National Natural Science Fund Guide to Programs 2017

National Natural Science

Foundation of China

Brief Introduction

The *National Natural Science Fund Guide to Programs 2017*, in accordance with the *Regulations on the National Natural Science Fund* and relevant documents on program management, gives instructions on how to apply for funding from National Natural Science Foundation of China (NSFC), and explains the definition of application quota and introduces the funding policies for various types of programs in 2017. It provides applicants with useful guidance on making independent selections of topics to seek support from the National Natural Science Fund. The *Guide* introduces the explanation, talent, instrument and merging program categories in separate sections. It is an important basis for the distribution of the National Natural Science Fund, and also a must-read reference for applicants.

This book can be used as a reference for researchers in universities and colleges of higher education and research institutions, and for people working in areas of S&T management and policy research.

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Foreword

The year of 2016 is the first year for the implementation of the 13th Five-Year Plan. In view of the new requirement on basic research for building China into an innovative country and S&T power, the National Natural Science Foundation of China (hereinafter abbreviated as NSFC) fully implemented the National Program for Medium and Long-Term Scientific and Technological Development (2006-2020), the 13th Five-Year Plan, and its strategy of "supporting basic research and scientific frontier exploration, supporting talent and team building, strengthening China's original innovative capability", and adhered to its evaluation principle of "relying on experts, promoting democracy, funding excellent research, and advocating fairness and justness" to nurture creative ideas and foster talents, further strengthen support to the development of research tools, and has made great contributions to the construction of an innovation-oriented country.

NSFC's funding portfolio consists of 4 categories of programs, namely, Exploration, Talent, Instrument and Convergence, with respective preferential focuses, constituting an integrated funding system of the National Natural Science Fund. The Exploration Program aims at achieving innovative results in basic research, fostering a balanced and coordinated development of disciplines with special emphasis on certain key areas, facilitating interdisciplinary research, and stimulating original innovation. Through funding young researchers to conduct independent research and assisting researchers in regions weak in basic research, Talent Program is targeted at nurturing outstanding academic backbones, top talents and innovative research teams and enhancing China's S&T competitiveness in the future. Instrument Program aims at strengthening research facilities, especially increasing support for the development of indigenous scientific instruments, expanding research areas and promoting source research. Convergence Programs caters to scientific frontiers and national needs, focuses on major issues in basic research, promotes disciplinary crossing and merging, integrates the limited resources, gathers and cultivate high-level talents and builds a highland for scientific research, while channeling social resources, solving common issues in basic research and promoting the independent innovation capabilities in relevant fields, industries or regions.

Until Dec. 9, 2016, a total of 182,507 proposals were received by NSFC for the year 2016, among which 172,843 proposals from 14 types of programs were submitted during the batch application period (from Mar. 1 to 4:00 pm on Mar. 20, 2016), up by 4.38% (7,245 applications) compared with that of 2015. Among them, the applications for the General Program increased by 1.40% (1,023 applications) over that of 2015. The applications for the Key Program decreased by 0.82% (23 applications) over that of 2015. The applications for the Young Scientists Fund increased by 7.12% (4,677 applications), the applications for Fund for Less Developed Regions increased by 7.49% (986 applications) and the applications for Excellent Young Scientist Fund increased by 25.37% (893 applications) over that of 2015. The applications for National Science Fund for Distinguished Young Scholar increased by 13.27% (285 applications) over that of 2015. For Science Fund for Creative Research Groups, the applications decreased by 3.21% (8 applications) and for Key International (Regional) Joint Research Program, the applications decreased by 1.29% (8 applications) over that of 2015. The applications for Special Fund for Research on National Major Research Instruments (free application) decreased by 2.97% (18 applications) over that of 2015.

Following the standard review procedures, up till Dec. 9, 2016, a total of 16,934 projects of the General Program, 612 projects of the Key Program, 23 projects of the Major Program, 502 projects of the Major Research Plan Program and 105 projects of the Key International (Regional) Joint Research Program were approved. Furthermore, 16,112 projects of the Young Scientists Fund were approved, so were 2,872 projects of the Fund for Less Developed Regions, 400 projects of the Excellent Young Scientists Fund, 198 projects of the National Science Fund for Distinguished Young Scholars, 38 new projects, 29 extended projects after 3 years and 10 extended projects after 6 years of the Science Fund for Creative Research Groups, 135 projects of the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao, 85 projects of the Special Fund for Research on National Major Research Instruments (Free Application), 4 projects in the Special Fund for Research on National Major Research Instruments (Department Recommendation), 733 projects for Joint Funds, 108 projects of the Research Fund for International Young Scientists and 222 projects in International (Regional) Cooperation and Exchange Programs. For more information about the statistics and analysis of the applications and final approvals, please refer to the relevant chapters of this *Guide*.

In order to reflect the principle of openness, fairness and justness and help

scientists better understand NSFC's funding policies, the *National Natural Science Fund Guide to Programs* (hereinafter abbreviated as the *Guide to Program*s) is published to all applicants for selecting proper categories of programs, research topics, areas and directions when they apply for the NSFC funds.

This *Guide to Program*s introduces different types of programs, of which applications will be accepted during the batch application period in 2017. Information on the application and regulations on total number of applications for each individual applicant are introduced in detail. The overall funding statistics and priority areas of the General Program, Key Program, the Young Scientists Fund, and the Fund for Less Developed Regions are introduced in the scientific department sections respectively. For the General Program, the overall funding principles and specified requirements as well as notes on applications are provided in addition to the introduction of the overall funding statistics of each scientific department. Apart from that, the trend of development, funding scopes and requirements in diverse disciplines are described by respective divisions of the scientific departments. Other types of programs are introduced in general terms. Special requirements for each of them are introduced in the main text of this *Guide*.

Calls for proposals not included during the batch application period will be announced at NSFC's website (http://www.nsfc.gov.cn). Applicants and host institutions are advised to pay due attention.

During the course of application acceptance, evaluation and management, NSFC will, in light of the *Regulations on the National Natural Science Fund* (hereinafter referred to as *Regulations*) and relevant guidelines for program management, standardize management procedures and optimize the peer review mechanism, strictly observe pertinent regulations on conflict of interest and confidentiality, and sincerely cherish the supervision from the scientific community and the general public. All researchers are welcome to submit high-quality applications for the National Natural Science Fund.

Editorial Committee

Dec. 9, 2016

Information for Applicants

In applying for NSFC funds in 2017, applicants and their host institutions should comply with the following provisions:

I. Eligibility for applicants

1. As the principle investigator, the applicant should comply with Article 10 Item 1 of The *Regulations*, the applicant has (1) the experience of undertaking basic research program(s) or other basic research activity; (2) a senior academic rank (title) or a doctoral degree, or recommendation from two researchers who are in the same research field and have a senior academic rank (title). Besides, those who apply for certain categories of programs shall satisfy other specific requirements. For more information, please refer to the text of this *Guide*.

When domestic or overseas applicants not employed full-time at the host institutions submit the applications, they should provide the copy of the employment contract from the host institution and the statement (with seal from the host institution or the personnel department of the host institution) for their position, employment period and working hours per year together with the hard copy of application form.

The applicants for the Fund for Less Developed Regions should be full-time employees in the specified host institutions (for more information, please refer to the section on Fund for Less Developed Regions in this *Guide*), or the technical personnel following national policy and sent by the Central Organization Department on the 3-year or longer aiding mission in Xinjiang and Tibet, who should provide the supporting materials of the aiding mission issued by the organization department or the personnel department of the aided institution. Part-time employees in the specified host institutions, technical personnel from the specified host institutions affiliated under Chinese People's Liberation Army or the excluded host institutions are not qualified to apply for the Fund for Less Developed Regions.

2. When a researcher conducting basic research satisfies the requirements as prescribed in the preceding paragraph but has no employer or does not work

in a host institution, on the condition that he or she has obtained the consent from a registered supporting institution, he or she is able to apply for the General Programs and Young Scientists Fund, but not other programs.

Under this circumstance, the applicant shall fill in the authentic personal information in the basic information of the proposal and research experiences in CV, together with the agreement signed with the supporting institution (for more information please refer to the *National Natural Science Funds' Management Methods*, hereinafter referred to as *Management Methods*) in the hard copy of the application form.

3. Students pursuing the postgraduate degree (not obtained by the deadline for NSFC submission) cannot apply for any fund as the Principle Investigator. However, with the supervisor's consent, in-service personnel can apply for certain categories of programs through the employment institution. The applicant should submit the hard copy of application with the following attachments: signed certification of the supervisor's consent which explains the connection between the dissertation and the proposal, and the guarantee of working hours and conditions after the project starts, etc.

In-service personnel pursuing postgraduate degrees can apply for the following program types: General Program, Young Scientists Fund, and Fund for Less Developed Regions. But in-service personnel pursuing the master degree cannot apply for Young Scientists Funds.

4. Researchers outside mainland China and not employed at the supporting institutions in the mainland cannot apply for NSFC programs. Those who are employed at the supporting institutions cannot apply for or participate in NSFC programs both as the international or regional collaborator and domestic researcher at the same time. If the researcher has the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao projects, or the International (Regional) Joint Research project (including Key International (Regional) Joint Research Program and International (Regional) Joint Research Program under Agreements/MoUs) as the foreign Principle Investigator, he or she cannot apply for other types of program as the Principle Investigator before these projects are completed, vice versa. If the applicant has on-going projects other than these two types, he or she cannot apply for the Overseas Chinese Scholars and Scholars in Hong Kong and Macao Program or participate in the International (Regional) Joint Research project (including Key International (Regional) Joint Research Program and International (Regional) Joint Research Program under Agreements/MoUs) as the foreign principle investigator.

