

Key Program

The Key Program constitutes an important type of research project series supported by the National Natural Science Fund. It supports researchers to conduct in-depth, systematic and innovative research in directions with sound research basis or where new growth points of research disciplines emerge, so as to promote disciplinary development and breakthroughs in important areas or scientific frontiers.

Key Program projects should follow the principle of limited objectives, limited research scope and focused goals, pay attention to intercrossing of disciplines, make effective use of the existing major scientific research bases at national and ministerial levels, and conduct active international cooperation and exchange with concrete contents.

Applicants should have the following qualifications:

- (1) Experience of undertaking basic research projects;
- (2) Senior academic position (title).

Post-doc researchers and graduate students are not qualified for application.

Key Program projects set research areas or directions and announce in the *Guide to Programs*. Applicants should follow the guidelines to write proposals, determine project title according to research content, and avoid using research area as project title. Please make sure to have clear research orientation and be specific in content, and not to cover all areas.

In general, one Key Program project is conducted by only one research institution. If necessary, two institutions at maximum are allowed as collaborators. The duration of a Key Program project is 5 years.

In 2012, NSFC funded 538 Key Program projects, with a total funding of 1.567 billion yuan and an average funding of 2.9126 million yuan per project (please refer to the table below for details). In 2013, about 500 Key Program projects will be funded, and the average funding will be about the same as that in 2012.

Funding of the Key Program Projects in 2012

Unit: 10,000 yuan

Department	Applications	Funding and Projects Approved				Funding Rate (%)
		Projects	Funding	Average Funding per Project	Percentage of the total (%)	
Mathematical and Physical Sciences	242	60	17,890	298.17	11.42	24.97
Chemical Sciences	240	55	16,470	299.45	10.51	22.92
Life Sciences	484	76	22,500	296.05	14.36	15.70
Earth Sciences	514	74	22,330	301.76	14.25	14.40
Engineering and Materials Sciences	369	82	23,940	291.95	15.28	22.22
Information Sciences	254	71	21,000	295.77	13.40	27.95
Management Sciences	139	30	7,390	246.33	4.72	21.58
Health Sciences	524	90	25,180	279.78	16.07	17.18
Total	2,766	538	156,700	291.26	100.00	19.45

Please refer to the respective sections in each department for research areas and orientations of the Key Program projects.

Department of Mathematical and Physical Sciences

In 2012, the Department of Mathematical and Physical Sciences announced 83 areas for Key Programs, and received 242 applications. 60 projects were funded with funding of 178.9 million yuan and about 2.9817 million yuan per projects.

In 2013, the Department of Mathematical and Physical Sciences plans to fund 60-66 projects with about 3 million yuan per project for 5 years.

To ensure the high quality of projects, applicants are required to have ever chaired national projects, and relatively large research teams.

Please give the title of the proposed research directions in the note section of the application form, otherwise the application will be not accepted.

In 2013, the Division of Mathematics plans to fund 12-13 Key Program projects, ranging from 2 to 3 million yuan per project and 2.2 million yuan on average. Main research directions are as follows:

1. Algebraic structure in number theory and theoretical physics
2. Algebra and hyper algebra in conformal field theory
3. Structure and representation theory of associative algebra
4. Geometry and topology of sub-manifold
5. Classification of singular points and its applications
6. Theory of complex analysis on Riemann surface
7. Theory of real variables in harmonic analysis
8. Variation theory and its applications
9. Complexity of random dynamical systems
10. Mathematical theory of fluid dynamic equations
11. Algebraic and geometric structures of integrable system
12. Stochastic partial differential equations in complex fluid
13. Statistic analysis of bio data
14. Optimization theory and method for information technology
15. Learning theory for large data
16. Mathematical problems in micro and nano structures
17. Mathematical analysis of complex network
18. Logic theory and method for complex deductions
19. Discretemathematical method in network design
20. Mathematical theory and method for reverse problems in resources exploration

In 2013, the Division of Mechanics plans to fund 14-15 Key Program projects, ranging from 3 to 4 million yuan per project and 3.3 million yuan on average. Main research directions are as follows:

1. Nonlinear and uncertainty system dynamics
2. Modeling, analysis and control of complex system dynamics
3. Deformation and damage mechanism of advanced materials
4. Theory, method and application of structural completeness and reliability
5. Mechanical behaviors of material and structure in multi field conditions
6. Unsteady complex flow mechanism and control
7. Hydro dynamics of ships, marine and coastal engineering
8. Flow and propulsion mechanism of aircraft and space craft
9. Biomechanical problems in human health and clinical medicine
10. Transient response of structures, explosive and impact dynamics
11. Numerical methods and software for complex mechanical problems
12. New methods and technology in experimental mechanics
13. Key mechanical problems in environmental evolution and catastrophe
14. Key mechanical problems in major equipment
15. Key mechanical problems in advanced manufacturing
16. Key mechanical problems in nonconventional conditions

In 2013, the Division of Astronomy plans to fund 7-9 Key Program projects, ranging from 3 to 4 million yuan per project and 3.3 million yuan on average. Main research directions are as follows:

1. Formation and evolution of first generation celestial body and large scale cosmic structure and measurement of its cosmic parameters
2. Formation, structure and evolution of galaxies, interstellar matter
3. Violent activities in active galaxy center and galaxy levels
4. Structure and evolution of very early Galaxy and different stellar populations
5. Star formation, structure and evolution
6. Star evolution in late period, inter stellar matter and matter cycling, compact stellar bodies and its related explosive phenomena and radiation mechanism
7. Celestial bodies in solar system and planetary systems outside the solar system
8. Fine structure, basic magnetic element diagnosis and property, magnetic field topology in active region and evolution of solar magnetic field
9. Origin, dynamical evolution, multi band electromagnetism and particle radiation of solar activity and solar earth physical property
10. Corona fluctuation, coronal ring structure and heating
11. Basic theory and methods of astrometry and astro-mechanics
12. High precision astronomical parameter measurement and astronomical reference frame
13. Techniques and method for astronomical observation in space and extreme environment
14. Low noise and array receiving technology, digital signal processing and large aperture radio telescope technology
15. Autonomous optics, self-adaptive optics, optical interference and very large aperture telescope technology

In 2013, the Division I of Physics plans to fund 14-15 Key Program projects, ranging from 3 to 4 million yuan per project and 3.3 million yuan on average. Main research directions are as follows:

1. Physical problems in new forms of energy
 - (1) Exploration and physical studies of new energy materials
 - (2) Physics of advanced energy saving materials and devices
 - (3) Physical problems in efficient energy conversion and storage
2. Physical basis of quantum information
 - (1) Physical problems in quantum state generation, control and measurement

- (2) Physical realization and measurement of quantum entanglement and multi composition association
- (3) Quantum information processing and solid quantum computation based on specific physical system
- (4) Theory, scheme and experiment of quantum simulation

3. Physics of advanced functional materials

- (1) Surface, interface and artificial micro structure physics
- (2) New functional materials and device physics of self- spin information carrier
- (3) Exploration of physical methods for preparation of new functional materials

4. Physical problems in confined or relevant quantum systems

- (1) Properties of electric transport, thermal transport and self-spinning transport in low dimensional system
- (2) Dimension and topological physical properties in quantum system
- (3) Ultrafast interference control of quantum state in micro nano structures
- (4) Novel quantum state and quantum phase change in relevant electron systems

5. Physical problems in soft matter systems

- (1) Structure, property and regulations of interface system
- (2) Microstructure and interactions of soft matter
- (3) Physical problems related to life sciences

6. Computation and simulation of matter structures and properties

- (1) Computational design and physical property prediction of new types of functional materials
- (2) Computational simulation of structure and properties of complex system and in extreme conditions
- (3) Exploration and application of multi body quantum computation methods

7. Atomic and molecular multi body interaction and physical process under extreme conditions

- (1) Atomic and molecular state in high temperature and dense conditions
- (2) Highly charged atom, high excitation state atomic molecules and impact process
- (3) High precision theoretical method and computation of atomic molecular multi body relevant effect

8. Quantum dynamic process of atomic molecular system

- (1) Multi pieces relevance of large molecular system and quantum process of multi bodies
- (2) Ultrafast atomic molecular process and measurement and control of regulated light pulse and quantum state evolution
- (3) Physical property of large molecule and cluster system and relevant quantum process

9. Cold atomic molecular physics and precision measurement

- (1) Cold atom molecule and ion preparation and control
- (2) Cold atomic system and quantum simulation
- (3) Measurement of atomic and molecular precision spectrum and physical parameter

10. Frontierproblems in nonlinear optics

- (1) Physical mechanism of new types of nonlinear optical materials
- (2) Nonlinear optics in relativistic conditions
- (3) Nonlinear optics of weak light

11. New type of light source and new spectrum physics and technology

- (1) THz radiation source, spectrum and its applications
- (2) EUV and other ultra-short wave length coherent radiation generation
- (3) New mechanism and new technology of photoelectric, electric photo transformation
- (4) Fast numerical simulation of nano optical filed and its characteristics

12. Ultrafast, ultra strong light physics

- (1) Atto second laser generation, measurement and application
- (2) Ultrafast laser regulation techniques and physics
- (3) Atomic, molecular and cluster behavior in ultrafast strong optical field

13. New phenomena in quantum

- (1) Strong photon-atomic coupling and cavity quantum electro dynamics
- (2) Quantum optical problems in solid state and manmade structures
- (3) Quantum optical problems in open system

14. Advancedacoustic material and energy converter

- (1) Basic physical problems in advanced acoustic materials and energy converter
- (2) Acoustic device, sensor and array

15. Spatial and temporal properties of marine acoustic field and its application

- (1) Properties of sound propagation, variation and scattering in 3-D uneven marine environment
- (2) New method of marine acoustic chromatography and its applications in fast forecast of speed of sound in sea water

16. Generation, propagation, measurement and interaction of sound wave in complex media

- (1) Interaction and effect of acoustic wave and matter
- (2) New theory and new methods for quantitative measurement and evaluation of acoustic waves

