated circuit fabrication and packaging, semiconductor micro and nano mechanical and electrical devices and system, and new types of information devices including nano, molecular, super conducting, quantum functional information devices.

The main funding scope for optics and photo-electronics includes optical information acquisition and processing, photon and photoelectric devices, transmission and exchange photonics, inferred physics and technology (including tetra-hertz), nonlinear optics and quantum optics, laser, spectrum technology, applied optics, optics and photoelectric materials, space optics, atmospheric and marine optics, biomedical photonics and optical problems in interdisciplinary studies.

In 2012, the Division received 1,982 proposals, and funded 357 projects with a funding rate of 18.01% and an average funding intensity of 820,200 yuan per project.

In recent years, along with the development of information sciences, the above areas are now having more and more interactions with physics, chemistry, materials sciences and life sciences, and many new research directions are emerging. Among the major branch areas, more applications come from following areas: semiconductor photoelectric devices, IC design and test, semiconductor crystals and membrane materials, photon and photoelectric devices, transmission and exchange photonics, optical



information acquisition and processing, laser, etc. There is still room for improving applications in such areas as semiconductor electronic devices, semiconductor micro nano mechanical electronic devices and system, IC manufacturing and packaging, semiconductor physics, inferred physics and technology, applied optics, biomedical photonics, nonlinear optics and quantum optics, optics and photoelectric materials, spectroscopic technology, etc. There are few applications in areas of new types of information devices, space optics, atmospheric and marine optics, and optical problems in interdisciplinary areas, which funding will be strengthened by the Division.

The Division will give priority to researches on high performance light source, low power consumption radio frequency chips and circuits, new types of sensor materials and devices and network technology, tera hertz devices, micro and nano device and technology, new types of optical field control technology and devices, quantum optics and quantum devices, quantum communication and quantum computation, optical information processing and display technology, photon electronic devices and photonic integration, wide gap semiconductor materials and devices, semiconductor integrated circuit system, energy photonics, new types of laser technology and devices, biomedical optical imaging, and space optics, etc. In order to solve the bottleneck issues of devices in various fields in China, the Division will encourage studies to improve device performance (both yield and reliability) including scientific issues in device physics, structure and technology development.

Based on the trend of application in recent years, proposals that track international frontier and hot spot and those that frequently change research directions have low success rate. Researchers are advised to take concrete steps in their research by making in-depth and persistent studies, and propose better and more creative research topics according to the international research trend and the national development needs.

## **Department of Management Sciences**

Management is an interdisciplinary science which aims at revealing and applying the basic laws of various management activities in order to optimize the utilization of limited resources with the help of modern science and technology. There are three divisions in the Department of Management Sciences, namely management science and engineering, business administration, and macro-management and policy. Research proposals

should be submitted to one of these divisions according to the relevant contents.

Scientists from diverse academic backgrounds are encouraged to take an active part in management science research and advance the development of management science, a comprehensive intercrossing scientific discipline. However, applications centering on social science and humanities, together with applications on topics funded by other scientific departments of NSFC, will not be accepted by the Department of Management Sciences. Applicants are advised to propose their research topics from the perspective of management science research.

Based on NSFC's position and basic tasks the Department of Management Sciences formulates its guideline in the 12th Five-Year Plan period as "following the law of management science, focusing on the excellence of talent and sticking to the policy of supporting all." The Department will encourage innovative research, and welcome the research proposals abstracted from the basic issue of Chinese management practice and a certain general significance for enriching the knowledge system of human management science. Besides, the interdisciplinary research will also be encouraged.

The Department supports management research emphasizing on exploring laws of management sciences based on scientific methods, while normal management research are not supported. The Department supports both experimental research projects which depend on experiment, observation, measurement, etc., for data collection, and theoretical research projects that aim at offering solutions to management issues based on the analysis and interpretation of management phenomena through modeling, computation, induction and deduction. For those experimental research projects featuring long-term large-scale data collection and processing, filed investigation and high performance computing and experiments, applicants are advised to propose a higher budget than the average funding intensity in accordance with their specific cases.

In 2013, the average funding intensity of the General Program projects will stay the same as last year, and the funding period will be 4 years.

### Funding for General Program Projects in the Last Two Years

Unit:10,000 yuan

Divisions		2011			2012		
		Projects	Funding	Funding rate (%)	Projects	Funding	Funding rate (%)
Division I	Management science and engineering	210	8,820	18.78	227	12,253	18.39
Division II	Business administration	230	9,660	17.08	247	13,333	16.69
Division III	Macro-management and policy	250	10,520	14.15	290	15,654	13.83
Total		690	29,000	16.30	764	41,240	15.88
Average funding per project		42.03			53.98		

## Division I of Management Sciences

The Division of Management Science and Engineering mainly supports research projects associated with fundamental theories, methods and techniques in the field of management science, which include the history of management science, general management theory, operations management, decision-making and game theory, organization theory, management psychology and behavior, management system engineering, industrial engineering, information technology management, technology and theory of internet management, forecast, prediction and evaluation methods, quantitative economic analysis, technology and approach of risk management, financial engineering, complexity science, knowledge management, engineering management, etc.

The Division give its priority and support studies on basic theories and frontier areas, which were mentioned above, and encourages innovative research combined with China's management practices, management philosophy and cultural characteristics of management theory and methods.

In 2012, a total of 1,234 applications for General Program were accepted by the Division, among which 227 projects were supported with the success rate of 18.39%.

Among of, the largest proportion of applications is still in the area of operations research and management (18.56% of the total, compared with that of 17.63% in 2011), which is keeping increasing, mainly focusing on logistic and supply chain, product operations management, and so forth. The second one is in the area of information system and management (13.65% of

the total, compared with 12.89% in 2011) with a focus on information management and data mining, network information systems, IT adoption, etc. The third one is in the area of financial engineering (8.44% of the total, compared with 8.45% in 2011) with the focus on financial production design and pricing, behavioral finance, financial risk measurement, financial market, etc. In addition, there are a number of applications in areas of industrial engineering and management, management systems engineering, decision theory and method, risk management techniques and methods, which respectively accounted for 7.15%, 6.72%, 6.55%, and 6.37% of the total.

The past few years have witnessed rapid development of management science and engineering and increasing high-quality papers published by Chinese scholars in international journals, especially the great enhancement of research capacities of a group of young scholars under the age of 45. They attached great importance to the international hot topic such as supply chain management, service operations management, behavioral decision theory and methods, thus the number of application projects in these areas in 2011 is steadily growing. However, most applications were still during the learning stage of western theories and methods; the number of original and innovative applications was still quite small and very few applications focused on issues of the management practices in China were proposed. Therefore, young scholars are encouraged by the Division to undertake explorations on frontier issues and conduct research on management theories, techniques and methodologies with the consideration of the specific requirement and the status of management practices in China, to conduct management science research with substantial international scientific cooperation; the project managers are encouraged to publish more research papers in the international core journals; and the priority will be given to innovative projects with consideration of China's realities.

## **Division II of Management Sciences**

The Division of Business Administration mainly supports basic research and some applied basic research on management theories and new management techniques and methodologies targeted at micro-level organizations and nonprofit organizations. The funding areas of the Division include strategic management, business theory, innovation management, organizational behavior and company culture, human resource management, company finance and financial management, accounting and audit management, marketing, operations management, production management, quality

management and quality engineering, logistics and supply chain management, service science and service management, technology management and technology innovation, project management, entrepreneurship and SME management, enterprise information management, e-commerce and business intelligence, non-profit organization management, etc.

In 2012, the Division accepted a total of 1,480 applications for General Program and 247 (16.69% of the total) were finally funded.