5. Researchers employed at postdoctoral research centers can apply for the following programs only: General Programs, Young Scientists Fund and Programs of Joint Funds. In the process of applying for these funds, the applicant should present the supporting institution's written guarantee that within the funding period the applicant will continue the research before or after he or she leaves the postdoctoral research centers. The guarantee shall be attached to the paper proposal form.

6. Researchers with on-going National Social Science Funds as the principle investigator cannot apply for any NSFC funds other than the National Science Fund for Distinguished Young Scholars. Within the same year, applicant for the National Social Science Funds cannot apply for any NSFC funds.

II. About proposal

1. Prior to the writing of the proposal, the applicant shall carefully read the *Regulations*, *Guide*, *Management Methods,* management regulations on various programs, and relevant notice and announcements. In case of a conflict between the existing Management regulations and the *Regulations* or this *Guide*, the later ones shall prevail.

2. The proposal shall be prepared by the applicant in person and in accordance with the outline. The applicant and the main participants should fill in their CVs accordingly. Caution against revealing any content contrary to law or confidentiality. The applicant shall be responsible for the authenticity and legitimacy of the proposal submitted.

3. In accordance with program types, the applicant shall make correct choice of the "funding category", "subclass introduction" and "annotation". Content that requires "choosing" can only be chosen in the pull-down menu; content that requires "filling out" can be written in words; some program's annotation attachments should be written strictly in accordance with this *Guide*.

4. For 2017, some modifications have been made on the application codes. Code should be chosen in accordance with the research direction or research field and the "National Natural Science Foundation Application Code". Much attention shall be paid to:

(1) When choosing the code, try to select the full code including the last digit (six or four digits).

(2) The first application code is reference for deciding NSFC's accepting department and selecting the panel experts. The second application code is supplementary. For some programs, the first or the second application code is

designated.

(3) For Key Program, Major Program Plan and Program of Joint Funds, etc., which have special requirement on the selection of application code, please refer to relevant text of this *Guide*.

(4) NSFC further promotes the standardization of "application code", "research direction" and "key word". Applicants should accurately select "application code 1" and the corresponding "research direction" and "key word" when filling out the proposal form.

(5) For any questions, please contact departments concerned.

5. The hard copy of application should be signed by the applicant and major participants. For participants outside the supporting institution (including post-graduates), their work places are seen as cooperative research institutions whose information shall be included in the proposal's basic information form and whose official seal should be included on the sign and seal page. The name of the institution and that on the seal shall be identical. The official seal should be used, if the institution is registered at NSFC, and the corporate seal should be used if otherwise.

The foreign researchers as the major participants shall be seen as individual participants and their foreign work places should not be seen as collaborative research institutions. If the researcher is unable to sign in person, a paper document with the signature and stating his or her consent to participate and perform the related responsibilities shall be sent via mail or fax and submitted with the paper form proposal as attachments.

The number of one proposal's cooperative institutions shall not exceed two.

6. In the proposal, the applicants and the major participants with a senior academic rank (title) shall indicate if:

(1) They have more than one supporting institution when applying or participating in NSFC projects in one year;

(2) They have different supporting institutions for on-going NSFC projects.

7. If the research has received funding through other sources, the applicant should specify the funding details and their difference and connection with the current proposal. Applying for funding from different funding agencies for the same research content should be avoided.

If the applicant applies for different types of NSFC programs during the same year, he or she should specify in the application the other NSFC program applications, their titles and information, and the connection and difference with

the current application.

8. The start time shall be Jan. 1, 2018; the finish time shall be Dec. 31, 20XX, depending on the funding periods (unless otherwise specified in this *Guide*). Researchers at postdoctoral research centers as the applicant should fill out the closing date as the Dec. 31 of the year the project is completed with written guarantee from the supporting institution.

9. The applicant and the major participants should use the same and only identification for application.

Applicants and major participants should use the same identification for application. If they have received funds using other identification as the applicants or major participants, they should explain in the proposal. If not, they will be treated as misconduct and their supporting institutions are responsible for verification.

III. About the supporting institutions' responsibilities

1. The supporting institutions should strictly abide by the *Regulations*, the *Guide*, the *Working Management Methods for Host Institutions*, other relevant notices and management methods, and *National Natural Science Funds' Management Methods*, *Budget Preparation Notes* and *Notes on National Natural Science Foundation of China Program budget Form*.

2. The supporting institution is responsible for the proposal's authenticity and integrity, and the qualification of the applicant. No confidential content should be included in the proposal.

3. If the supporting institution allows the applicants without work or whose work place is not registered to apply for funds as listed under *Regulations* Article 10 Item 2, it shall bear the *Regulation*'s relevant responsibilities as listed in Article 13, sign the written contract and attach it to the paper form proposal.

4. The supporting institution should provide written guarantee for researchers in postdoctoral research centers that the applicants will continue the research before and after he or she leaves the research center. Each written guarantee should have the institution's seal and be attached to the proposal.

IV. About application reception conditions

According to the *Regulations*, the application for NSFC funds shall not be accepted in case of any of the following circumstances:

1. The applicant does not comply with the conditions of the *Regulations*,

the *Guide* and relevant management methods.

2. The application materials do not comply with the *Guide*'s conditions.

3. The number of proposals does not comply with the Application Limit's conditions.

V. Special notice

To prevent academic misconduct and repeated funding, it is important that applicants shall not:

1. Use the identical or similar proposal and apply for different programs from the same or different science departments.

2. Use the identical or similar proposal and apply from different supporting institutions if the applicant is employed at more than one supporting institution.

3. Use the identical or similar proposal and apply by different applicants.

4. Use the granted project content and apply for repeated funding from the same or different science departments.

NSFC will use software for proposal comparison. If the above condition is verified, treatments shall be in accordance with the circumstances. Those with academic misconduct shall be handled by the Supervisory Committee.

Application Limit

1. Application limit in general

(1) Applicants shall only apply for one type of program once in a year (excluding the Integrated Program and Strategic Research Program in the Major Research Plan, and the International (Regional) Exchange Program; for Joint Funds, the same type refers to the same program title).

(2) Applicants cannot apply for the same type of program if in the previous year he or she received funding for the General Program (including one-year program), Key Program, Major Program, Major Research Plan Program (excluding the Integrated Program and Strategy Research Program), Program of Joint Funds (referring to the Joint Fund with the same name), Fund for Less Developed Regions (including one-year program), International (Regional) Cooperation and Exchange Programs (unless otherwise notified) and National R&D Program for Major Research Instruments.

2. One-year suspension from application after unsuccessful application for the General Program for two years in a row

Applicants with unsuccessful application for the General Program both in 2015 and 2016 (including eligibility rejection) cannot apply for the General Program as the principle investigator in 2017.

3. Restriction on the total number of projects for researchers with a senior academic rank (title) applying for and undertaking

The total number of the following programs the researcher with a senior academic rank (title) applies for (including the applicant and the major participant) and undertakes (including the applicant and the major participant) shall not exceed three: General Program, Key Program, Major Program, Major Research Plan (excluding the Integrated Program and Strategy Research Program), Program of Joint Funds, Young Scientists Fund, Fund for Less Developed Regions, Excellent Young Scientists Fund, National Science Fund for Distinguished Young Scholars, Key International (Regional) Joint Research Program, International (Regional) Joint Research Program under Agreements/MoUs with direct cost more than 2 million yuan per project (only the principle investigator are counted, and the major participants are not counted), National R&D Program for Major Research Instruments (including Special Fund for Major Research Instruments and Special Program of National

Major Research Instruments), Excellent State Lab Research Program and Emergency Program over one year.

During the stage of application, Excellent Young Scientists Fund and National Science Fund for Distinguished Young Scholars are not counted. They are counted before receiving NSFC's formal funding decision and after approval.

Limit on the number of Instrument Program: the number of National R&D Program for Major Research Instruments (including Special Fund for Major Research Instruments and Special Program of National Major Research Instruments) a researcher applies for (including applicants and major participants) and undertakes (including principle investigator and major participants), and the National Major Instrument Equipment R&D Program by Ministry of Science and Technology should not exceed one; After the National R&D Program for Major Research Instruments (recommended by the department) is funded, the principle investigator cannot apply for any other NSFC funds other than the National Science Fund for Distinguished Young Scholars before the program terminates.

During the stage of application, Basic Science Center Programs are not counted. After approval, the PI and key members cannot apply for any NSFC grants before the Centers Programs are terminated except National Science Fund for Distinguished Young Scholars, neither can they use similar materials to apply for any S&T Programs.

4. Limit on the principle investigator for accumulated number of funding

(1) For Young Scientists Fund, Excellent Young Scientists Fund, National Science Fund for Distinguished Young Scientists, and Science Fund for Creative Research Groups, the applicant can receive the funding only once.

(2) Beginning from 2016, for Fund for Less Developed Region Program, the applicant's accumulated number of funding cannot exceed 3. Projects approved before (including) 2015 are not counted.