In 2013, the Division II of Physics plans to fund 13-14 Key Program projects, ranging from 3 to 4 million yuan per project and 3.3 million yuan on average. Main research directions are as follows:

1. Frontier problems in basic theory of quantum information and physics
2. Frontier problems in non-equilibrium statistical physics
3. Frontier problems in cosmology, gravitation and interdisciplinary research
4. Experimental studies on Higgs physics and new physics
5. Studies on τ charm physics
6. Nuclear structure and properties of strong interaction
7. Studies on frontiers of mid high energy heavy ion collision and new forms of matter
8. Radioactive nuclear beam physics and nuclear reaction mechanism
9. Neutron physics and basic research on its applications
10. Basic research on nuclear technology applications in material, life and health sciences
11. Studies on physical problems and key technology in nuclear radiation protection and environmental protection
12. Accelerator physics and advanced technology
13. Nuclear detection and advanced technology nuclear electronics
14. Inertia confined fusion and frontier problems of strong laser particle accelerations
15. Magnetic confined fusion plasma physics and new methods of diagnosis
16. Basic research on low temperature plasma physics and key technology
17. Studies on advanced technologies and experimental methods of synchrotron and neutron scattering

Department of Chemical Sciences

During the first two years of 12th Five-Year Plan period, the number and the funding intensity of Key Program projects supported by the Department of Chemical Sciences were remained relatively stable. In 2012, the Department funded 55 Key Program projects with 164.7 million yuan and 2.994 million yuan of average funding intensity per project. The duration of each project is 5 years. In 2013, the Department will announce guidelines and accept proposals in 60 research areas, and the average funding intensity will be from 2.0 to 4.0 million yuan for each project. In order to further improve the quality of projects, proposals from those groups and teams with excellent research resources are welcomed, and proposals for interdisciplinary research suggested by teams which have strong background in cooperation are encouraged. When filling in the application form, the applicant must indicate the selected research area in 'the column of note' of basic information table, and must select the proper discipline code marked in brackets of the research area.

In 2013, the research areas for Key Program projects funded by the Department are listed as follows:

1. Inorganic solid functional materials
2. Compounds with multi-hole structure and their function
3. Molecule-base oriented functional materials
4. Preparation and function of clusters and their compounds
5. Basis of bio-inorganic chemistry
6. Function of inorganic nano-materials and their application
7. Basis of applying inorganic chemistry
8. New reaction and new agent in the organic synthesis
9. Selectivity activation and conversion of inertia chemical bond
10. High efficient asymmetric synthesis and its utility
11. Synthesis and reaction chemistry of metal organic compounds
12. Synthesis of element organic functional molecule and its application
13. Chemical reaction induced by controllable free radicals
14. Design and function of organic supper-molecular system
15. Biological organic chemistry and chemical biology
16. Development and acting mechanism of ecological pesticide
17. Green organic synthetic chemistry
18. Experiment research of structure chemistry
19. New methods in theoretical and computational chemistry and their application

20. Physicochemical basis of catalytic materials and catalytic process
21. Research on molecular reaction kinetics
22. Physicochemical basis of colloid and interface
23. Electrochemical basis in the process of energy conversion and storage
24. Physicochemical basis of photochemistry and photoelectrical chemistry
25. Experiment and theoretical research of chemical thermodynamics
26. Experiment research of bio-physical chemistry
27. New spectrum methods used for studying physical chemistry
28. Physicochemical basis in utilization of resource/energy
29. Physicochemical basis of solid and surface
30. Synthetic chemistry of polymers
31. Interface/surface of polymer
32. Structure and properties of polymers
33. Biological polymers
34. Polymers with photoelectric function
35. Basic issues on condensed state of polymers
36. Hybridized system of polymers and inorganic compounds
37. Separation and analysis of complex samples
38. Image formation and *in-situ* analysis
39. Nano-analytic chemistry
40. Analytic chemistry basis of the chemical sensors and bio-sensors
41. New methods for high-output analysis and magnanimous data handling
42. New methods and new techniques in the 'omics' study
43. New methods and new techniques for early diagnosis of major diseases
44. Key scientific issues in the area of bio-chemical engineering
45. Chemical engineering basis in the area of food and medicines
46. Chemical engineering foundation for the high effective clean utilization of fossil energies
47. Chemical engineering foundation in the explore and utilization of new type energies
48. Key scientific issues related to chemical product engineering
49. Design of new materials for chemical engineering and their functional integration
50. Chemical engineering basis related to the high effective utilization of resources
51. Scientific and engineering basis of typically chemical reaction and scale-up of reactor
52. Scientific foundation for environment and safety of chemical engineering
53. Transfer process and separation process
54. Process, principle and effect on the pollution of water environment

55. Exhausting characteristics of chemical pollutants, and principle and method of new technology for their control & reduce exhaust
56. Molecular conversion of typical pesticide (or new type pollutants, e.g. PPCPs and so on) and their harm to one's health
57. New methods for studying state existed and effect of pollutants in the actual environment
58. Toxicological mechanism of chemical pollutants and their health risk
59. Basic research on organic heat-electric materials
It is encouraged to carry out the study of designed synthesis and relation between basic physical properties and structure of new type heat-electric materials system with conjugated organic molecular materials.
60. Key chemical engineering issues on mineralizing utilization of CO₂
It is encouraged to carry out the research on fixing CO₂ by natural mineral resource, such as potash feldspar, as well as combined production of chemicals.

The 59th and 60th research directions listed above are the Key Program projects driven by disciplinary frontier. The applicant may form his/her research team to apply one of them according to international development trend and combining the basis and interest of self-studying work. When filling in the application form, the applicant should select corresponding code according to mainly studying content. The General Office of the Department will accept and handle the proposals.

Department of Life Sciences

Key Program is one important series of programs funded by NSFC, it mainly support applicants to carry out research on the important areas with well research background or accumulations, or on the new scientific growing point with in-depth, systematic and innovative study, while combining national requirement with the science development. From 2011, the Department of Life Sciences began to accept two types of applications for Key Program. One of them, as the major part occupied of the total applications, should be guided by designated areas (ADA for short) and another, which is a complementary part, could freely select their own research areas (ANA for short). In 2012, the Department of Life Sciences received 484 applications, among which, 374 applications were for ADA and 363 were accepted, with 64 projects being funded at a funding rate of 17.63%; 110 applications were for ANA and 94 were accepted, with 12 projects being funded at a funding rate of 12.77% (counting by applications

accepted).

In 2013, the Department of Life Sciences will still accept applications for ANA, so the applicants should read carefully the type of acceptance in each subject of this *Guide to Program*. Subjects which will accept the projects in two patterns (both ADA and ANA) include: microbiology, ecology, biophysics, biochemistry and molecular biology, neuroscience, cognitive science and psychology; cell biology, basic agriculture and crops, plant protection; horticulture and plant nutrition. Subjects will accept the projects only for ADA, but refuse application for ANA include: botany, forest science, immunology, biomechanics and tissue engineering; physiology and integrative biology; genetics and bioinformatics; developmental biology and reproductive biology; food sciences; zoology; animal husbandry and grassland science; veterinary and aquatic science. Applicants should carefully read the application requirements, notes, and the funding plan of the department in this chapter for Key Program in 2013, to apply for Key Program in line with the requirements of this guide. Moreover, since the research areas in charged in the Department of Life Sciences covers biology, basic medicine and agricultural science, the designated areas of key program in each subject is closely related with the funding scope of the subject. So attention should reminded, the applicants should correctly apply for key programs referring to the funding scope and rejecting category of each subject in the general program part of this *Guide to Program*. The refusing category in the explanation for general program of each subject will also appropriate for Key Program.

Applicants for ADA shall correctly fill in the corresponding application code lined out in each Division when writing application. Proposals for ANA may choose autonomously the application code pertaining to its research content.

The concrete requirements for application to Key Program projects of life sciences are as follows:

(1) Applications to Key Program projects in designated areas (ADA)

For designated areas, applicants should propose research topics and compose application texts in reference to the guidelines of designated areas issued by the Department in 2013. In the column of Annotations on the basic information table of the application form, applicants should fill in the applied research areas, and fill in the corresponding application code lined out in each Division's designated areas correctly. Please note that the designation of application codes for Key Program projects is just

done for the sake of efficient management, whereas the application codes appointed may not include all the research contents of the designated areas, so applicants should not be restricted by the application codes appointed in ascertaining their research themes according to the relevant contents of designated areas.

- (2) Requirements for Applications to Key Program projects for free application of non-designated areas (ANA).

Applicants who have achieved great progress, and urgently in need of key support, while their research contents is not included in ADA of the department of life sciences this year. Study should be in the area of new frontline or new orientations of the subject, and which is not covered in ADA of the year, and applicants have sound basis of research work in this field, and urgently need intensive support in order to further their research. Applicants for this category shall specify with “Application for Free Areas” in the column of “Annotations”. Moreover, a statement with about 800 Chinese characters on the important innovative progresses already achieved is required in addition to the routine application text for ANA. In the statement, applicants are required to elaborate and emphasize the rationale for ANA, the important innovative progress closely related to this application, relevant research basis and papers published in international important academic journals, etc. Papers representing the “significant progress achieved” in the application should be those published in recent years, and applicants must be the first author or corresponding author.

- (3) Applicants for Key Program (including both ADA and ANA) of the Department are required to attach the first pages of five representative papers relating to the applications.

In 2013, based on the overall arrangement for Key Program of NSFC, the Department will put 210 million yuan budget, and support about 71 Key Program projects (10 for ANA). The funding intensity is around 2 to 4 million yuan per project, and the average intensity is about 3 million yuan, the duration of Key Program project is 5 years. Applicants should put forward reasonable budget according to the actual needs of their research. Besides, in filling in the budget in the application, applicants need to add detailed justification for the budget in the proposal for the peer review and final approval of funding. Applications will not be approved for funding without such budget justifications or with obviously unreasonable budget.