During 2012, more applications were received in the area of corporate finance and finance management, marketing management, accounting theory and method, logistics and supply chain management, strategy management, human resource management and organizational behavior, and with correspondingly more projects were funded. Proposals were slightly increased for innovation and business creation, production and quality management, and the non-profit organization management, showing some innovation in exploring methods and new techniques researching, thus the portion of being supported grows faster. A balance distribution of funding areas has been formulated.

In 2013, the Division will continue to value and actively support the original theory innovation and research on knowledge discovery and creation, attach importance to the research of scientific accumulation and discovery through the combination of the empirical analysis, case studies and observational experiments, the research on concise scientific problems from China's management practice which has potential social application value, and the research with substantial international cooperation. The study on fundamental theory, technology, and method of management science combined with the management practice of China's enterprise/organization is encouraged.

In order to promote the development of science, improve research capability of management science, and reduce the gap with international research, the Division will keep on supporting frontier basic research in the area of corporation theory and strategy, finance management, organized behavior, entrepreneurial and innovation management, human resource management, marketing, e-commerce and business intelligence, logistics and supply chain management. And more funding will be put in the area of SME management, service management, logistics management, quality management, enterprise information and resource management, risk in big project with safety

management, non-profit organization management and the theory innovation based on Chinese management practice.

### **Division III of Management Sciences**

The Division of Macro-management and Policy mainly supports basic research in such fields as macro-economy management and policy, financial management and policy, tax management and policy, industry management and policy, agriculture and forestry economics management, public administration and policy, science and technology management and policy, health management and policy, education management and policy, public security and crisis management, labor, employment and social welfare, resources and environment management and policy, regional development management, information resources management, etc. Meanwhile, the Division attaches great importance to the promotion of scientific development and academic innovation on the one hand and the nurturing of talents and research teams on the other. While developing related theories and methodologies, researchers are encouraged to provide consultation, support and suggestions to the government in its national macro decision-making.

In 2012, the Division accepted a total of 2,097 applications for General Program and 290 projects among them (13.83% of the total) were funded.

In 2012, more applications and funding of such areas as resource environmental management, agriculture and forestry economy management, financial management, macroeconomic management are respectively received. Applications of security management and educational management were also increased gradually, especially areas related to climate change and energy strategy. It reflects that scholars in the fields of macro management and policies have paid close attention to national macro management practice, and put forward scientific problems for further study. Most applications were increasingly conformed the requirements that the research method is more standardized and more emphasis is put on using scientific theory and method to solve the important theoretical problem in management practice which was proposed by the Department.

On the basis of disciplinary strategic priority areas, the Division will continue to encourage researches on the public management theory and method, public security management, education management, climate change and energy strategy management, as well as the ethics management.

The Division will encourage researches with strong innovation and long-term accumulation, and focusing on theoretical research achievements for international academic exchanges and publications in the international academic journals. Applications should take China's actual management problems as the research object, extract scientific issues from the research object accurately and pay attention to the scientific and normative significant of research methods. The applicant should distinguish the difference between management science research and practical management, the difference of research method between natural science projects and the humanities and social sciences projects. Notice that the subject of topic selection should be appropriate, the research goal should be concentrated, and the research content is specific and concert. The key scientific issues should be put forward clearly and the research methods and route map to solve scientific issues should be clarified.

## **Department of Health Sciences**

In view of the fact that scientific research is both curiosity-driven and national needs-driven, the objective of the funding for General Program in the Department of Health Sciences is to support basic research on issues concerned with disease prevention, disease control and disease treatment in China. Major funding areas include: the structural, functional, developmental, genetic and immune abnormalities of organisms, the occurrence, progression, regression, diagnosis, treatment and prevention of diseases. Proposals for research on normal structure, function and development of organisms may be submitted to the Department of Life Sciences. Applicants concerned may refer to the section of the Department of Life Sciences in this *Guide to the Program 2013*.

The Department encourages researches as follows:

- (1) Innovative theoretical and methodological research aimed at the scientific issues emerging from medical practices.
- (2) Systematic and indigenous study on key scientific issues emerging from medical disciplines.
- (3) Research on translational medicine by way of combining basic research with clinical research.
- (4) Integrative medical research on the occurrence, development and regression of diseases at various levels from molecular, cellular, tissue to the whole-organism and population level by use of new

- multidisciplinary and comprehensive techniques or methods.
- (5) In-depth systematic and innovative study based on existing accumulative researches.
  - (6) Interdisciplinary medical research crosscutting with other scientific fields.
  - (7) Research on the development of new animal models of human diseases.
  - (8) In-depth systematic research based on accumulated scientific data or collection of clinical samples.
  - (9) Cohort epidemiological research.
  - (10) International joint research.

In addition, the Department will give priority to basic research on major key diseases closely related to the national welfare, human livelihood, major emergency even of public health t, and common or frequently encountered diseases that severely affect human health. Besides, to keep the balance and coordinative development of various disciplines and research institutions, priority support will also be given to weak research areas and institutions.

To avoid common problems in previous applications, the following instructions should be observed in applications for the General Program:

- (1) Applicants are encouraged to carry out competitive mechanistic studies underlying the scientific issues emerging from clinical practices, rather than descriptive studies or studies tracking others. Furthermore, applications with unique academic ideas or solid previously accumulated research work are more encouraged than those blindly chasing high tech or hot spots of research.
- (2) Applicants are required to propose a defined scientific issue or a specific hypothesis based on analysis of the relevant latest publication and research progress in the field.
- (3) Applicants are expected to pay attention to the elaboration of the significance and values of the anticipated research results. Besides, specific research contents, research design, technical protocols and research methods in applications are expected to be fully developed. Moreover, the proposed research contents should be adequate, and the research design, technical protocols and research methods be clear and scientifically feasible.
- (4) Applicants are expected to provide detailed description of relevant previous work. In case of applications as extension of a previously funded project, detailed elaboration of the innovation and relevant scientific issues are required. Further more, all relevant published work should be listed. In case of unpublished previous work, relevant



experimental data, tables and graphics, pictures etc. are required.

- (5) Applicants are expected to provide precise information, including the curriculum vitae, previous grant information and publications of the principal investigators. In the curriculum vitae, both education and working experience should be included (in chronological order with exact months and years, keeping the timeline consistent). Besides, a list of previous grant numbers and brief progress reports or final reports is required in the page of previous grant information. For publications, detailed information including the names of all authors (in the same sequence in which they appeared in the publication, the article and journal title, book title, volume number, page number, and year of publication (abstracts or meeting lectures should be specified) should be included. Moreover, the first author, corresponding author or co-authors should be specified. Accepted manuscripts should be listed along with an attached acceptance letter, and those already submitted, unaccepted or in preparation should not be included. Patents and awards should also be listed.
- (6) For applications involving special medical research objects such as human subjects, the related ethical or informed content requirement should be met by providing a signed written institutional certification or approval.
- (7) For applicants with good performance records in their previous grants, priority will be given on the basis of performance evaluation.
- (8) In 2013, to keep a reasonable distribution of the scientific fund among different scientists, the Department will basically not give further funding to applicants who have got high funding intensity (such as Key Program, Major Program, Major International and Regional Joint Research Program etc ) in 2012, especially when they apply for General Program, or for programs of high funding intensity, or for research work repetitive or similar to their ongoing projects (such as the National Program for Basic Research (973) projects, the National High Technology Development Program (863) projects , and other major special funding projects etc).
- (9) A copy of the front page of up to 5 representative papers should be attached, along with their clearly scanned electronic files.
- (10) For applicants working as part-time workers in the research institution, a formal appointment agreement by the research institution is required, with a specific explanation of the appointed position, duration and the required shortest working time.
- (11) The specific requirements for various programs are expected to be referred to the website of the Department (<http://health.nsf.gov.cn>).