5. Limit for the researcher without a senior academic rank (title)

(1) The total number of project the researcher applies for or undertakes as the principle investigator should not exceed one. During the stage of application, the Excellent Young Scientists Fund and National Science Fund for Distinguished Young Scholar are not counted. They are counted after the formal application and before NSFC makes the final funding decision, and also after the approval. The principle investigator of the Young Scientists Fund can apply for the General Program in the last year of the fund.

(2) Under the premise of adequate time and energy, the total number of projects the researcher applies for or undertakes as the major participant is not limited.

6. The programs not limited by the total number limit

Science Fund for Creative Research Groups, Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao, Tianyuan Fund for Mathematics, International (Regional) Joint Research Program under Agreements/MoUs with direct cost of or less than 2 million yuan per project, International (Regional) Exchange Program, Research Fund for International Young Scientist, assignment and soft projects by bureaus and divisions in the Emergency Program, Projects which last for one year or less (except for the General Program), and other programs specified in the *Guide*.

7. Special notice

(1) During the evaluation period (prior to NSFC's final decision), the proposal shall be counted in the total number limit.

(2) In the case that applicants engaged in multiple supporting institutions apply for or undertake through different supporting institutions, the Limit is still applicable.

(3) In case the researcher receives the senior academic rank (title), the projects he or she undertakes as the principle investigator shall be counted into the total number whereas those the researcher undertakes as the major participant shall not.

(4) In case of an inconsistency between other management methods and this Limit in terms of total project numbers, the latter shall prevail.

Contents

General Program

General Program supports scientists to do basic research on bottom-up based topics within the funding scope of NSFC to conduct innovative research and promote a balanced, coordinated and sustained development of all disciplines.

Applicants should meet the following qualifications:

(1) With the experience of undertaking basic research projects or doing basic research;

(2) Have senior professional title or PhD degree, or are recommended by two professionals with senior academic positions (titles). Post graduate students are not eligible to apply for the General Program, but part time graduate students may apply through their employers if agreed upon by their supervisors.

Applicants should be familiar with the current situation of relevant research in China and the world, capable of leading a research group to conduct research. Home institutions should have necessary experimental research infrastructure for those proposals which need experimental facilities. Applicants should follow the guideline to prepare proposals. The proposed research should be of significance and have research merits, sound thematic basis, new academic ideas, clear research objectives, reasonable and detailed research contents and feasible research schemes. The number of collaborative institutions for General Program projects should not exceed 2, and the duration of General Program projects is 4 years. (For applications consist of only in-site post-doctoral researchers, they should determine the duration of the project based on the written commitment from the host institutions.)

In 2016, NSFC funded 16,934 General Program projects, an increase by 1.35% (or 225 projects) compared with that of 2015, with total funding of 10.17 billion yuan and average funding of 600,900 yuan per project for direct costs. The average funding rate was 22.87%, approximately the same as the previous year (22.88%). Applicants are advised to prepare their research proposals in line with the instructions by respective science departments on funding scale.

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

Funding of the General Program Projects in 2016

Unit: 10,000 yuan

Department	No. of applications	Awards				Funding rate (%)
		No. of awards	Funding for direct cost	Average funding for direct cost	Share of NSFC total funding for direct cost (%)	
Mathematical and Physical Sciences	5,380	1,551	95,045	61.28	9.34	28.83
Chemical Sciences	6,065	1,576	101,082	64.14	9.93	25.99
Life Sciences	10,806	2,700	162,990	60.37	16.02	24.99
Earth Sciences	5,867	1,573	108,260	68.82	10.64	26.81
Engineering and Materials Sciences	13,941	2,851	176,900	62.05	17.39	20.45
Information Sciences	7,995	1,861	108,600	58.36	10.67	23.28
Management Sciences	3,676	720	34,560	48.00	3.40	19.59
Health Sciences	20,318	4,102	230,090	56.09	22.61	20.19
Total	74,048	16,934	1,017527	60,09	100.00	22.87

Department of Mathematical and Physical Sciences

Mathematical and physical sciences studying deep level structures of matter and the laws of its motion are important foundations of natural science, and the precursor and basis for the development of contemporary science. In their own development, mathematical and physical sciences also provide theories, methods and means for other disciplines. Research findings in mathematics and physics play a key role in promoting the progress of both basic and applied scientific disciplines. Disciplines in mathematical and physical sciences are peculiar in characteristics, such as big differences between or among disciplines, and pure theoretical research (such as mathematics, theoretical physics, etc.) and experimental studies. Many disciplines feature "mega-science", such as high-energy physics, nuclear physics, astronomical physics, high temperature plasma physics, etc.

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

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

In 2016, the Department received 5,380 applications for General Programs, which is 379 more than 2015, increasing 7.58%. 1,551 projects were funded with a funding rate of 28.83%, and the funding per project was 612,800 yuan in average. The funding per project was 480,000 yuan for mathematics, 661,700 for mechanics, 665,000 for astronomy, 661,700 for physics I and 661,700 for physics II.

According to the strategic needs of the development of mathematical and physical sciences and the overall plan of project funding, the Department has taken some measures in project funding performance and has strengthened macro guidance. In 2017, the Department will continue to pay attention to the following aspects:

(1) Emphasize on fostering outstanding young talents. In 2016, the principal investigators under the age of 40 in General Program projects reached 51.97%. In 2017, the Department will further increase funding for young researchers and expand funding scale for applicants under age 40, so as to have more young scientists funded and improve their research capability.

(2) Give more emphasis on creative research and disciplinary development. Multi-level funding to suit the needs of research will be adopted. More funding will be given to studies on developing experimental methods and techniques with innovative ideas aiming to the actual needs, which can be up to 1 to 1.5 million yuan per project. Applicants are encouraged to pay attention to this policy.

(3) Strengthen macro planning, and give preferential support to special areas so as to promote sustainable development in these areas. In 2017, preferential support will be given to the following areas:

(i) New concepts and new methods in soft matter studies;

(ii) Interdisciplinary issues related to mathematics and information science;

(iii) Research and development of experimental methods and techniques with novel research idea;

(iv) Pre-research on scientific goals of major national infrastructure projects;

(v) Problems driven research in applied mathematics;

(vi) Radiation protection and radiation physics;

(vii) Integration and standardization of computational mechanic software;

(viii) New principle and methods of X-ray, inferred, tetra-hertz generation and imaging;

(ix) Advanced method and key technology of nuclear detection and nuclear electronics;

(x) Key technologies for physics and detection of gravitational wave.

Please indicate the research directions in the note section of the application form when applying for these projects, and choose the proper application code.

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

In 2017, the average funding per project for General Programs will be the same as 2016.

Division of Mathematics

The Division of Mathematics mainly funds research on basic mathematics, applied mathematics, and computational mathematics. It encourages creative research on important issues in the mainstream and frontier of mathematics, explorations of new ideas, new theories and methods in mathematics and interdisciplinary applications, intercrossing and merging of different branch disciplines with mathematics, and applied mathematical research on practical issues. Applicants are required to have sound research background and capability. Proposal should be prepared based on deep understanding of the current status of the research involved, main issues and relevant research methods and available approaches. The Division encourages researchers to consolidate research team, foster talents and promote academic exchanges through the funded research projects. Research direction adjustment is allowable when needed. **In 2017, the average funding for direct cost will be 500,000 yuan per project.**

Funding for General Program Projects in Department of Mathematical and Physical Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Funding	Funding rate (%)	Projects	Funding	Funding rate (%)
Mathematic	Mathematics I	193	9,327	32.55	201	9,644	29.91
	Mathematics II	198	9,711	29.69	218	10,466	27.98
Mechanics	Basic problems and methods in mechanics	6	392	25.00	6	376	25.00
	Dynamics and control	61	4,084	29.61	62	3,945	28.97
	Solid mechanics	152	10,658	29.63	147	9,783	28.43
	Fluid mechanics	82	5,502	29.82	84	5,752	28.57
	Bio-mechanics	25	1,666	30.86	26	1,676	28.89
	Explosive and impact dynamics	33	2,230	29.73	37	2,423	28.03
Astronomy	Astrophysics	41	2,953	33.61	46	3,065	29.30
	Astrometry and celestial mechanics	36	2,517	30.77	38	2,521	29.01
Physics I	Condensed matter physics	215	14,751	30.76	212	13,940	28.84
	Atomic and molecular physics	34	2,280	32.69	41	2,648	29.08
	Optics	125	8,537	30.79	120	8,033	28.99
	Acoustics	34	2,344	30.63	33	2,245	28.95
Physics II	Fundamental physics and particle physics	70	4,295	30.70	78	4,678	30.95
	Nuclear physics, nuclear technology and its applications	105	7,406	32.41	86	5,846	27.74
	Particle physics and nuclear physics experimental facilities	65	4,684	26.64	65	4,594	26.97
	Plasma physics	58	3,993	32.95	51	3,410	31.29
Total		1,533	97,330	30.65	1,551	95,045	28.83
Direct cost funding per project		63.49			61.28		

For basic mathematics, the funding aims at maintaining stable development of research directions where China is traditionally strong and has comparatively large-scale research capability, promoting fast development of research areas that are within the mainstream of international mathematical research but relatively weak in China, and promoting interdisciplinary research among branches of mathematics. Focus is given to number theory, Langlands program in algebraic geometry, random analysis method and application, and mathematical problems in quantum field theory.