The designated areas and application code of each Division in the Department of Life Sciences in 2013 are as follows:

1. Microbial Resources and their functional analysis
2. Metabolites of plant and their functions
3. Environmental adaptability of plants and the mechanisms of evolution
4. Habitat fragmentation and its impact to biodiversity and eco-system function
5. The biological basis of the Good traits formation of trees
6. Mechanisms of Forest degradation and the restoration
7. The biochemical mechanisms of Metabolism and Regulation (Apart from sugar, fat)
8. The cellular and molecular mechanisms of immune response and immune regulation of cancer
9. Study of the occurrence of immune system and new immune cell subsets
10. The interaction mechanism study of biomaterials and the organism
11. The regulator effect of biomaterials to tissue regeneration
12. The nerve-cellular, molecular mechanisms of Behavioral Decision
13. The influence and mechanisms of cell microenvironment change to the physiological function of organisms
14. Endocrine function and regulating mechanisms of non-classical endocrine organs and tissues
15. Mechanism of Genomic variation and formation of complex traits
16. The mechanism and function of Chromatin modification
17. The occurrence, structure and function of organelle
18. The development and regeneration mechanism study of tissues and organs of model organisms
19. Mechanisms study of gametes occur, mature and the development of early embryo
20. The physiological and genetic fundament of the formation of crop quality traits
21. The biological basis during fermentation and Brewing process of food
22. The nutrition and quality change rules of food during storage, transportation and processing
23. The resistance mechanisms of crops to important diseases and pests
24. Exploration and Utilization of Excellent genes of horticultural crops
25. Basic research of endangered mechanism and conservation of animals
26. Study of animals adaptability to special environment
27. The genetic mechanisms of production traits formation of Livestock
28. Molecular mechanisms of Efficient transformation of nutrients of livestock
29. Mechanisms study of important pathogen adaptation and Infecting host of livestock
30. The molecular mechanisms of immune regulation of important epidemic

- diseases of livestock
31. The Epidemiology and pathogenesis of important pathogen of aquatic animals
 32. The cellular and molecular mechanisms of nutrient metabolism of aquatic animals

Moreover, in view of the problems existing in the past, the Department particularly reminds applicants of avoiding any of the cases listed below in 2013. Otherwise, their proposals may be refused during the preliminary checking procedure:

- (1) Applications for ADA do not specify the title of designated research areas in the column of “Annotations” of the basic information table in the application text.
- (2) Applications for ADA do not fill in the corresponding application code claimed by this guide.
- (3) Applications for ANA do not specify “ANA” in the column of “annotations” of the basic information table in the application text.
- (4) Applications for ANA do not offer an around-800-Chinese-character description about the important innovative progresses already achieved claimed by this guide.
- (5) Applicants for Key Program projects (including both ADA and ANA) do not attach the requested first pages of five representative papers to the application documents.
- (6) Applicants applying for ANA to certain disciplines but the division do not accept such ANA applications.
- (7) Similarity or overlapping with projects already funded by the National Program on Key Basic Research Project (973 Program), National High-Tech R&D Program of China (863 Program) and NSFC Research Fund for Distinguished Young Scholars.
- (8) Applications indicate the designated areas in the “Annotation” column, but the actual research contents do not match the scope of funding.
- (9) Applications submitted by applicants who are still working abroad, or who cannot ensure necessary time and efforts for implementing the proposed research in China.

For other issues to be noted for the writing of applications, please refer to the guide to General Program projects of the Department of Life Sciences.

Department of Earth Sciences

The Department of Earth Sciences announces the guideline for Key Program according to the major issues in the priority funding areas in earth sciences for the 12th Five-Year Plan period. The criteria to identify priority areas are as follows: (i) to analyze the frontier trends of the development of the international earth science, to include related results of strategic research, and to take in account of the inherit of the former priority areas for the 11th Five-Year Plan; (ii) guided by the major scientific issues, to pay more emphasis on basic and frontier research; (iii) with consolidated basis, showing the scientific promising prospection, promoting interdisciplinary research, to foster or even drive the progress of the earth science and advance the research level and international role for the Earth science research in China; (iv) to pay attention to the major scientific issues related to the economic and social sustainable development of China, and to exert far-reaching impacts on the society and economy. According to the scientific issues listed in the following specified areas, applicants are free to determine their research topics, goals, technical approaches and budget on the basis of summarizing research work carried out both domestically and internationally as well as stating clearly the new breakthrough points and ways for research.

Previous experience related to the proposed work must be stated in detail in the proposals. In the part of CVs, working experience, education, former NSFC grants (and results) and publications of all the PIs and co-PIs must be listed in detail. In the publication list, papers published and in press must be listed separately. For the published papers, all of the authors, paper titles, issue numbers of the journals and pages must be presented. All the publications must be classified as books, journal papers, conference papers, etc. In addition, the first pages of 5 representative publications must be attached to the hard copy of the application.

The relevance and academic contribution to the specific priority area must be stated in the proposals. To avoid duplication in funding, applicants shall state clearly the relations and differences between the research and related projects funded by other national agencies.

As one branch of fundamental sciences, the research object of earth sciences is the complex planet of the Earth. The challenges emerging from the research in the past, present and future of the earth system and its

habitability have well beyond the capability of any single traditional discipline. Interdisciplinary research has become the fertilizer for innovative ideas and original innovation. It is expected that scientists from various disciplines of earth sciences and scientists from other research areas such as mathematics, physics, chemistry, biology, materials and engineering sciences, information sciences and management sciences jointly provide your proposals for Key Program in the Department of Earth Sciences. The application codes for interdisciplinary study should be filled in the application form.

In 2013, standardized “application code”, “research field” and “key words” will be put into trial use in the geographic field of Division 1. When filling out the application forms, “application code 1 (D01 and subordinate codes)” and relevant “research field” and “key words” must be chosen precisely according to the “list of application code, research field and key words for trial disciplines”. The list of the code, research field and key words are available on the official home page of the NSFC (<http://www.nsf.gov.cn/>).

In 2012, the Department of Earth Science received 514 proposals for Key Program, and 74 were funded with a total of 223.3 million yuan. In 2013, about 80 projects will be funded, and 3 million yuan will be allocated to each project on average, with a preferred range of 200 to 500 million yuan. The required research period of a Key Program project is 5 years.

Special notes for applicants:

Titles of 11 themes to accept proposals for Key Program projects in the Department of Earth Science are as follows: “Environmental evolution and life processes on the planet Earth”, “Origin, evolution of the continents and geodynamics”, “Theoretical studies on the forming process and exploration of mineral resources, fossil energy”, “Process and mechanism of weather, climate and atmospheric environment change”, “Global environmental change and multi-sphere interaction of the Earth”, “The effect of human activities on environment and its mechanism”, “Processes and mechanisms of the changes in terrestrial surface system”, “Evolution and regulation of the water and soil resources”, “Marine processes, resources and environmental effects”, “Solar-terrestrial space environment and space weather”, and “Earth observation and information processing”.

In regard to the problems emerged when applying Key Program projects, applicants must fill in “Annotations” in the proposal sheet with ONE of the

above 11 titles of the themes. Proposals with incorrect “Annotations” or without “Annotations” will not be accepted.

1. Environmental evolution and biological processes on the planet Earth

The scientific objectives of this field include: Reevaluating the processes of major geological events and their environmental implications under the consistent high-resolution temporal framework based on the complete stratigraphic sequences and diverse fossil resources from China and multidisciplinary studies from geochemical, sedimentological, mineralogical, tectonic, paleontological and geobiological aspects, maintaining the advantage levels in our established directions, and striving to obtain achievements with originality in solving major scientific issues in geosciences.

Key scientific issues:

- (1) Systematic paleontology of major fossil groups
- (2) Macroevolution of life and high-resolution integrative stratigraphy
- (3) Environmental backgrounds for global changes during critical transitions
- (4) Life in extreme environments, geomicrobiology
- (5) Biomarkers and their environmental implications
- (6) Biogeochemical processes and evolution of surface environment

Research orientations in 2013:

- (1) Biodiversity and evolution of ecosystems during critical transitions
- (2) Reconstruction of life evolution and environment under the high-resolution temporal framework
- (3) Origin and systematic evolution of important fossil groups and their environmental implications
- (4) Geomicrobiology, biogeological processes and their environmental implications
- (5) Biogeochemical processes in the Earth’s history
- (6) Life in extreme geological environments and its adaptive mechanisms

About 6 to 8 projects will be funded.

2. Origin, evolution of the continents and geodynamics

Scientific objectives: Research on the origin, evolution and geodynamics is an important approach to better understand the processes inside the Earth, and also a theoretical support for the natural hazard mitigation and natural resource capability. How the deep Earth components work and how the

surface be affected by geodynamic processes are challenging themes faced by earth science in the 21st century. The basis for scientific innovation includes: accurately describing the spatial and temporal trajectory of the movement of the continental materials, calculating and correlating their links, establishing a basic framework to characterize the structure and evolution of the continents in the global scale, in the temporal and spatial dimension, and from the surface to deep mantle, understanding the history of the Earth, and predicting the effects on the natural resource, hazard and environment.

Key scientific issues:

- (1) Crust-mantle structure, composition and interaction
- (2) Origin and evolution of the continents and intra-continent processes
- (3) Continental collision and geodynamics of the orogenic belts
- (4) Interaction between the oceanic plate and continental margins
- (5) The coupling of the deep Earth and surficial process

Research orientations in 2013:

- (1) 3-D structure of the crust-mantle and mantle dynamic process
- (2) 3-D structure of mantle velocity discontinuity, lithosphere-asthenosphere interaction and inter-layer material exchange
- (3) Forming, growth and rebuilding of the continents
- (4) Dispersion of the continent and the role of mantle plume
- (5) Convergence of plates and the dynamic of the orogenic process
- (6) Basin and range system evolution and basin dynamics
- (7) Oceanic plates and continental margin process
- (8) Relation between the deep Earth and surface process
- (9) Mechanism of the large scale magmatic activities
- (10) Deep Earth fluid and water-rock interaction
- (11) Volcano and geothermal activities and related deep processes
- (12) Cenozoic structural deformation, seismogenic process and geohazard mechanisms
- (13) Correlation and interaction between the Earth and near earth objects
- (14) Rheological property of the rocks and experiment and simulation of geological processes
- (15) Observation and monitoring of the present crustal movements, lithospheric detection, data assimilation and modeling

About 6 to 8 projects will be funded.