The number of applications has been increasing in the Department of Health Science ever since its establishment. In year 2010, 2011 and 2012, the number of applications was respectively 30,727, 40,179 (from 888 research institutions) and 46,570 (from 988 research institutions), accounting respectively for 25.8%, 26.35% and 27.10% of the total applications in NSFC. In 2012, the specific number of applications for General Program, Young Scientist Fund and Fund for Less Developed Regions, 44,347, is larger than that in 2011 which was 38,253, with an increasing rate of 15.93%. The dramatic increasing applications in the Department have resulted in a great pressure on maintaining good quality of the review and management process. Since the scientific quality of some applications needs further improvements, research institutions are expected to further strengthen their organization and management, and to improve the scientific quality of applications under the guidance of “NSFC’s requirements for institutions in enforcing management of scientific fund”, in an effort to enable the rapid and healthy development of both scientific fund and medical research in China.

In view of the fact that animal models for mimicking human diseases are requisite to biomedical research, especially to in vivo gene analysis, to the understanding of mechanisms underlying diseases, to identifying new drug targets, as well as to efficacy evaluation of drugs in clinical trial phases, we will give special support to applications involving the development of animal models of human diseases. Basically, animal models for mimicking human diseases include both spontaneous animal models and inductive (laboratory ) animal models, the latter may include gene modified animals (transgenic models, gene knock in/out models, ENU inductive models and cloning models), surgical animal models and physical- or chemical-induced animal models. Research in the following areas are especially encouraged: ( i ) identification of spontaneous animal models of human diseases; (ii) the development and standardization of various new inductive animal models; (iii) studies on the interaction between animal models and their environment; (iv) systematic comparative studies of animal models to clinical data; ( v ) comparative medical studies on various animal models of different species; (vi) databases of animal models; (vii) improvements of existing animal models; (viii) application of relevant animal models in the development of new therapeutics or drugs.

Studies on the development of new animal models for human diseases, one of the fundamental works in experimental medical research, will be given

long-term continuous support by the Department, in order to provide technical platforms and to facilitate research progress in this area in China.

The applications are expected to be focused on the development of new animal models for mimicking common major human diseases, rather than on studies based on available animal models of diseases. The applicants are expected to choose the proper funding instrument, such as general program, and applications aimed at buying or developing animal models from companies or other institutions will not be supported. The applicants are expected to choose the proper primary and secondary application codes according to their proposed research, and “The Development of Animal Models for Human Diseases” should be written in the annotated column of the application form. Applications involving gene modified animal models are expected to be based on solid preliminary molecular or cellular studies. In addition, the similarity and differences in disease susceptibility and clinical investigations between animal models and human should be elaborated, and a detailed analysis of the available animal models of a given human disease is required.

An overview of the award number, funding, and success rate of the General Program in 2011 and 2012 by the Department is listed in the table below.

#### Funding for General Program Projects in the Last Two Years

Unit: 10,000 yuan

Divisions		2011			2012		
		Projects	funding	Funding rate <sup>++</sup> (%)	Projects	funding	Funding rate <sup>++</sup> (%)
Division I	Respiratory System, Circulatory System, Digestive System, Blood System, Gerontology	502+31*	29,063+434*	16.89	565+39*	39,810+624*	17.34
Division II	Urinary System, Reproductive System/ Perinatology/Neonatology, Endocrine System/ Metabolism and Nutrition Support, Ophthalmology, Otorhinolaryngology Head and Neck Science, Oral and Craniomaxillo-facial Science	450+28*	26,003+392*	17.18	507+40*	35,763+640*	17.94
Division III	Neurological and Psychiatric Diseases	273+20*	15,892+280*	17.02	311+27*	21,946+432*	17.99
	Medical Imaging and Biomedical Engineering	170+16*	9,817+224*	16.40	194+24*	13,642+384*	17.84

## General Program

Divisions		2011			2012		
		Projects	funding	Funding rate <sup>++</sup> (%)	Projects	funding	Funding rate <sup>++</sup> (%)
Division IV	Medical Pathogenic Microorganisms and Infection, Skin and Appendages, Orthopedics and Sports Medicine, Emergency and Intensive Care Medicine/Trauma/ Burns/Frostbite/plastic Surgery/Special Medicine/ Rehabilitation medicine,	364+24*	21,036+336*	16.61	411+36*	28,935+576*	16.64
Division V	Oncology	671+45*	38,848+630*	17.30	755+67*	53,245+1,072*	16.70
Division VI	Preventive Medicine, Endemiology, Occupational Medicine, Radiology	168+16*	9,710+224*	21.03	189+18*	13,253+288*	22.12
	Medical Immunology, Forensic Sciences	123+14*	7,139+196*	25.05	138+20*	9,842+320*	24.69
Division VII	Materia Medica and Pharmacology.	211+17*	12,218+238*	18.60	238+22*	16,738+352*	19.19
Division VIII	Chinese Medicine ,Chinese Materia Medica, integrated Chinese and Western Medicine	491+29*	28,414+406*	16.52	552+47*	38,776+752*	15.26
total		3,423+240*	198,140+3,360*	17.39	3,860+340*	271,950+5,440*	17.43
Average funding per award		55.01(57.74 <sup>++</sup> )			66.05 (70.45 <sup>++</sup> )		

## Division I of Health Sciences

The Division provides financial support for basic research on the diseases of respiratory, circulatory, digestive and hematologic systems, and gerontology.

### Respiratory System

The Division mainly funds studies on morphological, functional and developmental abnormalities and diseases of lung, airway, pulmonary circulation, mediastinum, pleurae, thoracic cage and diaphragm. It also funds studies on pulmonary transplantation and new diagnostic techniques, but does not support tumor-related projects. Asthma, chronic obstructive pulmonary disease (COPD), pulmonary hypertension, pulmonary fibrosis, lung injury and infection, lung transplantation and protection are hot topics and we attach great importance in this field. In the past years, studies on sleep apnea have been emphasized. Applications on asthma in 2012

accounted for about 25%, lung injury and COPD for 18% and 15% respectively. The applications for lung transplantation were relatively few, totally 19 proposals. Proposals for pulmonary hypertension could be categorized into both respiratory and circulatory systems. Applicants may select the code according to the specific scientific issues.

### **Circulatory System**

The main funding is focused on study in areas of morphological, functional and developmental abnormalities in circulatory system, diverse cardiac and vascular diseases, microcirculation and shock. Proposals were referred in the past years mostly to atherosclerosis and coronary heart diseases, cardiac injury and protection, arrhythmia, hypertension, and heart failure. The research about the role of microRNA in the progression and intervention of cardiovascular disease has become a new increasing topic in this field in recent years. Applicants are encouraged to carry out original and translational research. Clinicians, developmental biologists and genetic biologists are encouraged to work together to study on mechanisms of cardiovascular diseases and the development of therapeutic strategies. In the cutting edge fields of stem cells and cardiovascular regeneration, researchers are encouraged to establish international collaborations, propose innovational hypothesis based on their own research experience and eventually gain achievements with independent intellectual properties. Research on the role of endogenous biological active substance on the mechanism of cardiovascular diseases and the screening and identification of potential biomarkers for the diagnosis and treatment are encouraged.

### **Digestive System**

The funding scope mainly covers studies on morphological, functional, developmental abnormalities and diverse non-infectious and non-tumorous diseases of digestive system. Due to the change of disease spectrum and the high morbidity of hepatitis, studies on various hepatic diseases, such as fatty liver, hepatic fibrosis, hepatic cirrhosis, hepatic injury, repair, regeneration and transplantation, have become important topics in this field. The number of proposals on the inflammatory bowel diseases and immune diseases of gastrointestinal tract has greatly increased in recent years. The studies on mechanisms of intestinal mucosal barrier, gastrointestinal motility and functional abnormalities are receiving more attention. Digestive diseases related to drugs, toxicants or alcohols are also hot issues in this field. Research on these important problems mentioned above, and studies on the pathophysiology of pre-clinical phase of these diseases and the mechanisms

of functional disorders are encouraged. The number of applications on liver diseases in 2012 increased fast, of which applications on liver fibrosis and cirrhosis, portal hypertension accounted for about 15%, and on liver failure and liver injury for about 14%. In addition, applications on inflammatory bowel disease, digestive organ transplantation, pancreatitis, gastrointestinal motility and functional abnormalities accounted for about 10% and 9%, 8%, 8%, respectively.