The funding for applied mathematics and computational mathematics aims at improving applications in solving practical problems, gives more emphasis on basic theory and new methods with strong practical background and sound potentials for application. NSFC encourages mathematical modeling of practical problems, analysis and computation, and statistical methods and theory for complex data and mass data, support research on

mathematical physical logic, algorithm complexity, discrete probability modeling, optimal algorithm, and combinational algorithm. Focus is given to applied researches such as mathematical modeling and theory of new materials, information processing and control, coding theory and information security, mathematical modeling and analysis in environmental and energy sciences, bioinformation and life system, pathogenesis and control of infectious disease, statistical methods in industry and medical science, data mining and computational statistics, mathematical methods for economic prediction and financial security, and mathematical theory and new method for industrial, medical imaging and image processing.

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

In order to promote interdisciplinary research between mathematics and information sciences, in 2017, the Department of Information Sciences and the Department of Mathematical and Physical Sciences will continue to fund interdisciplinary research that requires joint efforts from information science and mathematics. The direct cost funding intensity will be the same as that of General Program projects. The interdisciplinary areas for funding include: mathematical theories in information sciences, mathematical methods in information security, information system and advanced control theory.

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

Division of Mechanics

The Division of Mechanics mainly supports research on basic problems and methods in mechanics, studies in areas of branches of mechanics such as dynamics and control, solid mechanics, fluid mechanics, biomechanics, explosion and impact dynamics. The Division supports projects with creative ideas in the frontiers of mechanical research on the one hand and projects closely related to the sustainable development of economy, society and national security, and the development of engineering and technology on the other hand. The Division encourages experimental research using the available experimental facilities and key labs in China and advocates interdisciplinary research conducted by scientists from different disciplines. **In 2017, the average funding of direct cost will be 700,000 yuan per project.**

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

Applications for research in areas of dynamics and control should pay attention to the theory, methods and experimental research of nonlinear dynamics, strengthen research on dynamics and control of complex systems, especially on non-smooth and uncertain

system, as well as dynamic modeling and analysis of problems involving the coupling of solid, flexible bodies, fluid, and magnetic bodies and multi-field effects. The Division encourages studies on key issues of dynamics and control problems in major engineering projects, and encourages analytical mechanics and multi-body dynamics.

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

Applications in fluid mechanics should pay attention to studies on the laws and mechanisms governing complex flows. The Division encourages researches on rarefied gas flow, hypersonic aerodynamics, especially theory, simulation and experimental studies on compressible turbulent flow, high speed hydrodynamics, multi-phase complex flow, and key fluid dynamic problems in aerospace, energy and ocean, environment and disaster, and transportation areas.

Applications in biomechanics should pay attention to biomechanical and mechanical biology problems related to human health and disease, biomechanical mechanism and transformation medicine related to non-infectious diseases such as cardiovascular, bone joint and cancer, and studies on new theory, methods and technologies in experimental studies on biomechanics.

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

The Department of Mathematical and Physical Sciences continues to support studies on instruments, new experimental methods and techniques with innovative ideas. Applicants for this type of application should mark "Experimental Techniques and Instruments" in the application form. The Department will keep supporting projects in computational software development, giving stress on the integration and standardization research on the development of the computational mechanics software which may produce independent or shared IPR. Applicants for this type are requested to mark "Computational Mechanics Software" in the application form. Applicants of above two types of projects should have relevant research background.

Division of Astronomy

The Division of Astronomy mainly supports researches on astrophysics, basic astronomy, astronomical instruments and technology. In accordance with the trend of

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

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

In 2017, in addition to strengthening continuous support for projects integrating theory and observation and projects conducted by young scientists, emphasis will be given on interdisciplinary research with physics, space science, earth science and information science, etc. Maintain research on advantageous directions, promote research related to using large observatory facilities in China, and foster research topics that may have breakthroughs. The Division encourages research on basic physical process on celestial bodies, celestial chemical evolution, and celestial bodies in the solar system, extra solar system planetary system, infrared astronomy, space astronomical measurement, and astronomical research that addresses the national needs. The priority will be given continuously to researches in basic astronomy, astronomical technology and methods, and to relative small scaled astronomical research institutions. **In 2017, the average funding for direct cost will be 700,000 yuan per project.**

In the next few years, the Division plans to give special support to pre-research around the research based on equipment that have already been built or being built, and conceptual studies on new technologies that are urgently needed for large-scale telescope and space exploration. For applicant in these research areas, please mark "Major S&T Basic Facilities Project" or "New Astronomical Technology" in the application forms.

Division I of Physics

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

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

areas. In-depth studies on important physical problems that have not become hot topics, and researches in basic physical problems on devices, and new areas and directions are especially encouraged. **In 2017, the average funding for direct cost will be 700,000 yuan per project.**

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

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

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

Division II of Physics

The Division II of Physics mainly supports research on fundamental physics, particle physics, nuclear physics, nuclear technology and its applications, accelerator physics and detectors, plasma physics, and synchronized radiation methods. **In 2017, the average funding of direct cost will be 700,000 yuan per project.**

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

For particle physics and nuclear physics, the Division will support creative

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

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

For nuclear fusion and plasma physics, more attention will be given to the exploration of new diagnostic means related to large facilities which are in operation at present or will be built soon. In particular, basic research on advanced magnetic confinement fusion and new approaches to inertial confinement fusion and related fundamental physical problems, and computer simulation and experimental studies of various kinds of plasma will be stressed.

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

In 2017, the Department of Mathematical and Physical Sciences will arrange special funding in certain areas, and continue to support innovative development and improvement of instrument, advanced experimental techniques and methods, advanced method and key technology in nuclear detection and nuclear electronics, and radioactive physics, radioactive protection and environmental protection.

Department of Chemical Sciences

Chemical science is to study the composition, structure, property, reactions and transformations of matters; it is the fundamental means which creates new molecules and builds new materials, and it is the central science which is closely intercrossed and permeated with and into other disciplines. Chemical engineering is aimed to accomplish the transfer and conversion of matters and energy by making use of the principles of the basic disciplines, and to solve scientific issues raised in the large-scale production of chemical materials and products.

The mission of the Department is to improve the overall quality and international status of China's fundamental research in chemical sciences, and foster creative talents and groups in chemical research with international impact. The Department supports multi-level and multi-scale research on the reaction, process and function at different levels of atoms, molecules, molecular aggregation and condensed state, as well as studies on the complex chemical system, in order to realize the precise control and logic cognition of chemical synthesis, process and function. In accordance with major scientific problems raised from the national economy, social development, national security and sustainable development, research on chemical sciences and chemical engineering are encouraged for exploring their role in fields of life, materials, energy, information, resources, environmental science and human health. The Department emphasizes the combination of microscopic and macroscopic research, static and dynamic states, and theoretical research and empirical development of novel experimental methods and precise analysis technologies. It is also encouraged to introduce the latest theories, technologies and achievements from other disciplines into the research in chemical science and chemical engineering for facilitating the sustainable development of research, fostering innovation and interdisciplinary studies, and supporting the emerging frontiers in research.

Funding for General Program Projects in Department of Chemical Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Inorganic	196	12,737	26.17	205	13,175	27.30
	Analytical	168	10,917	26.29	181	11,601	26.70
Division II	Organic chemistry	282	18,367	26.58	268	17,177	26.77
Division III	Physical chemistry	292	18,977	26.19	302	19,356	26.65
Division IV	Polymers	148	9,618	26.38	130	8,333	26.97
	Environmental	179	11,672	26.72	184	11,828	27.42
Division V	Chemical engineering	303	19,692	22.30	306	19,612	22.68
Total or average		1,568	101,980	25.48	1,576	101,082	25.99
Direct cost funding per project		65.04			64.14		

In 2016, 6,065 proposals for General Program from 631 research institutions were received by the Department (1.45% less than that of 2015). 1,576 proposals were funded with the success rate of 25.99% and the average funding intensity of 641,400 yuan per

project.

In 2017, the Department will continue to promote high quality research in the cutting edge fields, lay stress on in-depth and systematic research work, give priority to interdisciplinary research projects, and take effective measures to support original creative and high risk research, so as to lead the breakthrough innovation, unblock the bottleneck of chemical research limitation in China and achieve the transition from quantity to high quality research outcomes. In the process of assessment, scientific merit will always be the core concept, and the balancing, coordinating and sustainable development of all related disciplines will be thoroughly considered for the promotion of the fundamental research of chemical sciences in China at international frontier. In 2017, the average funding intensity per project will be at the same level as that of 2016.

Division I of Chemistry

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

Inorganic Chemistry

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

Inorganic chemistry is aimed to precisely synthesize the specific function-oriented new inorganic molecules, new substances and new materials, reveals reaction mechanisms and rules, investigates the molecular basis and principle of new inorganic functional material systems by making full use of the modern characterization techniques and theoretical methods, focuses on the research and deep utilization of characteristic resources in China, emphasizes the effect of inorganic small molecules and metal ions on the systematic control of biomacromolecules, as well as design, synthesis and applications of the molecular probe, develops inorganic energy materials and new energy system of chemistry and deeply explores the precise construction and regulation of inorganic nanostructures, as well as the dynamic growth, mechanism, structure and performance of clusters.