3. Forming mechanism and exploration theory of mineral resources and fossil energy

The scientific objectives of this field are to make breakthroughs in the metallogenic theories through examining the structure of shallow crust and ore fields, tracing the regional ore-forming fluids, and studying the special metallogenic system and continental geodynamics; to investigate the relational theory between the dynamics of large superimposition basin and the accumulation of oil and gas, and the dynamics of unconventional formation of natural gas reservoir, to improve the geologically theoretical system for oil and gas generation in complex geological setting in China; to establish and integrate exploration technique and theory of hidden ore and deep-seated oil-gas reservoir; and to disclose the regional evolution characteristics and controlling factors of the flow system of groundwater, forming and evolution mechanism of groundwater dynamic field and chemical field.

Key scientific issues:

- (1) Continental geology and metallogenesis
- (2) Genetic model of ore deposit, metallogenic system and mechanism
- (3) Basin dynamics and hydrocarbon accumulation
- (4) Regional hydrological processes of groundwater and evolution of environmental geology
- (5) Information detection and extraction of deep-seated large-scale mineral deposits (reservoirs)

Research orientations in 2013:

- (1) Enrichment mechanism of giant ore-forming materials in sedimentary basins or magmatic systems
- (2) Metallogenesis and metallogenic regularities of specific metallogenic units
- (3) Metallogenic specialization on different continental dynamic environments
- (4) Tracing regional fluid system and metallogenic systematic evolution within a large ore concentrated area
- (5) Characteristics, structural model and prospecting marks for different types of metallogenic systems
- (6) Regional dynamical system for large-scale basin evolution and oil-gas accumulation regularity
- (7) Earth systematic evolution and basin sedimentary environments of hydrocarbon generation and reservoir stratum

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- (8) Formation and evolution mechanism of concealed and deep-seated ore deposits and unconventional hydrocarbon reservoirs and their geophysical responses
 - (9) Principles and methods for information detection and extraction of deep-seated large-scale mineral deposits (reservoirs)
 - (10) Regional groundwater flow system and groundwater spatial distribution and exploration theory
 - (11) Hydrologic processes and evolution of groundwater in different geographical units

About 6 to 8 projects will be funded.

4. Process and mechanism of weather, climate and environment change

The scientific objectives are to investigate various physical, chemical and biological processes of disastrous weather and climate dominated by climate system, to understand their spatial and temporal characteristics, variability rules, mutual relations and physical mechanisms, to obtain early symptoms of significant weather and climate events, to improve the accuracy of weather forecast, and to develop new versions of climate model, forecasting methods and climate prediction theory. During the 12th Five-Year Plan period, innovative studies shall focus on the process of climate system, theory of modeling and prediction, theory of dynamics and predictability of disastrous weather, atmospheric chemistry, boundary layer physics and atmospheric environment, middle and upper atmospheric dynamics, cloud and mist physics, and so on. Significant and advanced progress in the mechanism of weather and climate system change is expected.

Key scientific issues:

- (1) New theories and methods for critical atmospheric variables detection, observations system optimization and data integration
- (2) Dynamical mechanism and predictability of the weather and climate change
- (3) Processes of atmospheric physics and atmospheric chemistry, as well as the mechanism of their mutual influences
- (4) Interactions among weather variations, climate change and atmospheric environment in Asia
- (5) Exchange and cycling between substance and energy in climate system

Research orientations in 2013:

- (1) New method and technology of the key variable observation of

- important atmospheric phenomena
- (2) Data integration among the atmospheric and other observations of the earth system
 - (3) Numerical coupled model Development
 - (4) Evolution and dynamical mechanism of weather and climate systems
 - (5) Process and mechanism of regional air pollution
 - (6) Research on the dynamical-physical-chemical-radiative processes and their interactions within the middle and upper atmospheric levels
 - (7) Interactions among ocean, land and atmosphere in Asian Monsoon area and their impacts on climate system
 - (8) Impacts of the climate change on the ecology, hydrology and cryosphere, etc.

About 6 to 8 projects will be funded.

5. Global change and interactions among different spheres of the Earth system

The scientific objectives are to improve the understanding of global change regulations and future change trends, explain the cause of formation of global change and its current situation and future prediction, as well as to provide scientific and technical support for addressing the enormous environment problems and challenges which human society is facing, by focusing on key scientific issues in the Asian monsoon and arid regions.

Key scientific issues:

- (1) Environmental system in the Asian monsoon and arid regions and global change
- (2) Regional water cycle (including the cryosphere) and climate change
- (3) Dynamical variations of the sea level and sea-land transitional belt, as well as their future trend regulations
- (4) Key processes of the biosphere, mutual feedback with other spheres, as well as elemental biogeochemistry cycle and earth system
- (5) Causes of the global change induced by natural and anthropogenic activities
- (6) Key scientific issues in earth system simulations

Research orientations in 2013:

- (1) Causes of formation of decadal-to-centennial-scale Asian monsoon system
- (2) Characteristic and mechanism of the typical climate events in warm

periods in Asia

- (3) Regulations of regional water cycle in China and the linkage to climate change
- (4) Relationship between cryosphere and water cycle in West China
- (5) Mechanism of the marine environment change and its interactions with the climate system
- (6) Trend of the dynamical variations of sea-land transition belt
- (7) Key processes of the biosphere on the background of global change
- (8) Characteristics of the biogeochemical cycle, and the interactions with the climate system
- (9) Causes of the global change induced by natural and anthropogenic activities
- (10) Development in the earth system model and relevant simulations
- (11) Prediction of the global climate change and the uncertainties analysis

About 6 to 8 projects will be funded.

6. Mechanisms of human activities' effect on environment

The scientific objectives are, by encouraging multi-disciplinary combination and crossing, to study the mechanisms of human activities effect on environment that related to industrial and agricultural production, infrastructure construction, resources and energy exploitation, urbanization process etc., to understand the role of human activities in global and regional environmental evolution and the potential catastrophic consequence in earth system caused by human activities, and to provide scientific basis for reducing global disaster, protecting earth environment and promoting sustainable development of society with the guidance of the scientific development concept of human-nature harmonization.

Key scientific issues:

- (1) Earth engineering and global changes; environmental effects of resource utilization
- (2) Mechanisms of environmental impact due to major geological disasters and large-scale engineering activities
- (3) Regional environmental process and control; interactions between natural processes and human activities
- (4) Regional sustainable development

Research orientations in 2013:

- (1) Revitalization of cultivated land, change of land use and their

- environmental effects
- (2) Urban and regional development and the environmental changes
 - (3) Process of groundwater pollution and its environmental remediation
 - (4) Environmental process of pollutants and impact mechanisms of ecological health
 - (5) Geological environmental and hazardous effect in major infrastructural projects and major geological disaster prevention and control
 - (6) Mechanisms of geological hazards caused by the exploitation of resources and prevention and control
 - (7) Vulnerability and recoverability research of the system with earth surface, human activities and environment

About 6 to 8 projects will be funded.

7. Processes and mechanisms of changes in terrestrial surface system

The scientific objectives of this field are to reveal the interaction mechanisms, interfacial processes and their tempo-spatial evolution principles of key components, such as water, soil, air and organisms, in the terrestrial surface system, to enhance the understanding of relations between structure and function of terrestrial surface system, to elucidate the interaction processes and coupling mechanisms between human and nature, and finally to provide the scientific basis for regional sustainable development.

Key scientific issues:

- (1) The interaction and interfacial processes of key natural components on the terrestrial surface
- (2) Migration and transformation processes of terrestrial surface materials
- (3) The coupling processes of natural and human components
- (4) Theory and methodology of integrated researches about the terrestrial surface system

Research orientations in 2013:

- (1) Interactions between climate and landform
- (2) Processes and effects of cryosphere
- (3) Geomorphologic processes and regional geomorphologic evolution
- (4) Interactions between soil and vegetation and their spatial heterogeneity
- (5) Interfacial biogeochemical processes of key elements (C/N etc.)
- (6) Migration and transformation of materials in typical ecosystem
- (7) Migration of trace elements and its effects in the terrestrial surface

system

- (8) Driving mechanisms of land use and cover change
- (9) Mechanisms of ecosystem degradation and restoration
- (10) Ecosystem processes, services and ecocompensation
- (11) Interaction mechanisms between patterns and processes of terrestrial surface system
- (12) Scaling and scale effect in key geographic processes
- (13) Partition and coding of surface spatial unit
- (14) Synthetical integration and simulation of terrestrial surface system processes
- (15) Coupling of surface processes in typical geographical unit

About 6 to 8 projects will be funded.

8. Evolution and regulation of water and soil resources

The scientific objectives of this field are to elucidate the evolution processes of water and soil and their coupling, to reveal the principles of formation and evolution of water and soil resources, and to propose the sustainable using approaches and conservation patterns of water and soil resources.

Key scientific issues:

- (1) Soil processes and evolution
- (2) Soil quality and resource effect
- (3) Watershed hydrological processes and their ecological effects
- (4) Formation mechanisms of regional water cycle and resource
- (5) Coupling of regional water and soil resources and their sustainable utilization

Research orientations in 2013:

- (1) Tempo-spatial variation of soil properties and informatization of soil resource
- (2) Interaction mechanisms and effects of soil processes
- (3) Soil biodiversity and its function
- (4) Nutrient elements cycle and fertility evolution of soil
- (5) Mechanisms of soil degradation and soil remediation
- (6) Soil function and the sustainable utilization
- (7) Soil quality and safety and regulation of agricultural products
- (8) Regional soil erosion and conservation of water and soil
- (9) Eco-hydrological processes
- (10) Watershed hydrological processes and their simulation

- (11) Model simulation and its uncertainty of regional hydrological processes
- (12) Interactions between ground water and surface water
- (13) Water phase transformation and water resource effects
- (14) Interaction between natural and social water cycles
- (15) Environmental effects and regulations of water and soil under the intensive land use
- (16) Carrying capacity and safety of regional water and soil resources
- (17) Valuation and ecological compensation of water and soil resources
- (18) Formation and transformation of regional water resource

About 6 to 8 projects will be funded.