### **Hematological System**

More and more Chinese scientists in this field have strong research background and have achieved original findings on hematological system diseases, especially leukemia. The researchers are encouraged to perform intensive and international competitive work on the basis of clinical scientific questions. The applications on leukemia accounted for about 53% in hematological system in 2012. The numbers of applications in the regulation of bleeding and blood coagulation, platelets, and thrombosis were increased slightly, accounting for 13%. The hot topics in this field include studies on characterizing hematopoietic stem cells, stem cell transplantation, the interactions between hematopoietic or leukemic stem cells and their hematopoietic microenvironments, as well as the host's pathophysiological states.

### **Gerontology**

The main funding covers studies on pathophysiology in aging, and pathogenesis and intervention for aging related diseases, providing theoretical foundation for early warning, diagnosis, treatment, and prognosis of aging associated diseases. Research on the common mechanisms of various aging related diseases are encouraged, including cell aging, stem cell aging, inflammation, stress, autophagy, signal transduction, gene expression and translation, epigenetic regulation in aging, and so on.

Research proposals on tumorous diseases are excluded from the Division's funding scope. Proposals on tumors of respiratory, digestive and hemolymphatic systems (except leukemia) should be submitted to the Division V. Proposals on pathogenic organisms should be submitted to the Division IV. Applications on the diseases unrelated to aging mechanisms should be submitted to appropriate systems.

## **Division II of Health Sciences**

The Division mainly supports basic researches on reproductive system,

urinary system, endocrine system/metabolism and nutrition support, ophthalmology, otorhinolaryngology head and neck science, oral and craniomaxillo-facial science, fetus, neonate and perinatology.

### **Reproductive System/Perinatology/Neonatology**

The Division mainly supports studies on the function and abnormal development of reproductive system, all diseases except tumor, and developmental disorders of fetus, diseases of neonate, assisted reproduction, prenatal diagnosis, contraception and birth control et al. The Division received 1,175 proposals in 2012, which was 12% increase from 2011. The proposals mainly focus on neonatal related diseases, pregnancy and pregnancy related diseases, abnormal endocrine and related diseases of female reproductive system, endometriosis, sperm anomalies and male infertility, fetal development and prenatal diagnosis, female infertility and assisted reproduction. The increase rate of total proposals in 2012 was much lower than that of 2011, but the application grants on diseases of neonate increased dramatically. The main research scientific topics were the pathogenesis and therapeutic targets and techniques. The Division will continue to encourage those researchers who have good track record and support preferentially innovative translational researches on prompting population quality, support innovative basic research on the health of female, fetus, newborn and human reproduction.

### **Urinary System**

The Division mainly supports studies on the functional disorders and abnormal development of kidney, renal duct, bladder and urethral canal and all the disease related proposals except tumor research. The Division received 1,062 proposals in 2012 which was 25% increase from 2011. The proposals mainly focused on kidney disease such as primary renal diseases, secondary renal disease damage and repair of the urinary system, renal failure and alternative therapy (including renal transplantation). The dominant application area was on the area of secondary renal diseases, the increase rate of proposals on kidney transplantation in 2012 was lower than that of 2011. However, the increase of proposals was evident on the area of renal failure and alternative therapy. The proposals on prostate and bladder diseases decreased from last year. The Division will continue to support consistent and innovative researches and translational researches in the above fields.

### **Endocrine System/Metabolism and Nutrition Support**

The Division mainly supports studies on the structure, function and abnormal development of endocrine system, including disease related research of endocrine system and endocrine abnormal of other non-traditional endocrine organs, and supports various dysfunctions of metabolism, malnutrition and nutrition support. The Division received 1,291 proposals in 2012, which was 15% increase from 2011. The research focused too much on diabetes related research (account for 51.2% of total proposals of endocrine and metabolism system) and abnormal bone turnover and bone metabolism and osteoporosis. The proposals on energy metabolism and obesity were increased from last year, whereas the amount of proposals on thyroid diseases stayed the same. The scientific questions were too much on hot areas such as regulation on the microRNA (62 proposals), stem cell transplantation (59 proposals) and stress (64 proposals). There were few applications on the research of endocrine organs themselves, amino acid metabolism, nucleic acid metabolism, trace and vitamin metabolism, which the Division will pay more attention and support preferentially in the future. In order to make innovative finding, the Division will encourage applications on questions arising from clinical practice, with proper research design and approach.

### **Ophthalmology, Otorhinolaryngology Head and Neck Science, Oral and Craniomaxillo-facial Science**

The Division mainly supports non-neoplasm diseases of the related field. In the field of ophthalmology, researches on fundus were the hot areas also in 2012, and the next is researches on corneal diseases, glaucoma, optic nerve and visual pathway related diseases. There were more proposals on immune-related eye diseases, as well as stem cell related research proposals (60 in total). The most common hot topic of ophthalmology was the researches on the genetic and molecular mechanisms of diabetic retinopathy, neovascular eye diseases, glaucoma retinal ganglion cells (RGCs) damage and pathologic myopia. In the field of otorhinolaryngology, head and neck science, there were more researches on auditory abnormality in 2012, accounting for 29% proposals in this field. The next is olfactory, nose and anterior cranial base diseases, ear and lateral cranial base diseases. There were a few more proposals in the field of genetic and developmental related diseases of ear, nose and throat than that of last year. In areas of oral and craniomaxillo-facial science, the ratio of proposals based on secondary application code is similar to that of last year. But there were more proposals on the periodontal and oral mucosa diseases, cranio-maxillofacial bone and



cartilage tissue than that of last year. The main hot topic was the destruction and remodeling of the bone, which were 114 proposals in total. There were as many as 136 proposals on the areas of development of teeth and periodontal tissues and dental stem cells. There were some misunderstandings of the application code, such as “prosthodontics and orthodontics”. It is suggested that applications on implant or other uncovered field may select the secondary application code of “prosthodontics and orthodontics” in order to put similar scientific questions grants together. The Division will continue to support researches on most severe, common, complicated diseases or functional disorders in the above field, support research on pathogenesis, diagnosis, novel treatment procedures and functional reconstruction, and support researches on areas related to general health of human body.

The Division will not support researches on cancer in the above four areas. All applications on cancer research in above areas should be submitted to the Division V of Health Sciences. It is worth to pay much attention to the fact that there were 120 rejected proposals in the Division in 2012, which were cancer related researches on reproductive system, urinary system, endocrine system, ophthalmologic malignant tumors, head, neck and oral cavity. The Division will not support researches on drug design as well. Please submit the proposals on drug design to the Division VII of Health Sciences. Applicants can only use application code if the research area is the female reproductive system endocrine disorders. The proposals on other endocrine disorders should use application code endocrine system.

## **Division III of Health Sciences**

Division III mainly supports basic and applied basic researches in the fields of neurological and psychiatric diseases, medical imaging and biomedical engineering sciences.

### **Neurological and Psychiatric Diseases**

The Division mainly supports basic and applied basic researches regarding to the structure, function, heredity and developmental anomalies of the nervous system, as well as the etiology, pathogenesis, diagnosis and treatment of non-tumorigenic neurological diseases. The Division supports researches not only on common disorders in the nervous system such as cerebrovascular diseases, epilepsy, neurodegenerative diseases, and traumas and repair in brain and spinal cord, but also rare nervous system diseases. Funding for researches on the pathogenesis and intervention of

neuroimmunological or neuroinflammatory disorders will be one of priorities in 2013. And the etiological and relevant clinical studies of comorbidity in neurological and psychiatric diseases will be highly encouraged.