In recent years, the research of inorganic chemistry discipline in China has been greatly improved. Inorganic chemists have paid increasing attention to the creativity of research theme and made outstanding achievements in some areas. In the studies on the synthesis and assembly methodology of inorganic materials, more applicants have emphasized on the mutual relations between structure and property as well as creative academic ideas. Nonetheless, there are still some problems as follows: a great number of proposals for coordinated chemistry, molecule-based material chemistry and inorganic nano-material chemistry have been funded by the Division. The research contents were mainly focused on synthetic methods and structural characterization, and the study on the reaction process mechanism, relationship between the structure and property needs to be enhanced. More proposals are expected in regard to function-oriented synthesis and its application fundamental research. As for the proposals of bioinorganic chemistry, more

attention should be paid to the mechanism study on biochemical process of inorganic small molecules. The proposal for basic research and fruitful achievements in the area of radiochemistry should be further encouraged. Inorganic chemistry research should carry out more distinctive, systematic and thorough work with an emphasis on the research characteristics and novelty.

In 2017, applicants should focus their proposals on the development of inorganic synthetic chemistry and assembly methods, pay more attention to the combination of theory with experiment, and emphasize research on the correlation of structure and property of inorganic matters. Finally, proposals with creative ideas in the areas of solid state chemistry, bioinorganic chemistry and radiochemistry will be encouraged. Those function-oriented design ideas and leading research are more than welcome.

Analytical Chemistry

Analytical chemistry is to study the component and structure of matters and to determine their chemical composition, content and distribution in different time and space. It covers wide fields and branches including spectrographic analysis, electrochemical analysis, chromatographic analysis, mass spectra analysis, NMR analysis, stoichiometry, surface and interface analysis; and inorganic analysis, organic analysis, biological analysis, environmental analysis, pharmaceutical analysis, food analysis, clinical analysis and legal medical examination, characterization and structural analysis of materials, quality control and process analysis, instrument development and its combining-use techniques, etc.; and newly emerged omics-analysis, imaging analysis, in vivo analysis, single molecules and single cell analysis, microfluidic and chip analysis, chemo-informatics and bioinformatics, etc. The creative research related to the above areas will also be supported, such as new principles, new methods, new techniques, new instruments, new installation and key devices. Those extended studies focused on certain important scientific issues will be especially encouraged.

The funding scope of analytical chemistry ranges from macroscopic complex structure to the precise analysis and detection of a single molecule, aiming at building innovative technologies, methods and application. For example, new approaches of detection and imaging for rapid chemical processes and electron transfer process, new methods of chemical metrology for big data analysis and interpretation, new theory and new methods for sensor related research, and the application widening of the existing technologies in the field of important science are encouraged. Although a number of innovative analytical instruments programs are supported, instrument research program with more than 1.5 million yuan can apply for national major scientific instruments development projects.

The current development in the area of analytical chemistry is very fast with obvious features. The features are incarnated from the applications as follows: (i) The research system has transformed from simple system to complex one, focusing on “-omics” samples and living objects, etc.; (ii) More profound studies were stressed on unicellular and mono-molecular level; (iii) Prospective, fundamental and innovation have been taken seriously in the research contents; (iv) Research targets have been extended from components, structure, morphology, conformation of substances to biological function and associated signaling pathway, meanwhile data mining and processing are more emphasized;

(v) Research is not limited to the instrument analysis based on the tradition and simple principle, and new principles and knowledge from nano-science and microfluidic controlling techniques, bionics and physics, etc., have been more and more brought into the creation of new methodologies and new technologies of analytical chemistry.

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

Division II of Chemistry

The Division supports research projects in areas of organic chemistry and chemical biology.

Organic Chemistry

Organic chemistry is to study sources and components, synthesis and characteristics, structures and properties, reaction and conversion, and functions and reactive mechanism of organic compounds, which is one of the key disciplines for preparing new substances.

From the vertical point of view, the research of organic chemistry continuously deepens the disciplinary connotation and extends the discipline from micro to macro level. The purpose is to fully reveal molecular structure-property relationship of time and space, chemical bond formation as well as fracture and the principle of intermolecular interactions; to search for the optimal conditions for material conversions, and gradually realize the precise creation and application of organic compounds. From the horizontal perspective, organic chemistry proactively promotes the interdisciplinary integration with other disciplines and catalyzes new research growing points, which facilitates the solution of great scientific problems in the fields of energy, health, and environment and so on, and stimulates the national economic and social development.

The main features of current research in organic chemistry are incarnated as follows: The systematic recognition of structure, transformation and interaction of organic matter is constantly deepening, which promotes the discovery and application of new reactions and new reagents, as well as the development of new theory and new concepts. More attention in organic chemical reactions and synthesis are paid to selectively precise control and atomic/steps/redox economy and large-scale amplification. The activation and conversion of inert chemical bonds and small molecules, cheap metal catalysis, green synthesis and

bio-mass conversion have become the frontiers for sustainable development. New structure/reactive molecules and biological compatibility and orthogonality reaction have provided key materials and research methods to solve the problems of life science and modern agriculture at a molecular level. The original innovation of materials science has been promoted by creation of new functional materials and intelligent assembly system.

In recent years, remarkable progress has been made in fundamental research of organic chemistry in China, not only in scope but also in depth. Some research areas like organic synthesis methodology have been among the most advanced ones internationally and formed a number of characteristic systems. However, based on the proposals received in recent years, there are still some problems for the development of organic chemistry in China, such as insufficient originality, systematization, characteristics, depth and breadth, obvious homogenization research, weak ability to develop and lead a new area and new direction, unbalanced development of sub-disciplines and the serious tendency of publication-oriented utilitarianism. The Division will continually support the harmonious development of sub-disciplines, encourage to bring forward scientific questions with original innovation and carry out the long-term systematic research of important scientific issues, discourage the applicants to simply repeat and extend documentation and topics conducted by their supervisors, emphasize the diversification of the research ideas, research direction, research content, the scientization of evaluation and the internationalization of evaluation criteria, lead a comprehensive and healthy development of disciplines, focus on original breakthrough in fundamental research and contribution to industry based on the organic synthesis with the core target of material conversion, and further strengthen the interdisciplinary integration with physics, material science, life science and other fields.

Chemical Biology

Chemical biology is the science to accurately modify, manipulate and explain biological systems at the molecular level by means of exogenous chemical substance, interventional chemical methods or pathways. It not only develops new reactive technologies and molecular tools, but also provides new thoughts and concepts for research in the area of life science. It is playing an increasingly crucial role in the research of visual, controllable and creatable life processes (or function). Innate living characters are revealed by utilizing the means and ideas of chemical science; meanwhile the development and innovation of the discipline are promoted on the basis of the understanding and exploration of living systems.

Chemical biology focuses on the processes and dynamic rules of important molecular events in life science, and gives full play to the characteristics and creativity of chemical science. Study focuses are: (i) to achieve, explore and regulate the living action in real-time, in-situ and in quantitative analysis by means of the design and synthesis of molecular probe; (ii) to develop diversified catalytic and non-catalytic reaction with bio-compatibility, as well as its reactive mechanism, rule and application in living systems; (iii) to exploit new methods and technologies for the synthesis and decoration of biological macromolecules, such as protein, nucleic acid, polysaccharide, and biomicromolecules, such as lipid compounds, coenzyme factor, living nature products; (iv) to establish, optimize and utilize small molecule compounds library and high-throughput screening technology to detect and interfere the biological process in cell, thereby to reveal unknown pathways and

new life activities of interaction of biological molecules, promote the study of signal transduction and gene transcription based on active small molecules, and realize the identification of drug targets and the discovery and development of leading compounds; (v) to synthesize target molecule or complete special chemical reaction by using biosystem (e.g., microbe) and/or basic work unit (e.g., enzyme); (vi) on the basis of creating and developing innovative chemical tools and techniques, to develop new theory and technology for life science or living system, carry out chemical assembly and simulation of complex living system, exploit new techniques for disease diagnosis, solve chemical biological issues in medicine and carry out research into the frontier issues related to life.

The Division encourages those intercrossing projects with core contents like chemical material, reaction, principle and technology, and preferentially supports the themes as follows: (i) the discovery, design and synthesis of chemical molecular probe and its utilization in living process, and study on the molecular mechanism and functional regulation of important biological events; (ii) new methods and new techniques of analysis and detection for important substances and processes in living systems and human diseases; and (iii) study of molecular mechanism in key biological events, in order to strengthen basic research of solving biological and medical events by use of chemical means and methods for promoting intercross and cooperation between chemistry discipline, and biology and medicine. Applications with the original innovation rather than the simple continuation of the project or repetition of the other research groups are encouraged. Studies on chemical biology in all directions will be supported to achieve the balanced development of chemical biology in various fields.

Division III of Chemistry

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

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

Among the proposals received and funded by the Division, chemical catalysis has

been one of the most active research areas in physical chemistry, and more and more attention is paid to the essence of catalytic action in studies. More and more studies on electrochemistry and colloid and interface chemistry focus on the basic physicochemical issues in materials and life sciences, so that the number of proposals and funding concerned have been steadily increasing. Research areas of chemical thermodynamics and kinetics have been broadened, and the development and application of microcosmic research methods in these areas have become a new trend. The development of theoretic chemical methods and computational chemistry programs has been emphasized. It has become a new growth point that theories and experimental methods of physical chemistry could be used to solve major issues in life science. However, research on experimental methods of physic-chemistry and the development of novel instruments, particularly for the research and application of spectroscopic methods, should be further strengthened.