9. Ocean processes, resources and environmental impact

Scientific objectives: The applications should focus on the scientific problems closely related to the key national demands and international research frontiers. The marginal sea along the Asia continent as well as the adjacent open ocean should be the key regions to be studied. By studying the oceanic physical, chemical, geological and biological processes as well as the interactions among them on different timescales and spatial scales, the projects should enhance our understanding on the oceanic processes and mechanisms, promoting the fundamental research on oceanology in China and extending ocean researches in China from marginal seas to deep oceans.

Key scientific issues:

- (1) Multi-scale processes in the western Pacific Ocean and the interactions between the low and high latitudes
- (2) Ocean-Continent interaction in the maritime China
- (3) Oceanic microbiologic and biogeochemical cycle
- (4) Oceanic ecosystem and eco-security
- (5) Theory on mineral deposits of resources on the ocean bottom
- (6) Environmental change and related oceanic process in the polar regions

Research orientations in 2013:

- (1) Dynamical mechanisms of the meso-small scale ocean processes
- (2) Multi-scale air-sea interactions and their impact on the regional climate
- (3) High resolution recording the environmental evolution in the marginal seas and the comparison of ocean-continent records
- (4) Magma activity and tectonic evolution in the marine ocean basin
- (5) Formation of oil-gas system in the deep ocean and the subsidence processes
- (6) Microbiology and biogeochemical cycle of carbon, nitrogen, sulphur and

- phosphorus on the ocean bottom and surface interface
- (7) Ocean physical-biogeochemical interaction
 - (8) Shelf circulation and mass transport
 - (9) Ocean dynamics and gene drift
 - (10) Ocean acidification and its influence on the ocean ecosystem
 - (11) Process and mechanism of coastal ocean environmental evolution and ecosystem disaster
 - (12) Dynamics and ecosystem evolution in high latitudinal oceans

About 6 to 8 projects will be funded.

10. Sun-Earth space environment and space weather

The scientific objectives are to form a theoretical frame of the global cause-effect chain of space weather processes so to achieve new original knowledge based on the study of space weather processes among the different layers of the solar-terrestrial system; to establish the cause-effect chain model of the space events and develop the integrated method for prediction based on physics to serve the safety of astronautic activities; to conduct the interdisciplinary research with mathematics, physics, information, material and life sciences on the exploration of the mechanism of space weather effects on human activities for providing scientific basis in the policy making of administrations; to develop new concept and method in space explorations and new schemes of space weather satellite series for a new era of space weather study; to encourage fundamental research on space weather combined with national key projects; to encourage analysis, theoretical and simulation study based on the newest space borne or ground-based data from both home and abroad; to encourage studies on the space weather by using of the data from 120° E Meridian Project observations and to encourage studies on hazardous space weather events during the 24th solar cycle.

Key scientific issues:

- (1) Basic space weather physical processes
- (2) The coupling among solar-terrestrial space
- (3) Space weather modeling
- (4) Effects of space weather on human activities

Research orientations in 2013:

- (1) Solar driving source of space weather, related physical mechanisms and activities during the solar cycle 24

- (2) Fundamental physical process in space weather and Sun-Earth connection
- (3) Multi-scaled spatial and temporal structures in solar wind, magnetosphere, ionosphere and upper atmosphere; their evolution and couplings
- (4) Prediction model and method in space weather, early warning of hazardous space weather
- (5) Investigations of effects of space weather on astronautics, telecommunication, navigation, materials and human health
- (6) New concept, principle, method and technique in space weather exploration, project pre-research in space exploration
- (7) Theory of Earth probes with geodetic techniques, process and mechanism of mass transport in the Earth system
- (8) New theory and techniques for integrated geodetic observation by land, sea, air and space-based Earth observation systems
- (9) Theory of multi-source geodetic data fusion and its applications
- (10) New theory and methodology for time-variable geodesy and theory of geodetic inversion

About 4 to 6 projects will be funded.

11. Earth observation and its information processing

The scientific objectives of this field are to orient toward the scientific research and synthetic monitoring of the Earth system based on the researches about the scientific issues in fields of the Earth observation, GIS and GPS, develop the basic theory and methodology of the data acquisition, processing and analysis originated from the Earth system elements observation, construct parameter set of geometric and physical boundary conditions in the Earth system analysis and simulation, and provide scientific and technical supports for promoting the ability of cognition and early-warning about the Earth system and resolving the key issues in resource, environment, ecology and hazard faced in the sustainable development.

Key scientific issues:

- (1) Surface effects and transmission mechanisms of electromagnetic wave
- (2) Distributed and reconfigurable Earth observation and synthetic Earth observation system
- (3) Confirmation and maintenance of high precision time benchmark and space datum

- (4) Geo-spatial cognition, tempo-spatial information model and theory of digital earth construction
- (5) multi-source Earth observation data fusion and synergistic inversion and assimilation of the Earth system parameters
- (6) multi-dimensional tempo-spatial processes analysis and synthetic simulation and prediction and warning of the Earth surface system

Research orientations in 2013:

- (1) Interaction mechanisms between electromagnetic waves and complex land surface and theory of remote sensing modeling
- (2) Determination methodology of spatial ultra-precision time benchmark and space datum
- (3) Time-varying geodetic survey inversion (including gravity, magnetism and deformation monitoring of satellite positioning)
- (4) Theory of satellite geodetic survey and satellite remote sensing, and the Earth quality migration and its mechanisms
- (5) High precision remote sensing inversion of atmospheric composition and footprint analysis of greenhouse gases
- (6) Remote sensing analysis of systematic simulation of global water cycle
- (7) High precision inversion model and parallel computing of global earth surface parameters
- (8) Validation and reliability of remote sensing inversion products of complex earth surface
- (9) Analysis and simulation of integrated human and natural processes
- (10) Tempo-spatial framework and its construction theory and method for the digital Earth

About 4 to 6 projects will be funded.

Department of Engineering and Materials Sciences

In 2012, the Department received 369 proposals for Key Program projects, and among them, 82 proposals were supported in 81 fields including 8 Key Program projects of 3 priority fields. The total funding is 239.4 million yuan and the average funding is 2.92 million yuan per project.

Up to 82-85 Key Program projects will be supported in 2013 in 83 fields including 3 priority fields with an average funding of 3 million yuan per project for 5 years.

Three categories of Key Program projects are to be funded by the Department of Engineering and Materials Sciences, namely, Key Program projects in the priority areas of the Department and Key Program projects of the respective Divisions. About 3-4 projects will be funded each area.

Key Program projects in the priority areas of the Department:

1. Design and manufacturing fundamentals for new energy equipment
2. The Basic thermo-physical issues in the utilization of renewable energy
3. The fundamental research on Transmission and distribution equipment for Smart Grid

Key Program projects of the respective Divisions:

- (1) Deformation and failure mechanism of high strength metals
- (2) Preparation and properties of high performance metallic crystals
- (3) Composition design, structure, strengthening and toughening of high performance stainless steels
- (4) Performance enhancement mechanism and stability of permanent magnetic materials
- (5) Structure and physical properties of liquid metals under electromagnetic field conditions
- (6) Design, preparation and properties of high entropy alloys
- (7) Microstructure control and mechanical properties of metal joining by severe plastic deformation
- (8) Evolution of properties and micro-structure of metals under extreme loading and deformation conditions
- (9) Self-healing protection layer of metals and its interaction with environments
- (10) Topological structure and electromagnetic properties of metals
- (11) Structure and property manipulation of high performance lead-free piezoelectric materials (with 3-4 projects supported)
- (12) Design, fabrication, property manipulation of multiferroic materials and principle explore for related prototype device (with 3-4 projects supported)
- (13) Collaborative design and preparation of high temperature absorbing structural ceramic-based composites
- (14) Microscopic structure design and preparation of nanostructural superhard bulk material
- (15) Growth and physical properties of high-quality wide bandgap ($> 3.5\text{eV}$) single-crystalline semiconductors
- (16) Semiconducting p-n junction based magnetoresistance materials and

- giant magnetoresistance effect
- (17) Controllable synthesis of multifunctional rare-earth nano-composite and fundamental research on their biomedical applications
 - (18) Basic research on the preparation of polymer materials: through molecular design to improve the material properties
 - (19) Basic research on the relationship between structure and properties ,and the structure regulation of polymer materials
 - (20) New theories and new methods for polymer material processing (including micro-nano processing)
 - (21) Basic issues on the implementation of high performance and function for general polymer materials
 - (22) Basic issues on biomedical polymer materials
 - (23) Fundamental research on opto-electronic organic polymer materials and devices with high efficiency and stability
 - (24) Basic research on polymer materials related to energy, environment and resource utilization
 - (25) Structure regulation of polymer composites for the realization of intelligent
 - (26) Basic research on functional polymer thin films
 - (27) Construction of polymer materials in micro-nano scale and the application in biomedical fields
 - (28) Key theory and method of enhanced oil recovery for tight oil/gas reservoirs
 - (29) Basic research on managed pressure drilling technology
 - (30) Research on key technology of deep submarine metal mineral resources mining
 - (31) Couple process of seepage-stress-chemical-temperature of damage rock mass
 - (32) Separation and transportation of coal mine gas
 - (33) Physics chemistry method of efficient utilization for refractory metal mineral resource
 - (34) Basic theory of the application for steelmaking of CO₂
 - (35) Basic theory of metallurgy technology for producing high purity polycrystalline silicon (solar grade silicon)
 - (36) Key technology of superplastic forming of metal material
 - (37) Theory of mechanical metallurgy
 - (38) Modern innovative design and performance integration of mechanisms
 - (39) New principles of efficient precision driving and transmission
 - (40) Theory of operation stability and assurance for complex electromechanical systems
 - (41) Failure mechanism and reliability design of typical parts/components