The modern disease spectrum is characterized by the rapid rise in the prevalence of psychological and psychiatric diseases. The efforts are mainly aimed to initiate studies regarding to early recognition, reliable diagnoses and treatments targeting at the etiologies and pathogenesis of these disorders based on unraveling biological mechanisms and etiologies. In all applications in 2012, more studies are focused on schizophrenia and depression whereas fewer researches investigate autism and attention deficit syndrome, especially crisis intervention. In order to reduce the prevalence of psychological and psychiatric disorders in China, researches are encouraged to illustrate the mutual interaction between environment and genetics and their impact on the development of these diseases, unravel the potential etiologies, discover the practical biomarkers monitoring the development, progression and prognosis of the conditions, establish early diagnostic methods, and develop pharmaceutical and non-pharmaceutical methods for early intervention and treatment. In addition, there are increasing applications to study the role of micro RNA in the pathogenesis and intervention of neurological disorders in 2012, indicating a highlight of this field.

In the recent years, the grants in the field of neurological and psychiatric diseases are obviously homogeneous, predominantly in stroke, epilepsy and neurodegenerative diseases. There is a significant increase in the grants on neuro-immunological diseases in 2012, which will be continuously supported in the future. The researches on neurological infectious diseases and AIDS-related encephalopathy will be encouraged.

The novel studies on rare neurological hereditary diseases with genetic approaches will be heavily funded. Although the applications for clinical study on cerebro-vascular diseases were increased in 2012 relative to 2011, the clinical data collection in involved studies was commonly not met with criteria. It is encouraged to perform the translational studies for stroke with a unified standard for data collection in China. Researches on the mechanisms underlying pain need to be strengthened based on the collaboration of basic and clinical studies. Studies on postoperative cognitive dysfunction have attracted great attention by anesthesiologists. The basic research on this field is weak in China and need to be improved and enhanced by international

academic exchange. The Division hopes to balance its support among applications from neurology, neurosurgery, psychiatric medicine and related clinical medicines such as pediatric medicine and anesthesiology. Clinicians and researchers in basic neurosciences are encouraged to jointly apply to perform scientifically significant investigation.

### **Medical Imaging and Biomedical Engineering**

Medical imaging and biomedical engineering is featured by multidisciplinary intercrossing, such as the intercrossing between medicine and mathematics, physics, chemistry, information sciences, material sciences or engineering, and life sciences, etc. The Division supports basic and applied basic researches in areas of medical imaging and medical engineering.

In the field of medical imaging, basic research which takes medical imaging and information as the content is mainly funded, including magnetic resonance imaging (MRI), X-ray and computed tomography (CT), ultrasound in medicine, nuclear medicine, medical photonics and optical imaging, molecular imaging and probes, electroencephalography (EEG), magnetoencephalography (MEG), data processing and analysis of medical images, interventional medicine and other related scientific issues. The important funding direction in the field is to solve basic scientific issues in the application of Magnetic Resonance Imaging (MRI), Functional Magnetic Resonance Imaging (fMRI), Magnetic Resonance Spectroscopy (MRS), CT, ultrasound, nuclear medicine and optical imaging etc, combined with data processing and analysis of medical images. Meanwhile, the explorative interdisciplinary studies in the scientific forefront of this field, including the areas of molecular imaging and probes, fMRI, EEG, MEG, brainbow imaging, and interventional medicine etc., are also encouraged. In addition, combined with clinical activities, researches of diagnostic imaging and image guided therapy related to various diseases such as cancer or neurological and cardiovascular system diseases are also supported.

In the field of biomedical engineering, the Division mainly funds research on medical engineering associated with disease diagnosis and treatment as well as the basic research related to regenerative medicine, including the detection, recognition, processing and analysis of human medical signals, the modeling and simulation of biomedical systems, biomedical sensors, medical information system and telemedicine, neural engineering and brain-computer interface, treatment planning and navigation technology, and

robot-assisted therapy, rehabilitation engineering and intelligent control, nano-medicine, drug delivery materials and gene transfer systems, medical biomaterials and implantation science, cell transplantation, tissue engineering and regenerative medicine (including stem cell therapy, tissue bioreactor building and biomaterials to induce tissue regeneration etc.), artificial organ and bionic medicine of specific receptors, electromagnetic and physical therapy, medical devices or instruments for the detection, analysis, imaging and treatment, biomarker detection technology and equipment, and other scientific issues. Among them, the medical signals, biomedical sensors, modeling of biomedical systems, neural engineering and brain-computer interface, rehabilitation engineering, tissue engineering and regenerative medicine etc. are important funding directions of the field. Basic researches on the treatment planning and navigation technology, robot-assisted therapy are also encouraged in this field.

The development of medical imaging and biomedical engineering has been accelerated by multidisciplinary studies. In 2012 project there were 1,225 applications in medical imaging and biomedical engineering, an increase of 6.8% compared with the number in 2011. The increased applications mainly focused on biomedical engineering. In contrast, the applications in the field of medical imaging had little increase. Although the number of applications in the field of biomedical engineering has been a little bit increased, the total number of applications is still small. The Division will continue to encourage researches on bio-electronics, or tissue engineering and regenerative medicine including stem cell therapy, tissue bioreactor building and biomaterials to induce tissue regeneration etc. At the same time, preferential support will be given to young investigators working in above mentioned interdisciplinary scientific frontiers. The interdisciplinary and collaborative researches with scientists having different academic backgrounds will be also encouraged.

The Division does not accept applications concerning tumors in the central nervous system and radiation oncology, which should be submitted to the Division V of Health Sciences. In addition, applications on radiation protection should be submitted to the Division VI of Health Sciences and applications on pharmacology and drug delivery quomodo to the Division VII of Health Sciences (H30 or H31).

## **Division IV of Health Sciences**

The funding scope of this Division covers basic researches in fields of

biological characteristics and infection of bacteria, fungi, viruses, parasites and other pathogenic organisms, laboratory medicine, abnormalities and diseases of skin and its appendages, abnormalities and diseases of locomotor system, emergency and intensive care/trauma/burns/cold injury/plastic surgery, special medicine and rehabilitation.

### **Medical Pathogens and Infection**

The Division mainly supports basic research on collection, preservation, separation and research of medical microbes and parasites as the main pathogenic biological resources, including the pathogen biological characteristics and genetic variation, the infection and pathogenic mechanism, the host immune response induced by pathogens, the epidemiologic trends in nosocomial infection, the drug resistance mechanism of pathogens, the discovery of the medium and the physiological-ecological-behavior based on the sources and the routes of infection, and related basic research on clinical diagnosis and therapeutics of infectious diseases. Key scientific issues in pathogenic organisms and infectious diseases are focused on the heredity, variation and drug resistance acquire of pathogenic organisms and the host-pathogen interaction, which are hot topics in the research concerned abroad. This Division encourages basic research carried out innovatively in the above mentioned areas, and studies on group abundance, collection and preservation of clinical pathogenic organisms, as well as related biomedical research. Continuous preferential support will be given to basic research topics on the rarely concerned pathogenic organisms.