The Division encourages applicants to give play to the discipline's strength, focus on the scientific frontiers, meet the national needs, and emphasize creative, systematic and prospective studies for developing new concepts, new theories and methods. The intercrossing research with other disciplines and the fundamental research with important theoretical significance and potential for application in the areas of energy, information, environment, materials and biomedicine will be advocated. Meanwhile, the Division invites researchers of other disciplines to apply for interdisciplinary projects, and application should stress the scientific problems correlated with physical chemistry and theoretical chemistry in their proposals.

Division IV of Chemistry

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

Polymer Science

Polymer science program deals with the synthesis, molecular structure, chain structure, condensed state structure, properties and function of polymers as well as their processing and application. The scope of polymer science covers the research on soft matter, including synthetic polymers, biomacromolecules and supramolecular polymers.

In the field of polymer chemistry, it needs to develop the synthesizing methodologies of polymers, explore the novel catalysts or initiators for polymerization expired by new ideas from other disciplines, and develop the reaction methods with mild, high efficiency and high selectivity. It also needs to stress polymerizing reaction with controlled structure and molecular weights as well as its distribution, pay attention to biosynthesizing methodologies and the chemical reaction process involving polymers, and emphasize the polymers synthesized by non-oil resource, and polymers with new structure, such as supramolecular polymers, hyper-branched polymers, dendrimer and chiral polymer. Meanwhile the Division will attach importance to the mass production methods of the optical-electric functional polymers.

In the field of polymer physics, it needs to deepen the understanding of the basic laws of condensed state physics of soft matter. Main tasks include: to pay attention to

polymer crystal, liquid crystals and glassy states and their phase transitions, and the hierarchical structure of the condensed state and its dynamic transition; to pay attention to the research on surface and interface of polymers, size effect of micro or nanostructure on properties of polymer; to enhance studies on the polymer solution and rheology; to pay attention to developing polymer characterization techniques and carrying out polymer structure characterization by using major national scientific and technological infrastructure; to stress the research on theory of polymer, as well as the methods for the bridge up gaps in multi-scale simulation; to focus on the research on polymer physics related to biological systems; to emphasize the research of the condensed state physics of the semi-rigid chains of optical-electric conjugated polymers.

In the field of functional polymers, it should be addressed to understand and develop new functional materials and functional system of polymers, e.g., polymers with electric, optic and magnetic functionalities, polymers correlated with biology, medicine and pharmacy, as well as polymers with the function of adsorption, separation, reaction agents, catalysis, bio-sensing and molecular recognition; to promote the functional polymer as the advanced soft matter used in those technologies related to the fields of energy, information, biomedicine and environment, especially pay attention to the polymers related to energy technology; to find novel research pointcut and areas with opportunities from the studies of natural polymers and biomacromolecules, so as to develop the cross-sectional research between synthesized polymers and biomacromolecules; to stress the studies on responsive polymers, environmental-friendly polymers, self-healing polymers and bioinspired and biomimic polymers. A new field is the synthesis of the two-dimensional functional polymers and the porous covalent polymeric frameworks.

As for the polymer assembly, the research focuses on the supramolecular polymers and polymer supramolecular assemblies. It needs to study the assembly processes between different polymers, polymers with small molecules, and polymers with the molecular aggregates, the effects of multiple weak interactions and their inside principle between supramolecular building blocks and interface, the ordered assembly with different size and shape by regulating the non-covalent interactions, and in turn to implement the function.

For applied science of polymer chemistry and polymer physics, it needs to further creatively develop the methods for optimizing polymerization and regulating reaction process of major category of polymers. It should be stressed to explore new technology in polymer fabrication and processing. It is encouraged to find out important fundamental issues from polymer industries, and pay attention to the fundamental research on high performance polymer, polymer composites, chemical fibers, polymeric elastomers, polymer membranes, flame retardant polymer, natural polymer, organic/inorganic hybrid polymer, aging and service and reactive oligomers as precursors of thin films and coatings.

It is necessary to strengthen the research on the basic scientific issues and classical issues of polymer science, which particularly needs the interdisciplinary and comprehensive research over full scale of the above-mentioned fields.

It should be noted that in recent years, few proposals have been received in methodologies of polymerization and structural characterization.

Environmental Chemistry

Environmental chemistry is mainly to study the principles and methods of pollution

characteristics, transportation and transformation, ecological environmental effects, health hazards and control of chemical substances. Major funding fields cover the following branches: environmental analytical chemistry, environmental pollution chemistry, pollution-controlled chemistry, pollution ecological chemistry, environmental theoretical chemistry, regional environmental chemistry and the relation of chemical pollutants with human health. In recent years, research on environmental chemistry has been developed rapidly along with the comprehensiveness and intercrossing with other disciplines. Research contents are gradually opened up from microcosmic mechanism to macrocosmic rule and their creativity and systematization are enhanced step by step. Currently, environmental chemistry is playing an increasingly important role in promoting the frontiers of fundamental research and solving national major environmental problems.

Based on the proposals received in recent years, major research orientations include: (i) identification, new analytic principles, methods and technologies of pollutants; (ii) environmental chemical behavior and microscopic mechanism of pollutants in various media, and evolution process and mechanism of regional environmental qualities; (iii) formation mechanism and control principles of air pollution, polluting chemistry and control of water body environment, pollution process and renovation technology of soils, and treatment technologies and reusable principles of solid waste substances; (iv) pollution ecochemistry and its health effects; (v) application and safety of new environmental functional materials in pollution controlled process; (vi) structure/effects and dose/effects of pollutants and forecast model of environmental pollution and (vii) the effects of chemical pollutants on ecological environment and human health. However, there are still certain problems in proposals, such as lack of innovative ideas; inadequate refinement on fundamental scientific issues; ambiguous key points; low-level simple repetition and unclear technical route.

The Division encourages the applicants to refine the key scientific issues from the actual environmental problems and to develop and apply modern scientific and technological means and methods, in conjunction with the major demands in the prevention of environmental pollution. It is also expected to study environmental characteristics, molecular transformation, ecological and health effects, and the principles of control technology of pollutants through combining the laboratory simulation, field research with theoretical calculation simulation.

Division V of Chemistry

The Division funds research projects in the two areas of chemical engineering and industrial chemistry.

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

technology will be especially emphasized.

In recent years, the fundament research of chemical engineering in China has made a great progress; research quality has been constantly enhanced; research team has been continually expanded; research ideas have also become more and more innovative and unceasingly opened up; and international influence has been steadily promoted. Key common scientific issues extracted from the research and practice in complex industrial systems gradually form systematic theories and key techniques step by step, which have become a major trend in areas of chemical engineering and industrial chemistry. A lot of new research contents are raised as follows: (i) the research transforms from the measurement and correlation of macro-properties to the observation, measurement and simulation of micro-/meso-structure, interface and multi-scales, and great attention is paid to the optimization and regulation of micro-/meso-structures, reinforcement of processes and scale-up rules; (ii) the research extends from common systems to the uncommon and extreme processes; (iii) from chemical processing engineering to the chemical product engineering and full life cycle process. Under such circumstances, there are still some problems. For example, some proposals lack of original creative ideas and breakthrough work, and especially some proposals are hardly combined with key scientific issues based on national needs. The Division encourages that researchers in basic areas, especially in traditional chemical engineering areas, should keep up their own defined study direction instead of blindly following hot subjects, and carry out the intercrossing and integrating research with other disciplines.

Under the guidance of the national goals and social needs, the Division will give preferential support to studies on basic theories, key practical technologies and sustainable development in chemical engineering and industrial chemistry to enhance the overall national comprehensive strength and creative ability. Particular focuses will be given to the following studies: (i) the research on frontier subjects in new and high technologies of chemical engineering and newly emerged disciplines, which should pay attention to extracting the chemical engineering issues from the intercrossing study of multi-disciplines and emphasizing the development and innovation of scientific theory and technological means; (ii) the research on key technologies in chemical engineering related to the national economy and people’s welfare, which should strengthen the originality and systematism of fundamental researches, improve the existing theories of the discipline and manifest the leading and scientific support role of basic research.

In 2017, the following research areas will be encouraged in the Division: basic chemical engineering data, transfer and reaction processes in uncommon condition, chemical process equipment and safety, chemical pharmaceutical engineering and health, synthetic biotechnology, energy, resources and environment, as well as food chemical engineering with creative ideas.

Department of Life Sciences

The funding of the Department of Life Sciences covers a broad spectrum including biology, agricultural sciences and basic medicine, which extends to various fields of resources, environment, ecology, population and health, etc. In recent years, with the

support from NSFC and other funding sources, together with unremitting efforts made by Chinese scientists, research in life sciences has achieved extraordinary progress in China. Not only the number of authentic research articles published by Chinese scientists in international authoritative journals is climbing, but the quality of research is improving rapidly.