- (42) Mechanical surface/interface behaviors and the control mechanism
- (43) Integration design theory and methods for complex electromechanical systems
- (44) New principles and methods for biomanufacturing and bionic manufacturing
- (45) Novel principles, methods, processes and equipment for integrated, high performance precision manufacturing
- (46) Novel theory and methods for high energy density beam and nontraditional energy field manufacturing
- (47) Theory/methods/technologies of precision machining for high quality parts
- (48) New processes, equipment, and modes for digital and intelligent manufacturing systems
- (49) Measurement, sensors, and testing of manufacturing processes and products
- (50) Fundamental thermo-physical research on thermodynamic system and energy conservation
- (51) Turbulent flow mechanism and flow control in fluid machinery
- (52) Advance research on mass and heat transfer in power systems
- (53) Research on flow and combustion in power plant
- (54) Advanced methods and techniques of measurement for complex thermo-physical properties
- (55) Key thermo-physical issues in mechanical engineering, materials sciences, life sciences, etc.
- (56) Fundamental research on high efficient conversion and large scale storage of electric power
- (57) Key issues on the Smart Grid
- (58) Fundamental research on electromagnetic-biological effects
- (59) Fundamental research on the advanced power transmission equipment and related electric materials
- (60) Key issues on the efficiency and reliability of power electronic devices and its system
- (61) Key issues on the pulse power and discharge plasma (generation and application)
- (62) The design theory and method of low energy public architecture in cold region
- (63) The principle and method of urban planning & design in view of urban climate and environment
- (64) The principle and method of climate responsive landscape planning & design
- (65) Principles of innovative efficient coagulants and enhanced techniques

- for micro-pollutant removal from water
- (66) Technical principles of new advanced municipal wastewater treatment processes for reclamation
 - (67) Analytical and design methods for reinforced concrete structures under complex loads
 - (68) Key scientific problems related to safety assessment and maintenance of historically heritage buildings
 - (69) Geotechnical problems of costal and cross sea transportation infrastructure
 - (70) Scientific solutions for transportation problems during urban development (3): Emerging mode and critical functional improvement technologies for modern urban transit systems
 - (71) Scientific solutions for transportation problems during urban development (4): Fundamental theory of demand and supply balancing and system coupling in modern urban transportation systems
 - (72) Drought-flood succession and its flooding characteristics
 - (73) Highly-efficient and Secure Irrigation Using Reclaimed Water
 - (74) Succession Mechanisms of Lake or Reservoir Habitats and Regulation Methods
 - (75) Non-equilibrium sediment transport process in rivers and reconstruction of riverbeds
 - (76) Damage characteristics of major hydraulic structures subjected to blast
 - (77) Evolution and control of Performance of high dams
 - (78) Hydrodynamics in Oceanic Energy Utilization
 - (79) Dynamics of new-form (new type) structures in naval architecture and ocean engineering
 - (80) Fluid dynamics arising in the transportation of deep-sea resource

Department of Information Sciences

In 2012, the Department of Information Sciences announced 62 areas and 4 priority funding areas for the application of Key Programs, and received 254 applications, of which, 71 projects were funded with a total of 210million yuan, and average funding intensity of 2.9577 million yuan per project.

In 2013, the Department announces 68 areas for application, of which 4 areas are the departmental key funding areas. 68-70 Key Program projects will be funded with average funding of about 3 million yuan per project for 5 years. Applicant should follow the guidelines for research directions in relevant areas, in accordance to the trend of development in the research

area and basis of their research team and the actual research object or process, propose key scientific problems and conduct systematic and in-depth theoretical studies or experimental verifications. Apart from high level papers, research results should be verified in experimental system or in practical applications.

Please provide proper application code in the application form. Please see NSFC's website: <http://www.nsf.gov.cn/> for details.

The deadline for proposing areas of Key Program for 2014 is April 30, 2013; please see the department website <http://www.nsf.gov.cn/cen/oo/kxb/xx/index.htm> for more details.

Key priority funding areas of the Department

1. Theory and key technology of high resolution SAR image target cognition

Development of land observation system of high resolution microwave imaging proposed major demand on cognition and interpretation of microwave image target. Due to special characteristics of microwave imaging and high complexity of target and scenario, SAR image target cognition and models of research are hard to meet the present and future demand. This project group plans to study the model, method and interpretation of SAR image target cognition in a systematic way, and gradually develop research platform and basic environment, so as to promote development of national infrastructure and application of important scenario. Main research directions include:

- (1) Test base of high resolution SAR and evaluation of data quality
- (2) Model and efficient algorithm of high resolution SAR image target
- (3) Impact factors of high resolution SAR image and integrated processing platform
- (4) Typical applications of high resolution SAR image target cognition and interpretation

2. Theory and key technology of crowd intelligence cognition network

Along with fast development of embedded system and network technology, portable intelligent devices (such as mobile phones and panel PCs) are widely used in daily work and life. Providing cognition and computation focusing on people (crowd computing) has become a new type of application and trend of development for the internet, which has posed challenges on various aspects such as data acquisition and processing,

network system architecture, self-coordination, and data mining, etc. This key project group plans to start from basic theory, method and technology, study network system structure, data organization and mining of crowd computing, explore information collection and processing technology for new types of cognitive network, make breakthrough in key technology for large scale self-organized network construction. Main research directions are:

- (1) Hetero same source data management and social merging in crowd cognition
- (2) Opportunity routing and interactive content transfer for collection of cognitive data in mobile social networking
- (3) Induction and special correlation of geographical information of social events based on unintentional coordination of crowd
- (4) Cognitive computation of intercrossing sensing information based on selective attention

3. New theory and new method for modeling and verification of engineering systems

Along with fast development of manufacturing, aerospace and national defense industries, complexity and uncertainty of engineering systems increased rapidly, and it becomes more difficult to make high precision control, diagnosis and optimizing integrated operation indicators. To meet above challenges, we must first break the limit of traditional modeling of engineering system, study and develop new theory and method for modeling and verification of engineering systems. This key project group focuses on major needs in industrial, national defense and transportation areas, study modeling and verification problems in engineering system control, troubleshooting and monitoring, and integrated optimizing of operation indicators. Main research directions are:

- (1) Theory and method of modeling of object feature and target control
- (2) Theory and method of modeling of troubleshooting and online monitoring in close loop operation of engineering system
- (3) Theory and method of modeling integrated optimization of operation indicators such as quality, safety, environmental, energy saving, consumption reduction and efficiency for engineering systems
- (4) Theory and method of modeling decision making for optimization of complex and dynamic engineering systems taking human behavior into account

While studying new theory and new method mentioned above, studies on relevant verifications, means of realization and key technologies are also

needed.

4. Basis and technology of combination of nano biomedical and photo electronics

Combining photo electronics and nano technology makes possible the generation, detection, running and control of optical signals in nano structures. The application of these technologies in medical areas will promote the development of basic research in relevant areas. This key project group focuses on diagnosis and therapy by application of nano photo electronic technology in medicine, acquisition and detection of information of nano biomedicine, exploration of biomedical detection method based on nano photo electronics, fiber and semiconductor photo electronic devices and system integration based on spectrum analysis and signal processing. Main research directions are:

- (1) Nano photo electronic technology in cancer diagnosis and therapy
- (2) Optical imaging technology in nano biomedicine
- (3) Method of non-imaging detection for biomedicine based on nano photo electronic technology
- (4) Nano photo electronic devices used in biomedical sensing
- (5) Optical characterization of mechanism of micro nano particle and tissue cell interaction

Key areas funded by Divisions are as follows:

1. Theory and technology of antenna for confined space supporting efficient radio wave coverage
2. Basic theory and key technology for integrated circuits of silicon based tetra hertz communication
3. Regulating filter and antenna based on new types of electro magnetic materials
4. Basic theory and key technology for time reversed electromagnetic wave
5. Basic research on imaging of tissue component and key molecules in vulnerable spot in blood vessels
6. Basic theory and key technology for X-ray based deep space radio communication
7. Basic theory and key technology for trans level design of internet of trains
8. Basic theory and key technology for high speed coherent optical communication
9. Mechanism and technology for detection of underwater oil spills
10. Exascale total optical exchange network for cloud service data center
11. Theory and method for processing signal of electromagnetic vector

sensor array

12. Basic theory and key technology for application based on fraction order of Fourier transformation
13. 3-D fine reconstruction and large scale high fidelity reproduction of urban plantation based on multi data sources
14. Basic theory and key technology for high frequency external radio source radar
15. Basic theory and key technology for trans lingual society data analysis
16. Basic theory and key technology for multi user information display
17. Encryption theory and technology in quantum computation environment
18. Key computational problems in high flux sequential mass data analysis
19. Theory and method of software reliability and security in cloud computing environment
20. Key technology for the management and analysis of memory data base in crowd environment
21. Basic theory and key technology for multi/many core processors designed for applications
22. New types of interactive computing theory, method and key technology based on body sense
23. High precision physical modeling and image computing technology based on algebraic surface
24. Theory and method of machine learning in large data environment
25. Syntax coordination in trans platform hetero media
26. Theory and technology of distributed evolution computation
27. Theory and method of social computation
28. Method of collecting evidence of multimedia contents
29. Method and technology of low energy consumption software
30. Structure and key technology for solid memory system based on new types of memory devices
31. Cognition and computation for human health application
32. Method and application of modeling, optimal operation and control of urban sewage system
33. Method and application of production process control in double network environment of equipment and monitoring
34. Optimal control of energy saving and low consumption paper making process
35. Modeling and control of material distribution on blast furnace with optimized indicator
36. Method and application of optimal coordination of production dispatch and process control
37. Method and application of coordinated control in spacecraft grouping