### **Laboratory Medicine**

In laboratory medicine, the funding scope mainly covers research on new theory, new indicators, new methods and new technology aimed at exploring the disease risk prediction, diagnosis, disease-monitoring, as well as the evaluation of the efficacy of therapeutics and prognosis. In addition, the key scientific issues and technology research on the quality assurance for the important indicators are included. Key funding scope is mainly focused on the screening and identification of sensitive and specific disease-related molecular markers for diagnosis of diseases or risk-prediction, new indicators and technique in personalized therapeutics, new techniques in immune labeling and rapid isolation and identification of clinical pathogens, as well as high-throughput detection, rapid analysis on drug-resistance of clinical pathogens, the correlation between the disease diagnosis and the body fluid and phenotype of blood cell in the progression of different stages,

the main quality issues of the important inspection items, as well as the reference methods and the scientific questions and technology related to the reference materials. The projects based on the clinical practice and clinical samples are encouraged.

### **Skin and Its Appendages**

The funding scope mainly covers the basic researches on the structure, function and developmental abnormalities of skin with appendages, as well as the related immune diseases, infectious diseases and hereditary diseases (tumor-related diseases are not included). With the severe progression of immune and immune related diseases, infectious diseases in this field and their threats to the public health, scientists should take them more seriously. The Division will also pay more attention to the advances in this field.

### **Locomotor System**

The Division mainly supports applications focusing on the basic scientific problems of the anomalies in structure, function and development of the bone, joint, muscle and ligament, the etiology, the pathogenesis, prevention, diagnosis and therapy of the genetic diseases, immune-related diseases, inflammation and infection, injury and repair, grafting and reconstruction, fatigue and recuperation, degenerative disorders, sports injury, deformity and correction and other neoplastic diseases in locomotor system. Meanwhile, proposals on the scientific issues arising from research on medical biomaterials of bone, joint and soft tissue are also encouraged in the Division. In view of the relatively weak basis in research on sports medicine, this Division will give support to the relevant applications.

### **Emergency and Intensive Care Medicine/Trauma/Burns/Frostbite/Plastic Surgery / Special Medicine /Rehabilitation Medicine**

In terms of emergency and intensive care, trauma, burn and frostbite areas, the Division mainly supports the basic and applied basic researches on the pathophysiological processes, pathogenesis, influencing factors, prevention, diagnostic and therapeutic technique, and related translational medicine research of these above diseases. In terms of plastic surgery, the Division focuses on wound healing and scar, superficial tissue and organ repair/regeneration/transplantation and reconstruction, as well as cranio-maxillofacia deformities and corrective therapy. In terms of special medicine, the Division mainly supports basic research probing on the pathophysiological phenomena and their therapies under aeronautical,

astronautic, nautical, submarine, plateau, alpine condition, high temperature, polar region and other extreme environmental conditions. In terms of rehabilitation medicine, basic research on scientific issues arising from the mechanisms and clinical of rehabilitation of dyskinesia and injuries in other organs or systems caused by cardiopulmonary diseases or diseases of, loco motor system or nervous system is encouraged.

Diseases, emergency and intensive care, trauma and burn due to extreme environments seriously influence both people's life quality and safety, and cause high disability and mortality. The research aiming at developing the new diagnostic and therapeutic techniques for clinical therapy, reduction of mortality and disability is the main concern of the Division. In most cases, more than one organ or systems are involved in the pathophysiological process of the above diseases, and shock, systemic inflammation and immune response are caused by these diseases. Therefore, in-depth and interdisciplinary research is encouraged.

In view of research proposals received in recent years, the academic quality of proposed research in the Division is rapidly improved. In the basic research field, more and more scientists devoted themselves to choose indigenous innovative issues for promoting their research with the international standard. They focus their work on the actual status and serious problems of health and safety of the country, and carry out studies in selective topics or fields that are in urgent needs but weak in actual research. However, non-negligible problems still exist: mainly reflected in the insufficient cooperation between medical experts and biologists, clinical experts and basic research experts, which leads to emergence of superficial research without focusing on the key scientific problems. For example, in the field of pathogenic microbe and infection, due to lack of efficient cooperation with biologists, research on the biological characteristics and the rule of heredity and variation of pathogen are not deep and systematic. In the field of locomotor system diseases, without proper understanding of the research literature, a number of scientists are not able to narrow down and focus on the key scientific issues.

## **Division V of Health Sciences**

The Division mainly funds research on oncology, involving in common features of tumors in occurrence, development and prognosis, as well as the distinctiveness of tumors of various systems/organs (excluding leukemia) in etiology, pathogenesis, diagnosis, treatment and prevention. The scopes of

funding cover not only tumor etiology, tumor development, tumor genetics, tumor immunology, tumor prevention, recurrence and metastasis, tumor stem cell, tumor diagnosis, chemotherapy, physical treatment, biological treatment, comprehensive treatment of the tumor, tumor rehabilitation including social and psychological rehabilitation, new techniques of tumor research, but also tumors of various systems/organs including respiratory system, haematologic and lymphatic system excluding leukemia, digestive system, nervous system including tumors of special receptors, genitourinary system, breast and endocrine system, bone and soft tissue, head, neck and maxillofacial, skin, body surface and other parts of the human body.

The establishment of this Division specialized on oncology is to emphasize, on the one hand, the common features of tumors, which focuses on the molecular mechanism of tumor biology, such as proliferation, differentiation, metastasis, autophagy and apoptosis, thus to explore the mechanism and regularity of tumor occurrence, development, metastasis and recurrence, and to lay the foundation for tumor diagnosis, treatment and prevention, and, on the other hand, to highlight the distinctiveness of tumors of various systems and organs. Proposals on translational research based upon clinical experiences and observation of specific systems/organs, and aiming to promote the clinical practice in tumor diagnosis and treatment are also emphasized.

Proposals related to common scientific problems of tumor should select corresponding application codes on tumor etiology, tumor development, tumor genetics, tumor immunology, tumor recurrence and metastasis, tumor stem cell, tumor diagnosis, treatment (including chemotherapy, physical treatment, biological treatment and comprehensive treatment), tumor prevention, rehabilitation (including social and psychological rehabilitation) and new techniques of tumor research. Proposals related to distinctiveness of tumor from specific systems/organs should choose application codes of corresponding systems/organs. Application codes should be carefully selected in accordance with various scientific fields.

Oncology is one of the most active areas in medical sciences. With the rapid development and integration of cell biology, developmental biology, genetics and immunology, the trends of cancer research are steered towards tumor epigenetics, tumor stem cells, tumor immunology, bioinformatics and systemic biology. Recently, research on cancer epigenetics has emerged as a rapid moving field. For example, the up-stream and down-stream regulatory mechanisms of non-coding RNAs, the positive and negative feedback loops



formed by non-coding RNAs, and the molecular functions of long noncoding RNA have aroused the interests of many scientists. Additionally, aberrant cancer metabolism and its role in tumorigenesis and cancer development have been appreciated, which is supported by results from evidence-based medicine. Some proposals have focused on the role of metabolism pathways in tumorigenesis and tumor development, as well as crosstalk among different signal pathways in cancer cells. On the other hand, the translational values of metabolic factors in tumor biology have been stressed. For example, studies exploring in vitro and in vitro efficacy and mechanisms of agents regulating tumor cell glycolipid metabolism may provide experimental evidence for the application of traditional drugs for cancer treatment. Studies probing the biology of tumor stem cells are also actively ongoing in recent years, which include the molecular mechanisms involved in maintaining the stem-cell like properties of tumor stem cells, abnormal metabolism of tumor stem cells, relationship between epithelial-mesenchymal transition(EMT) and tumor stem cells, formation and mechanisms of vascular mimicry, interactions between microenvironment and tumor stem cells. Furthermore, signal pathways are widely studied for their involvement in tumor progression, and have been expanded from single signal pathway to crosstalk among various pathways. It should be noted that some medical oncologists have explored the mechanism of crosstalk among signaling pathways and have developed strategies to reverse the resistance of targeted agents, which have taken on strong translational values.