In 2016 the Department of Life Sciences received 10,806 proposals, of which, 10,576 were accepted for General Program and 2,700 projects were funded, including projects of Small Fund for Exploratory Studies, with a funding rate of 24.99% (accounted by the accepted proposals, and all the data bellows are also calculated by the number of accepted proposals). The average direct cost is 603,700 yuan per project, among which, there are 2,580 projects funded as 4-year General Program projects. The funding rate for 4-year General Program projects is 23.88% and the average funding intensity is 620,100 yuan per project. In the future, the Department will continue to emphasize on funding decision according to the research quality and actual need rather than funding in equal intensity. The Department also expects that the home institutions of applicants should pay close attention to academic standard of research and improve the quality of proposals. In 2017 the funding of General Program projects is expected to keep constant as the previous year. **The applicants should apply for funding according to the actual need of the research.** For proposed research having more exploratory nature but with weak research basis, we suggest applicants apply for lower funding. For those with solid research basis and recent important progresses in previous work and requiring more funding to carry out further investigation, applicants may apply for higher intensity of funding according to the actual need. It should be noted in particular that the budget in proposals will be evaluated by peer reviewer and the panel.

The Department has been encouraging researchers to carry out original study with innovative academic ideas, as well as novel technology and approaches, particularly for those playing a pivotal role of promoting the development of related disciplines with authentic ideas. Emphasis will be put on proposals with novel theories, firm hypotheses and the interdisciplinary importance based on previous research over a long period of time. The Department will pay attention to important frontiers and new emerging fields in life sciences in the future, while keeping a balanced and harmonious development among various disciplines. The Department continues to encourage studies concerning basic research on morphology, structure and function of cells, tissues, organs and systems, and actively support researches related to human physiology, biochemistry, immunology, reproduction, development, aging, stem cell and tissue engineering, etc. Studies will be encouraged on aiming at fundamental level scientific questions of life sciences using various disease models. Pivotal investigations to agriculture sciences and environmental ecology are encouraged.

The Department encourages researchers to carry out systematic and innovative work focusing on key issues over a long-term period, therefore, great importance to project management at later stage. The Department implements the funding policy depending on the performance of previous funded project, and gives preferential consideration to applicants with good performance in their previous projects under equivalent conditions. **Moreover, considering the problems commonly occurred during the application and peer review processes in recent years, the Department reminds applicants to pay special attention to the following points when writing proposals:**

Funding for General Program Projects in Department of Life Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Microbiology	167+7*	10,599+175*	25.66	171+7*	10,605+175*	24.65
	Botany	187+7*	11,881+175*	25.80	189+7*	11,716+175*	28.08
Division II	Ecology	163+7*	10,381+175*	25.07	167+7*	10,334+175*	25.78
	Forestry	167+7*	10,616+175*	23.45	166+7*	10,273+175*	22.67
Division III	Biophysics /Biochemistry /Molecular biology	144+3*	9,138+75*	31.89	146+6*	9,061+150*	30.58
	Immunology	71+4*	4,526+100*	30.49	72+4*	4,454+1008*	29.12
	Biomechanics and tissue engineering	86+8*	5,467+200*	26.18	84+5*	5,193+125*	25.87
Division IV	Neurosciences	77+4*	4,906+100*	29.35	77+5*	4,804+125*	26.71
	Psychology	46+4*	2,940+100*	24.04	49+4*	3,026+100*	20.46
	Physiology & integrative biology	79+4*	4,988+100*	32.68	77+4*	4,752+100*	31.15
Division V	Genetics and bioinformatics	125+6*	7,925+150*	25.74	126+6*	7,850+150*	26.67
	Cell biology	101+5*	6,419+125*	34.98	101+5*	6,263+125*	32.02
	Developmental biology and reproductive biology	72+4*	4,596+100*	29.80	73+4*	4,515+100*	29.73
Division VI	Agriculture and crop sciences	197+8*	12,478+200*	21.44	200+8*	12,398+200*	23.19
	Food science	174+8*	11,025+200*	17.98	180+7*	11,175+175*	19.34
Division VII	Plant protection	126+6*	8,021+150*	21.75	127+6*	7,864+150*	23.67
	Horticulture and plant nutrition	135+6*	8,589+150*	21.83	140+6*	8,663+150*	22.92
Division VIII	Zoology	133+5*	8,446+125*	31.80	130+5*	8,081+125*	32.69
	Animal husbandry and grassland science	112+6*	7,115+150*	23.74	116+6*	7,228+150*	21.75
	Veterinary medicine	114+6*	7,222+150*	21.66	118+6*	7,309+150*	22.30
	Aquaculture	69+5*	4,362+125*	21.14	71+5*	4,426+125*	22.22
Total		2,545 +120*	161,640 +3,000*	24.73	2,580 +120*	159,990 +3,000*	24.99
Direct cost funding per project		61.78 (63.51**)			60.37 (62.01**)		

Note: * Pilot projects of Small Fund for Exploratory Studies; ** Average funding for General Program project excluding Small Fund for Exploratory Studies; + Funding rate including projects of Small Fund for Exploratory Studies.

(1) In the explanation part of the Guide to Programs of the Department of Life Sciences, as well as of the eight scientific divisions, the funding scope of the Division is emphasized and the categories that are not to be accepted have been clearly noted. Therefore applicants should read carefully according to their subject of application. It

should be stressed, that **the categories not to be funded by the Division in the General Program Guide may apply to other types of programs in the same Division**.

(2) Concerning applications related to medical ethics, applicants should provide the hard copy of the certification of ethic committee from their host institutions or the superior administrative agencies, as well as electronic copy submitted as attachment in the system.

(3) Concerning applications related to operation with highly pathogenic microbe, applicants should abide by national regulations concerned, and perform under bio-safety qualified conditions.

(4) The signature of both the applicant and all participants should be in regular script, and the signature should be the same as the one in printed form in the application. Any kind of "personal signature" which is not inconsistent with the printed form is not acceptable. Please note specially that the signature and the name in printed form may not be in different languages, for instance Chinese and English; otherwise, the proposal may be declined due to determination difficulty.

(5) The applicants should note that the fund is filled in the unit of 10,000 yuan. Misfiling will cause errors in the budget, leading to a decline.

(6) Please fill in the research period according to the notes requirement for application in this guide. If the start time is earlier than the deadline of the applications, they will be declined.

(7) The application code should be specified to the final level. Applications fail to provide the detailed code will be declined. Please refer to the division guides for specific requirements on application codes

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

Division I of Life Sciences

The funding scope of Division I covers two disciplines, namely microbiology and botany.

Microbiology

The Microbiology discipline supports basic research in the area of microbes, including fungus, bacteria, achaea, virus, prion and other microbes. Major funding fields in this discipline include resources and taxonomy of microbe, microbe ecology, microbe group behavior, metabolism, physiology and biochemistry of microbes, microbe genetics and evolution, microbe epigenetics, microbe morphological differentiation, structure and function of microbes, synthetic biology of microbe, the interaction between microbes and their hosts, the relationship of microbes and environment, the pathogenesis and drug-resistance of pathogenic microbes, etc.

There is an obvious lack of balanced development of different branches in microbiology, observed based on previous years of grant application and funding situation. The number of proposals aiming at study on mycoplasma, rickettsia, chlamydia, spiroplasma, phage, prion, etc., is relatively small, indicating that the related research team

needs to be augmented and intensified. The discipline of Microbiology encourages researchers to carry out fundamental and authentic studies in the fields listed above. Preferential support policy will be given to these fields.

In 2017, the discipline will continue to give preference funding to areas in the taxonomy of microbes (such as Pezizaceae of ascomycetes, Tricholomataceae of basidiomycetes, etc.), and taxonomy research combining novel technology such as whole genome and big data with traditional methodology is especially encouraged, so as to foster cultivation of young scientists.

The discipline encourages the exploration of novel techniques and methodologies applied to basic research of microbiology, and especially welcomes scientists in mathematics, physics, chemistry, and information sciences to carry out interdisciplinary studies related to microbiology; encourages research based on single microbe cell, structural compositional research of microbe, basic research in pathogenic microbe and marine microorganism, and functional research on microbe in complex system; systematic research to mechanisms of frontiers in life sciences applying microbe as model system is preferentially encouraged.

In order to promote the development of microbial research on the new technology and novel method, convergence of multi-field academic thoughts, research methods and technical tools as well as to break the traditional disciplinary barriers for solving of complex scientific problems, strengthen the integration of mathematics, physics, chemistry and microbiology, information technology and engineering and other related disciplines, the Department pilots to spend 5 million yuan as special support for non-biology education background researchers (including undergraduate or graduate professional stage for mathematics, physics and chemistry, electronics, information engineering, etc.) in the discipline of Microbiology. In 2017, the application code for this kind of interdisciplinary research is C0104.

Botany

The discipline of Botany supports basic and part of applied basic researches on plants. It mainly covers studies in areas of structure of plants, taxonomy (including flora geography), plant evolution biology, paleobotany, plant physiology, plant biochemistry, plant morphology, plant development, plant reproductive biology, plant chemistry and natural product chemistry, endangered species protection, resource plant (including economic botany), marine/ocean botany, ethno botany, interaction between plant and environment, plant secondary metabolism, plant nutrition and substance metabolism, plant germplasm (including conservation and innovation of germplasm), as well as the exploration of new techniques and methodologies related to botany.