- and formation
38. Self-coordinated control and verification of unmanned aircraft formation
 39. Theory and method of coordinated guidance and control of multi aircrafts for interception of supersonic targets
 40. Theory and method of high order energy optimization in graph understanding
 41. Method and application of multilevel linguistic analysis for Chinese language
 42. Studies on new method of sparse analysis and key problems of its application in high dimensional dynamic data processing
 43. Theory and method of online machine learning in open and dynamic environment
 44. Basic problem and key technology of robot for minimal invasive spinal surgery
 45. Basic theory and key technology for efficient high maneuverable motion of underwater bionic crafts
 46. Method of integrated analysis of brain images and its application in diagnosis of brain diseases
 47. Studies on rare bismuth semiconductor material and non-cryogenic laser
 48. Studies on key technology for 3-D integration of super high density memory
 49. Applied basic research on self-power supply and low power consumption micro nano transducers
 50. Studies on efficient GaN base green light LED
 51. Studies on key technology for long life time GaN base semiconductor laser
 52. Basic research on tetra hertz HEMT devices
 53. Studies on basic problems of GaN base power devices
 54. Semiconductor based anisotropic self-spinning electronic materials and devices
 55. Multi band short pulse photon integrated chip light source
 56. Basic research on silicon based integration of optical frequency comb and its application
 57. Studies on key technology for optical modem based on graphite ethylene
 58. Studies on double mode semiconductor laser used to generate tetra hertz wave
 59. Studies on key technology for new types of multidimensional optical information transmission
 60. Inferred gas transducer integrated by nano structure
 61. Studies on basic problem of generation and amplification of single frequency optical fiber laser

62. Studies on reliability and failure of high power semiconductor laser under extreme conditions
63. Highly efficient fluorescent narrow band quantum point doping glass and optical fiber devices
64. Optical characterization of cell and molecular mechanism of meridian point effects

Department of Management Sciences

In 2012 the Department of Management Sciences accepted a total of 120 Key Program applications, in which 24 were funded with success rate of 20.00%, including 3 areas respectively counting twice. The total funding is 58.93 million yuan and the average 2.455 million yuan per project. Besides, 19 Key Program Cluster applications were received and 6 of them were finally funded with a total budget of 14.97 million yuan and the success rate of 31.57% and the average funding of 2.495 million yuan per project.

In accordance with the development planning and priority area of the 12th Five-Year Plan period, the Department of Management Sciences will release its research areas for the Key Programs year by year and duly issue research areas for the Key Programs cluster and the number of the Key Program projects to be funded. The number of Key Program Projects and the average funding intensity will be increased to some extent compared with the 11th Five-Year Plan period. Key Program should focus on the economic and social development and opening up policy of the country, as well as frontier scientific issues which may achieve innovative results with international impact and promote disciplinary development and some key theoretical and applied issues which are urgently needed and possible resolved in the improvement of the comprehensive competitiveness of the country. The research should be oriented toward scientific issues exploring management theories and laws with Chinese characteristics, and systematically carried out in the fields with sound research background and good potential to achieve theoretical and innovative breakthroughs.

The priority funding areas listed below outline the main contents, scopes and basic requirement of research work. It is not required that all areas or contents stated below should be covered in a specific proposal. On the contrary, applicants are encouraged to edge their academic thoughts, set concrete goals, conduct a thorough investigation into one or more key scientific issues, and bring about possible theoretical breakthroughs on the

basis of their own academic advantages. Due attention should be paid to the linkage of theory with practice, and applicants are encouraged to detect key scientific issues on the basis of the status quo of China and try to present new management approaches and methods after in-depth investigation. Scientific methodology is emphasized and real data and cases are defined as the basic information foundation for research, and subjective assumption must be avoided.

Applicants for Key Program may refer to requirements for the application of the General Program which could be applied for both Key Program and General Program.

Key Priority Areas of the Department of Management Sciences

In 2013, the Department proposes 24 priority areas for Key Program, and is planning to fund about 24 projects with an average funding intensity of 3 million yuan per project. The duration for each Key Program project will be 5 years.

1.Theory and methodology of calculation experiment for social management

Studies on the social management system structure and operation mechanism of the management innovation, organizational behavior and evolution modeling theory methods in the social management, virtual social complex behavior influence modeling methods, exploratory analysis and calculation the experimental method of the virtual social interaction; social management effect evaluation and typical case study based on the scenario of experiment.

2. Behavioral decision theory and method

Studies on the individual/group decision making behavior characteristics and laws conforming to China's situation, uncertainty or risk decision theory and method based on the limited rational behavior, the behavior group decision theory and method, behavioral decision theory and method in dynamic environment, the real behavioral decision methods and application including emergency decision-making, risk investment decision, service product design and development, etc..

3. Smart Grid power pricing modes and their effects

Studies on the important electricity utilizing industry and residents'

electricity time-sharing or feasible dynamic pricing model, Analyze the influence of different pricing model to the generator set controlling, carbon emissions in electricity production, electric market development, regional economic development and people's life, and explore the energy saving service outsourcing of the new method and new ways under the influence of different pricing model such as contract energy management, etc..

4. Financial econometric theory frontier and its application

Research on the financial asset pricing and risk management, asset income predictability and pricing, pricing and management of fixed income securities risk, under the condition of asymmetric random fluctuation, High-frequency financial data modeling and risk management, measurement management and consistency of systemic financial risk in different terms, no or half parameter estimation problem in financial econometric models, and elated financial markets empirical research.

5. Goods/services pricing research under the environment of network

Studies on the individual or group's new features of consumers bounded rationality, risk preference and cooperation under the environment of Internet, the various sales promotion means and network pricing competition strategy combined with the network pricing, group purchase, seconds kill, auction, and other comprehensive pricing method under different network marketing platform, and price strategy and inventory level, market segmentation, customer service and other aspects of the collaborative optimization problem under the network environment.

6. Cloud-based management information system reengineering

Research on enterprise's cloud-based industry ecology resources integration; collaborative innovation value chain construction; information system strategy management; information systems business process reengineering and business model changing; cloud-based information system construction, operation and maintenance management mechanisms; security management of enterprise data and information system; and management of cloud-based information system outsourcing.

7. Management decision innovation research under the big data environment

Studies on the storage and processing of unstructured or semi-structured large data optimization technology and management methods based on cloud computing, explore description of characterization methods of the big data complexity and uncertainty, new method in big data system modeling

and knowledge mining, the impact of big data knowledge discovery and decision structure variation on management decisions.

8. Online customization theory and method

Studies on the interactive technology of online customization system, the influencing factors adopted in online customization system, the relationship between online privacy customization and attention, the impact of decisions of online customization on consumers' shopping, efficiency and effectiveness of different technical characteristics of online customization system, and the combination of online customization and other emerging technologies.

9. The transformation and development of the Chinese enterprise strategy and competitive advantage

Studies on the future competition under the background of globalization and its driving force or influence elements, explore the mechanism and theory model of China's enterprises especially large and medium-sized enterprises to obtain the competitive advantage, mainly including analyzing the future competition advantage foundation under the international perspective, enterprise strategy and implementation in the future, strategic choice and the way of the transformation of Chinese enterprise, transnational and cross area growth mechanism of Chinese enterprises, Chinese enterprise international competitiveness cultivation, research of the enterprise sector dynamic ability or competitiveness based on the development, etc.

10. Business model innovation based on the socialization business

Studies on in-depth participants' behavior model in socialization business (Social Commerce or Social Business) combined with China's economic transition and social culture features, business model innovation mechanism and supportive elements, value transfer and power in the value network, value creation and operation innovation driven by social relations and social media, business intelligence and the analysis of socialized business, etc.

11. Enterprise multiple employment mode and human resource management innovation under the background of globalization

Research should be closely related to our human resources management practice, focus on a number of key scientific problems, and carry out the related theory research. Mainly includes our enterprise multiple employment mode, characteristics and performance in the background of globalization and social economic transformation, innovation of enterprises' various employment model of optimization and human resources management

mechanism, constructing the mechanism and model of the harmonious labor relation research, and the high performance work system of conflict management strategy and human resources, etc.

12. Enterprise internal control effectiveness under the background of information

Research should be focused on enterprise internal control effectiveness and internal control implementation effectiveness under the background of information, mainly including the internal control effectiveness mechanism under the background of enterprise information, enterprise internal control effectiveness assessment model under the background of information, the effectiveness of the internal control implementation measurement and key factors analysis, internal audit information system and internal control implementation effectiveness safeguard mechanism, coordination of modern information technology and the traditional internal control method, etc.

13. Consumer behavior and preference research based on the whole-network data

Studies on how to create the complete consumer interest map, analyze consumer behavior consistency and continuity, and construct a network of consumer preference and behavior model, build a cloud technology-based model and explore the new personalized products recommendation methods and technology based on the whole-network data, the precise chemical personalized marketing strategy of electronic business enterprise, etc.

14. Operation management for large complex product research and development process

Research should be focused on the management theory of large complex product development processing, including the large-scale complex product development engineering system structure and operation mechanism analysis, sharing and collaboration between resources and knowledge among the multi-cores enterprise, technology innovation mechanism and the diffusion effect, development process of the planning and scheduling modeling and optimization, large complex product development management and so on.

15. Value creating business models and platform system based on the emerging IT technology

Studies on the theory and method of how to transform the traditional enterprise into value creating enterprise in business system under the environment of exploring new IT technology, including business system

value creating theory and mechanism based on emerging IT technology, enterprise joining value creating business platform strategy and the adaptability to the system; path, strategy and organizational change for the traditional enterprise to transform into value creating type, enterprise business model innovation strategy based on the value creating platform, etc..

16. The supply chain system research of high risk complex random production process

Supply chain system research should combine with a typical high-risk complex random production process of the national emerging strategic industries. Major issues will be focused on the supply chain risk of high risk complex random production process including market, government regulation, product research and development and production process control, etc. and its influence mechanism, the supply chain risk aversion methods and evaluation, the network modeling of the production process quality control batch with complex random queuing network characteristics, and the design of the optimal service priority rules and service path, etc..