Scientific problems sprouted and condensed from accumulated research findings or clinical practice, and to systemically investigate mechanisms for malignant tumors to improve cancer diagnosis, treatment, and clinical translation, as well as to develop new technology for cancer research are highly encouraged. Integrated researches taking the advantages of domestic clinical resources are also encouraged.

Applicants should note that the proposals on tumor epidemiology should be submitted to the Division VI of Health Sciences, and leukemia-related proposals should be submitted to the Division I of Health Sciences. Proposals related to distinctiveness of tumor from specific systems/organs should carefully choose application codes of corresponding systems/organs.

## **Division VI of Health Sciences**

Division VI of Health Sciences provides funding to the basic researches in

fields of Preventive Medicine, Endemiology Occupational Medicine, Radiology, Medical Immunology and Forensic Medicine.

### **Preventive Medicine**

The Division provides funding to basic researches including environmental health, occupational health, human nutrition, food hygiene, maternal and child health care, children and adolescent health, toxicology, analytical chemistry, epidemiology of infectious disease, epidemiology of non-communicable disease, epidemiological methods and medical statistics.

### **Endemiology**

Funding is given to basic researches regarding the natural nidus diseases, biogeochemical diseases and work-related or life style-related diseases.

### **Occupational Medicine**

Funding is given to basic researches concerning diseases due to exposure to occupational hazards.

### **Radiology**

Funding is given to basic researches including radiological damage and radiological pathology, radiological hygiene and radiological prevention, and non tumor radiological therapy.

Funding for preventive medicine, endemiology, occupational medicine and radiology will be mainly focused on researches aiming at discovering new theory and developing advanced technology and methods for disease prevention and control. Projects with important scientific significance and original innovation are highly preferred. Investigators must focus on population based studies according to the actual demand of national population health and disease prevention. It is required to conduct the projects using integrated advance technology of molecular biology with immunology and integrated field studies with laboratory works. In order to demonstrate our national characteristics and prestigious international standing, it is prerequisite to seek a novel research direction and to make great efforts in prospective research. Basic data accumulation and medical specimen collection will be encouraged in order to carry out in-depth, systematic study on the basis of the existing data and samples by modern medical statistic methods. The basic research about epidemiological cohort study and intervention strategy will be also encouraged.

Division VI does not accept applications for studying cancer radiotherapy. Applicants may refer to categories under Division V of Medical Sciences. Moreover, the Division does not accept applications for studying gynecologic diseases and pediatric diseases. The former may refer to categories under Division II of Medical Sciences, while the latter depends on the classification of system characterization. Application of clinical test was not accepted under the category of analytical chemistry. Applicants may refer to categories under Division IV of Medical Sciences. The Division does not accept applications of pure laboratory research under the category of epidemiology. Application of hereditary disease without epidemic characters was not accepted under the category of endemiology. The criterion for selecting the category depends on the classification of system characterization. In addition, the Division does not accept applications on drug toxicology and applicants may refer to categories under Division VII of Medical Sciences.

### **Medical Immunology**

The funding areas of this discipline cover basic and applied basic research in areas of morphological, structural, functional and developmental abnormalities of immune cells, tissues, organs and systems, as well as the mechanism underlying immune pathological process, immune regulation, immunization, immunodiagnosics and immunotherapy of various diseases. Key research directions and areas are as follows: ( i ) The discovery of new immune molecules and signal transduction pathways, and their relevance to diseases; ( ii ) The phylogenesis of immune systems, immune cells and their subsets involved in immune responses, and their relevance to diseases; (iii) The effect of epigenetic modification on immune cell differentiation, and its relevance to diseases; (iv) The inflammation process and its regulation triggered by immune recognition of antigen presenting cells, NK cells etc. (v) The mechanism underlying the immune recognition- responses- effects by both innate and adaptive immune systems; (vi) Molecular and cellular mechanisms underlying immune regulation of various diseases; (vii) Mechanism underlying the generation and regulation of immune memory cells in host anti-disease immune responses; (viii) Research involving infectious diseases, inflammatory diseases, hypersensitive diseases, autoimmune diseases, primary and secondary immunodeficiency diseases, transplantation immunology and organ transplantation, and the mechanism underlying vaccines and adjuvants etc. The Division will highlight immunological studies in the above areas, especially studies aiming at taking the advantages of the unique genetic or disease resources and

establishing unique research systems or technical platforms (such as unique cell models or animal models, molecular targeting techniques, etc.), and studies aiming at understanding the common mechanism underlying human immune-mediated diseases by creating or modifying appropriate animal models, as well as systematic immunological studies that are intended to understand the immune-related features across various diseases spectrum by immunoinformatics, immunogenomics and computational immunological techniques. The collaborative studies on scientific issues emerging from clinical practices by both basic and clinic researchers will be also encouraged. Preferential support will be given to visualized disease-related studies on immune systems and immune response processes by utilizing the real-time dynamic imaging techniques (MRI, PET, co-focal laser microscopy and living cells imaging etc), which are currently developed.

### **Forensic Medicine**

Specific scientific areas covered in this discipline include basic and applied basic research designed to solve the medical problems during legal practice by using the human body and biological samples. Priority areas include: the identification of cause of death, estimation of postmortem interval, the determination of manner of death as well as fundamental theory related to death; the relationship between postmortem phenomena and its mechanism with the time of death; the diagnostic basis and the mechanism of the personal injury caused by violence; the mechanism and the molecular pathological diagnosis of sudden unexplained death; the pathophysiology changes, molecular mechanisms and intervention studies of organ damage caused by drug abuse and drug dependence; poisoning and poisoning biomarker research; the determination of the time that the toxicant enter into the body; in-vivo studies of toxicant disposal process; objective evaluation methods for central nervous system and peripheral nervous system dysfunction as well as visual and auditory dysfunction; the biological evidence associated with the verification of the degrees of injury and physical disability; the identification of the malingering, fraudulent injury and relationship between the disease and the injury; the identification of medical disputes and medical insurance; the forensic identification of the abuse and family violence; the objective assessment of criminal responsibility and civil capacity of the mental disorders; the basic and applied research of individual identification, paternity identification and ethnic origin identification. Systematic in-depth cross-disciplinary research aimed at providing clues for cases investigation, scientific evidence as the trail of the case, and medical basis for the formulation of relevant laws and

regulations by making full use of the theories and techniques in biology, law science and other scientific disciplines are strongly encouraged.

## **Division VII of Health Sciences**

The Division VII mainly supports basic research and applied basic research in the discipline of materia medica and pharmacology. The funding scope for materia medica focuses on sub disciplines including medicinal chemistry (synthetic, natural products, microbial and marine based bioactive substances), biotechnological drugs, special medicines, drug design and drug informatics, pharmaceuticals, pharmaceutical materials, pharmaceutical analysis, drug resources, and other scientific issues related to materia medica. The funding scope for pharmacology focuses on research fields of drug action mechanism or drug resistance mechanism of therapeutic drugs or drug candidates or bioactive products with some advantages in treatment of a disease, drug metabolism and pharmacokinetics, drug toxicology and clinical pharmacology et al.

Interdisciplinary researches are emphasized in the field of materia medica. Researches on chemical synthesis of compounds with medicinal prospect, discovery, chemical modification, preparation, and evaluation for druggability of potential medicinal active substance from terrestrial or marine microorganisms, plants, animals by innovative theories, technologies or approaches will be mainly supported in the sub disciplines of medicinal chemistry. Researches on biotechnological drugs including therapeutic antibodies, vaccines, proteins, nucleic acid drugs and cells etc by innovative biotechnologies or approaches will be supported in the sub discipline of biotechnological drugs. Researches on drugs related to aeronautics and astronautics, deep sea, radiations, militaries and special environments etc., will be supported in the sub disciplines of special medicines. On the basis of biology, chemistry, systems biology, pharmacological principals such as ADME, drug transporters etc., and applying innovative theories and approaches to drug design, computer-aided drug design and pharmaceutical informatics to design drug, evaluate druggability and predict drug safety will be supported in the sub discipline of drug design and drug informatics. Researches on new theories and technologies related with pharmaceutical dosage forms, physical pharmacy, biopharmacy, novel drug delivery systems and new dosage forms will be supported in the sub discipline of pharmaceuticals, and much attention should be paid to the integration of innovativeness and feasibility in the related researches. Researches on development and safety evaluation of new pharmaceutical excipients and

carriers will be supported in the sub discipline of pharmaceutical materials, in which related researches should have outstanding features and be different from researches in pharmaceuticals. Researches on establishment and development of innovative analytic approaches and techniques aimed to solve key scientific problems in the field of materia medica and pharmacology will be supported in the sub disciplines of pharmaceutical analysis, in which innovative testing approaches should be emphasized in the fields of “-omics” researches. Researches on key scientific problem of discovery, exploration, mining and protection, sustainable utilization of new resources will be supported in the sub disciplines of drug resources.

Much emphasis will be placed on further in-depth study on action mechanism of drugs and bioactive products in the discipline of pharmacology. On the one hand, systematic and deep mechanism research should be strengthened in pharmacological proposals in aspects of discovery and validation of new target, establishment of novel screening models, site of action, target identification, regulatory network and overall effect, pharmacokinetics and toxicity of new types of active compounds. On the other hand, basic research should be strengthened in pharmacological proposals in aspects of molecular regulatory network of complex disease and drug intervention, individualized drug therapy, new treatment program, translational medicine, innovative pharmacological model and disease models. In addition, evaluation of druggability and new theories and new models related with molecular biological mechanism in pharmacodynamics and drug toxicology should be strengthened in the sub discipline of pharmacokinetics. Researches on molecular toxicology and metabolite toxicity should be strengthened in drug toxicology.

In recent years, a large proportion of proposals in materia medica were still from sub disciplines of medicinal chemistry of synthetic or natural medicines and pharmaceuticals, in which the research contents should be further in depth and researches on druggability of compounds should be emphasized. Most researches in pharmacological proposals were carried on around drug action mechanism or drug resistance mechanism. Some characteristic applications could be founded based on long term work accumulation, while most studies on mechanism were still limited to the description of drug biological activities and fewer proposals were focused on the discovery of new targets and intensive study on molecular mechanism.

Proposals with good topics may fail to be approved due to insufficient

preliminary data and inadequate justification for the project, or oversized research plan, insufficient study in depth, ambiguous research objects, et al. Quite a few proposals were not funded because their research topics were short of innovation, or the application forms were too simple, or early studies were not enough.

Funding priority will be given to the applications in creative basic research and continuous in-depth research. Since translational medicine is of far reaching importance in improving clinical application value of basic research, the Division will strengthen laboratory basic research based on new discoveries from clinical therapeutics and diagnostics, in order to discover new drug targets and diagnostic markers of disease during the procedure of exploring the mechanism of occurrence and development of disease, and establish the theoretical and experimental basis to develop creative new drugs and diagnostic reagents with independent intellectual property.

The funding scope of the Division does not cover conventional research and pharmaceutical process and technology research aiming at new drug approval. The applicants should pay special attention to the protection of intellectual property and deal with the care relationship between application and secrecy. Any proprietary contents or techniques such as chemical structures, which are inconvenient to illustrate in application should be sent to the Division directly by confidential letters, and should be explained in application documents.

## **Division VIII of Health Sciences**

The Division VIII of Health Sciences identifies its role as advancing the theories of traditional Chinese medicine (TCM) while highlighting its uniqueness. It provides funds to basic research programs in Chinese medicine (CM), Chinese materia medica (CMM) and integrated Chinese and western medicine (IM).

### **Chinese Medicine**

Funding areas: ( i ) Fundamental theories of CM: essence of viscera, Qi, blood and body fluid, body constitution, etiology and pathogenesis, basis of syndrome, therapeutic principles and methods, prescription of CM, and diagnosis of CM. ( ii ) Basic research in clinical medicine: internal medicine of CM, surgery of CM, orthopedics and traumatology of CM, gynecology of CM, pediatrics of CM, ophthalmology of CM, otorhinolaryngology of CM,

stomatology of CM, geriatrics of CM, and health preservation and rehabilitation of CM. (iii) Acupuncture and massage: meridians and collaterals, acupoints, acupuncture and massage. (iv) Ethnomedicine.

### **Chinese Materia Medica**

Funding areas: ( i ) Chinese materia medica: resourceology of CMM, identificology of CMM, pharmacodynamic material basis of CMM, quality evaluation of CMM, processing of CMM, pharmaceutics of CMM, and theory about the properties of Chinese herbs. ( ii ) Pharmacology of CMM: neuropsychopharmacology of CMM, cardiovascular and cerebrovascular pharmacology of CMM, anti-tumor pharmacology of CMM, endocrine and metabolic pharmacology of CMM, anti-inflammatory and immune pharmacology of CMM, antiviral and anti-infective pharmacology of CMM, respiratory pharmacology of CMM, digestive pharmacology of CMM, urinary and reproductive pharmacology of CMM, pharmacokinetics of CMM, and toxicology of CMM. (iii) Ethnopharmacology.

### **Integrated Chinese and Western Medicine**

Funding areas: ( i ) Fundamental theories of integrated Chinese and western medicine. ( ii ) Basic research in clinical integrated medicine. (iii) Methodological or technical innovations in CM research.

The Division has identified a few tendencies in the current CM, CMM and IM research:

- (1) Innovative and creative idea plays the most important role. Novel theories and techniques from the frontier of life sciences and other fields have been continuously introduced to this area.
- (2) More in-depth studies have been done in different levels such as a whole body, a system or organs, cells and molecules, guided by the CM theory and nested in clinical practice.
- (3) The pattern of human vital activities and its integrated regulatory system have been investigated through a combination of macro- and micro-perspectives.
- (4) Principles and research thoughts of emerging disciplines such as system biology, network pharmacology, evidence-based medicine and translational medicine have been given more attentions to and applied in the basic TCM research and thus facilitate its development.

Generally, the Division will continue to encourage interdisciplinary cooperation, and the use of up-to-date concepts, methods and technologies



from multiple fields for enhancing TCM inheritance, development and innovation. Particularly, basic and further research based on previous studies has been deemed top priority. However, research on TCM theories should avoid being “word play” that lends little practical value to clinical practice. And improper or unnecessary use of advanced technologies should be discouraged.

Given the current situation, the Division will give priority to support research in the following areas in 2013: doctrine of viscera, syndrome and pathogenesis, prevention and treatment of TCM advantage diseases, prevention and treatment of major incurable diseases, basis of clinical efficacy evaluation, the correlation of classic prescription with syndrome and disease, basis of meridians and collaterals, mechanisms underlying acupuncture and moxibustion treatment, theoretical and clinical basis of IM, methodological innovation of CM; resource and authentication of CMM, processing and pharmaceutics of CMM, theory about the properties of CMM, pharmacodynamic material basis of CMM, pharmacokinetics and mechanisms of CMM, toxicity and toxicology of CMM, relationship between toxicity and efficacy of CMM, and ethnopharmacology, etc.

It should be noted that a proposal will not be supported if:

- (1) It will not provide genuine thoughts on CM theories or practice even though it claims to study some herbs, prescriptions or herbal ingredients.
- (2) No specific herbs or acupoints are provided in the proposal when main content of study is TCM prescription or acupoints (unless the applicant provides a confidential letter directly addressed to the Division and specify the situation in the application form).
- (3) It only focuses on the derivatives of active ingredients of CMM or on the chemical synthesis of these ingredients.