17. China's economic green development evaluation system, realizing path and policy

The project should be focused on the framework construction that can reflect economic green growth, resource environmental bearing and government policy support area green development, and form a complete system of green development evaluation index system, and carry out analysis and comprehensively study on the green development in areas of industry, population, ecology, resources, environment, science and technology at dimensions of the provinces, cities, and the world to compare our country's economy development transversely and longitudinally, and other areas of green development, explore reality path for our country to realize the economic green development, and put forward policy suggestion.

18. The government assets and liabilities accounting measure theoretical method and policy

Studies on the generalized government account of international standard and practical experience, the establishment of China's general government asset liability accounting theoretical basis. Identify the influencing factors of the change in Chinese general government assets and liabilities, analyzes its operation rules and trend, establish Chinese general government balance sheet, put forward sustainable accounting mechanism scheme, construct a generalized government balance sheet analysis application framework,

assessment of the Chinese government operation risk, and extended financial risk and its impact on the Chinese economy sustainable and stable development of the influence.

19. Research on civil financial risk evolution and management

Research should be focused on China's civil financial origin, development and evolution, the development pattern and differences, evolution and allocative efficiency of China's civil finance. Study should be on risk factors, the mechanism of civil finance and impact path and effect on the regional economic and financial system stability, civil financial risk control mechanism and tools, and the development of the theoretical analysis framework from the agent to governance path, as well as the regulations of the civil financial path and policy, the establishment of civil financial regulatory framework. Priority should be given to empirical and case study in the research.

20. Study on the key technology, standard and implementation mechanism for the construction of social credit system

Study should be focused on the analysis of the relationship between the social credit system and economic and social development, the construction of the social credit system theory framework, the core issues of China's social credit system construction such as key technology, standard and implementation mechanism, etc.; the construction of the evaluation model of social credit suitable for China's national conditions and the development of scientific and reasonable evaluation system of runtime environment for social credit system, as well as the core standard for social credit system construction. On the basis of empirical research, study may put forward the construction mode and realization mechanism for social credit system.

21. Research on the mechanism and policy for the promotion of the industry transformation and upgrade in the economic developed region

Studies on the theoretical basis of the industrial transformation and upgrading according to the urgency and difficulties and restrictive factors faced by industry in economic developed region; to develop the strategy at dimensions of system mechanism and policy for the promotion of the industrial transformation and upgrading in the economic developed region areas; to study the modeling of the industry transformation and upgrading at multiple condition restriction and goal orientation, and the interaction between industrial policy and industrial transformation and upgrading for developing the realizing path and corresponding policy suggestions of the

industrial transformation and upgrading in the economic developed region.

22. Research on the policy and management for the development of non-business government investment project

Studies on the policy environment demand and policy system for the non-business government investment based on the influence of government investments to the transformation of China's economic development; to design the decision-making mechanism for non-business government investment project; to construct the management mode and credit evaluation system; to explore the mechanism of risk early warning for the investment and implementation of the project; to establish the management & supervision system and accountability mechanism for government investment projects for providing the theory and methodology in the development and reform policy system of the non-business government investment in China.

23. Research on the performance evaluation, system construction and system optimization of medical insurance system for all population

Research is aimed to summary and review on the structure, characteristics and development trend of the basic medical insurance system at domestic and abroad, and innovate and perfect the theory system of medical insurance system for all population, to construct the evaluation framework and index system of the universal medical insurance system to quantitatively evaluate and study the effectiveness of the system for urban workers and residents and new system of agriculture collaborative organization in our country; to study feasible approaches and methods in the current medical insurance system structure and system optimization based on the perfection of medical insurance system design, as well as to put forward policies concerned.

24. Research on the human capital formation mechanism and new labor group formation in the process of urbanization

Research into the dynamic process of migrant workers employment, migration and the formation mechanism of human capital, including the influence factors for farmer to choice employment outside home and return home; the impact of human capital of the farmer workers' employment itself; the impact of employment outside home on the income, the marriage and fertility, the next generation of human capital, as well as health. Research should be based on large sample panel data that can represent migrant workers most.

Key Program Cluster

The selection principle of Key Program Cluster is to adapt to the rules and characteristics of basic research in the area of management science, select the fields with well research foundation and potential features or important breakthrough to form the group of projects with a unified goal or direction, and to carry out the support for the relative long-term multiple Key Program projects to stimulate innovation for promoting the great-leap-forward development in the certain field in view of the core scientific issues.

Key Programs Cluster is a funding way for Key Program; under the framework of disciplinary development strategy and priority funding of the "12th Five-Year Plan" proposed by the Division, the chain and complementary relationship between the Key Programs group and other types of funded project should be paid due attention.

In 2013, the Division is planning to fund one of Key Program Cluster namely "Research on the Development of Modern Agriculture Policy". In the application for the Key Program Group, National Natural Science Funds should be used, in which Project Category should be used the Key Program, and the "sub category" should be Key Program Cluster of macro-management and policy.

The Key Program Cluster of "Research on the Development of Modern Agriculture Policy"

Focused on new challenges in the agricultural development in the new period, this Key Program Cluster aims to study modern agriculture science and technology development policy and reform, national food security strategy and management, climate change on agricultural influence and adaptive strategy, modern agriculture industry organization system, land and related elements market cultivation and the reform, the modern agricultural development national policy support system and the important theory and policy issues which is closely related to modern agricultural development. Put forward new ideas of realizing industrialization and urbanization and also the agricultural modernization at the same time, improve international academic status of agricultural economy management discipline, while promoting the development of agricultural economy management, design agricultural development strategy and policy for the country at the same time and train a group of influential leading talents in the domestic and foreign academic circles.

In 2013, the Key Program Cluster is planning to support 6 projects with an

average funding of 2.2-2.8 million yuan per project for 5 years. Priority funding areas are as follows:

1. Research on the modern development of agricultural science and technology innovation system
2. Research on national food safety early warning and forecast and the development strategy
3. Research on climate change and low carbon rural forestry development strategy and policy
4. Research on the agricultural industry organization system and farmer cooperative organization
5. Research on the rural land and related factor market cultivation and reform
6. Research on the development of the support system for the national agriculture policy in the new period

Department of Health Sciences

Applications for Key Program in the Department of Health Sciences are accepted only if they are in responsive to the solicited thematic areas listed in *Guide to Programs 2013*, which are set by the panel scientists on the basis of the Department's priority areas. Applicants are expected to give their own specific project title, research contents and research plans according to the listed areas, the relevant application code corresponding to the given thematic area should be filled in the application form, and the name of the selected thematic area should be written in the "annotated column" of the application form.

Detailed requirements for applications for Key Program are expected to be referred to that for general program in the Department of Health Sciences in this guide. Special attention should be given to the following requirement: A copy of the face page of up to 5 relevant representative papers is expected to be attached, along with their clearly scanned electronic files, otherwise the applications may be declined.

In the year of 2012, 524 applications for Key Program in response to 36 thematic areas are accepted, accounting for 18.94% of the total applications for Key Program in NSFC (2766). 80 applications are finally funded with a total funding of 25.180 million yuan and an average funding intensity of 2.7978 million yuan.

In the year of 2013, about 90 applications for Key Program will be awarded by the Department of Health Sciences, The funding intensity is expected to be 2 to 4 million yuan per project with an average of 3 million yuan. The duration is 5 years. Applicants are expected to fill in the budget form with detailed justification.

In 2013, the Division V of Health Sciences will continue to standardize the selection of “application code”, “research direction”, and “key words”. The applicants are expected to precisely select the “application code 1 (H1601 – H1626)”, and their relevant “research direction” according to the “List of application codes, research direction and key words in pilot fields” on the NSFC website (<http://www.nsf.gov.cn>, the list could be browsed in “special issues” under the column of “application process”). The first column for “key words” should be selected from the pull-down menu of “research object”, and the other four columns for “key words” are expected to be typed-in by applicants according to the specific contents of their applications.

The thematic areas for solicited Key Program in the Department of Health Sciences in 2013 are listed as follows:

1. Basic research on mechanisms and intervention of pulmonary hypertension
2. Protein modification and myocardial remodeling
3. Gut homeostasis and pathogenesis of digestive diseases (excluding tumors)
4. Pathological mechanisms and intervention of bone marrow failure
5. Molecular mechanisms of cell aging and aging related diseases (excluding tumorous and neurodegenerative diseases)
6. Pathogenesis, prevention and treatment of major neonatal diseases
7. Immune and inflammation mechanism of renal diseases
8. Pathogenesis, prevention and treatment of vascular diseases of ocular region
9. Auditory/ olfactory dysfunction and its functional reconstruction
10. Studies on pathogenesis of embryo implantation and early pregnancy failure
11. The pathogenesis and intervention of craniocerebral and spinal cord injury
12. The pathogenesis of common child neurological and psychiatric disorders
13. Interaction and regulation of vascular implant materials and implant surroundings

14. Basic research on the brain - computer interaction and neurological rehabilitation
15. Human virus chronic infection and pathogenic mechanism
16. Human fungus infection and drug-resistance
17. Basic research on vital organ injury induced by special environment (temperature, pressure, gravity, hypoxia, etc.)
18. Basic research on sports injury and rehabilitation
19. Mechanisms of tumour immunosuppression and its reversing strategies
20. Self- renewal of cancer stem cells
21. Heterogeneity of cancer and related therapeutic resistance
22. Microenvironmental remoulding mediated by cancer cells
23. Cell senescence and cancer
24. Health and nutrition requirements
25. Child and adolescent health and environmental hazards
26. Dynamic effects of various physiological/pathological microenvironments on the differentiation, development and function of immune cells
27. New theoretical and methodological studies on therapeutic vaccines
28. Basic research on complex parentage testing / individual identification in forensic science
29. Basic research on medicinal chemistry in the discovery and validation of drug target.
30. Active small molecule regulatory in immune response and inflammation
31. Basic research on discovery of new type anti-infective drugs
32. Biological basis for the theory of phlegm and blood stasis
33. Regulation of neuro-endocrine-immunity network by acupuncture and moxibustion and its mechanisms
34. Mechanisms underlying the same syndrome in different diseases and basic research on its prevention and treatment
35. Basic research on the treatment of viral diseases with heat dispersing and detoxicating prescriptions