It can be seen from the applications accepted and funded in recent years that the development of each branching field within the Botany discipline is unbalanced. There are relatively more applications in areas such as plant phylogeny, plant hormone, growth and development, and resistance physiology, and therefore the research quality is relatively high. Systematic and creative research should be further strengthened henceforth. Besides, emphasis on interdisciplinary study is put to the application of novel technologies on those relatively developed fields listed above. On the other hand, there are fewer applications in the fields such as paleobotany, biological nitrogen fixation, photosynthesis, respiration,

water physiology, mineral elements and the metabolism, organic synthesize and transportation, physiology of seed, plant introduction and acclimatization, plant germplasm, hydrophytes and ocean plant and resources, etc. Applications that have research basis in the above-mentioned subjects will be encouraged.

Applicants are also encouraged to carry out their studies in the fields of systematic plant biology, plant tropism biology, invasive plant biology, molecular basis of plant cell totipotency as well as plant response to environmental change, etc.

The discipline of Botany will continue to give preferential support to plant taxonomy in 2017, especially to strengthen the support to young taxonomists. The discipline encourages applicants to carry out research on species revision of certain families and genus on the world wide range and plant resources research in key areas and special environment.

The interdisciplinary studies of botany with other related fields will be strongly encouraged, especially with mathematics, physics, chemistry, geosciences, and ecology, genetics, genomics, proteomics, metabonomics, bioinformatics and computer science, etc. Studies are also encouraged on the discovery and development of novel instruments, technologies and methodologies applying to further research in botany, such as new detection techniques, high-throughput screening techniques, advanced imaging techniques, analysis techniques of high efficiency, etc. To encourage applicants to put forward unique or typical scientific issues based on their strength and research basis, the discipline will intensify its support to projects with high degree of creativity. In order to achieve better use of local advantages, resources advantages, and talent training, the discipline will encourage collaborations among applicants with institutions or groups having unique special advantages.

Division II of Life Sciences

The Division supports researches in areas of ecology and forestry.

Ecology

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

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

study on landscape and regional scale.

In 2016, a large number of applications were accepted in fields of ecosystem ecology, physiological ecology, pollution ecology, globe change ecology, population ecology, conservation biology and restoration ecology, microbiology ecology, and molecular ecology, etc., while relatively fewer applications in the areas of evolution ecology, behavior ecology, landscape and regional ecology and civil ecology. Scientific questions and research aims in globe change ecology are lack of proper variations. In the future, the discipline will strengthen its support to biological ecology, including micro evolution ecology, species differentiation, and pedigree ecology. The discipline encourages studies on behavior ecology, civil ecology, landscape and regional ecology, and soil ecology. Continuous encouragement is put on special-regional ecology studies in the Fund for Less Development Regions.

The discipline reminds applicants to pay attention to the following points in 2017: The content of research proposal should focus on key points with clear definition of scientific issues, and special attention should be paid to scientific aspect and feasibility of the research route and methods. Proposals regarding to the multidisciplinary and macro research should put enough emphasis on the combination of the theoretical study with the national need.

Forestry

Forestry is to reveal the essence and mechanisms of the biological phenomena by taking forest and xylophyta as its research objects, in order to carry out the cultivation, protection, management, and utilization of forest resources. The Forestry discipline covers studies in fields of forest resources, forest resources information, wood physics, chemistry of forest products, forest biology, forest soil science, silviculture, forest management, forest health, tree genetic breeding, non-wood product forest science, landscape architecture, desertification, and water and soil preservation, as well as related new technology and methodologies in forest related studies.

In recent years, there is a tendency of rapid growth of basic research on forest, but the unbalanced development among sub-disciplines remains the key issue. It is shown from applications in recent years that the number of proposals submitted to branches such as wood physics and the chemistry of forest products is large, while there are much fewer applications to the more classical sub-disciplines like silviculture, forest soil science and forest management, indicating a trend of shrinking. The proposals failed to focus on important basic scientific issues in some important fields, such as silviculture and non-wood product forestry. Some applications in the field of forest genetic breeding on homologous gene cloning and function verification failed to carry out the research from the angle of biological characteristics of trees, as well as lack of close relation with forestry production.

There are two major features in basic research of forestry. The first one is to meet the national needs for forestry development. Therefore applicants should pay close attention to formulating the important and key scientific questions from the forestry industry. The second is to carry out continuous and in-depth studies regarding to perennial woody plants for a relatively long period of time. In the future, the discipline will continue to prioritize to support basic research in such core fields like silviculture, the health care, the efficient utilization of forest resources, etc. The discipline will encourage researchers to carry out investigation in fields of advanced generation tree breeding theory and methods,

multi-service function of forest and management, forming mechanism of wood superior traits, the analysis of the specific growth, silviculture, forest soil science, forest management, garden planning and landscape architecture and development mechanisms of trees, which meet the national strategic needs at the international frontier research fields.

In 2017, applicants should pay close attention to the following: the discipline of Forestry will not accept proposals on pharmaceutical functional verification of effective components targeting at animals. Proposals should focus on targeted scientific questions with a precise title.

Division III of Life Sciences

The Division covers disciplines as follows: biophysics, biochemistry and molecular biology; immunology; and biomechanics and tissue engineering.

Biophysics, Biochemistry and Molecular Biology

Biophysics is a cross discipline to investigate mechanisms of biological problems and phenomena, applying the theory and method of physics; Biochemistry and molecular biology is a discipline to study chemical composition of living organisms as well as chemical changes during the process of life, and to research the life phenomena and activities of life process at the level of biological molecules. The Division mainly supports studies on the following issues: (i) structure and function prediction of biological macromolecules, protein crystallography, NMR, biological mass spectrometry, electron microscopy, small angle scattering and its composites; structure of protein complex and membrane-proteins; novel structural biology methodology for functional study and predictions of macromolecule; (ii) Structural studies of protein complexes and membrane proteins, as well as the development of structural biology methodology for novel research on function and structure determination of proteins, as well as other biological macromolecules; (iii) the interaction between macromolecules (including small molecules); (iv) the role of post-translational modifications on stability and function of proteins; (v) classical biochemistry of protein and peptide, nucleic acid and enzymology; (vi) molecular mechanisms of metabolism regulation on biological macromolecules, such as protein, sugar, lipid and nucleic acid; (vii) computational biology, bioinformatics, systematic biology and synthetic biology; (viii) interaction and regulation between bioplasma membrane and membrane proteins; (ix) studies on polysaccharides and glycoconjugates; (x) the effect and role of the physical environment to organisms, including microgravity and space radiation; (xi) novel technology and methodology in biophysics, biochemistry and molecular biology.

Considering the contents of applications received in the past three years, fields with more applications as well as more approved grants are the following: structure and function of protein complexes, which have in-depth researches with sound background and accumulation. Among studies on protein structure, the number of applications aiming at function of protein complex as well as membrane proteins is climbing; researchers and application numbers of cryo-electron microscopy are developing fast; NMR study on macromolecules remains the same with previous years. The proposals accepted on the

interaction of biological macromolecules can carry out their research closely connected with important vital movement of cells. There are comparatively high-quality applications in areas of nuclear biochemistry, including non-coding RNA metabolism, post-transcription modification and their interactions with proteins for various function and regulation. As for studies on the structure and function of biomembrane, the quality of applications is relatively high in transmembrane signal transduction and transportations across membrane. Proposals in areas of structure computing and theoretical forecasting of large biological molecules and bioinformatics have well reflected the character of the intercrossing of disciplines. Researches on bio-effect and functional mechanisms of ionization and the electromagnetic radiation to organisms, and proteomics are inadequate in the quality of proposals. Applications for structure and function research on glycoconjugates and environmental biophysics showed significant improvement in recent years. Applications on acoustic biophysics, photo-biophysics and space biology are few. There is a wide range of research directions covered by new techniques and methods in the area of biophysics and molecular biology, and some applications have creative ideas in terms of the development of disciplinary intercross methodology and new technology in recent years. Interdisciplinary studies for novel technology and methodology are encouraged.

As a discipline with bio-molecules as the object of study, focusing on methodology, the discipline will continue to encourage studies on investigation of life phenomena on the level of molecules. Funding priorities is given to the following fields: (i) researches on the methods of structure computing and forecasting of large biological molecules and complexes, protein crystallography, nuclear magnetic resonance spectrum, bio-mass spectrometry, electronic microscope, small angle scattering, etc., for studying the structure and function of protein and complexes; biological studies on the protein complexes and membrane protein structure, and the development of new structural biology methods for the structure determination and function study of proteins and other large bio-molecules; (ii) applications with new methods and ideas from mathematics, information sciences, and interdisciplinary subjects, to carry out researches on bioinformatics, systems biology or integrative biology; (iii) molecular mechanism studies of the regulation of glucose, polysaccharide glycol-conjugates and lipid biochemistry will be moderately encouraged; (iv) applications on the mechanisms of environmental physical factors to organisms, and research on the effect of space factors to organisms in micro gravity, space radiation conditions will be moderately encouraged.

Immunology

Immunology is a frontier and leading discipline in life sciences and basic medicine. The funding areas of the discipline include molecular immunology, cell immunology, immune response, immune tolerance, immune regulation, immunogentics, reproductive immunology, mucosal immunology, vaccine, antibody engineering, and novel technologies and methodologies of immunology, etc.

The discipline mainly supports basic research aiming at the structure, development, function and abnormal mechanisms of immune molecules, cells, tissues, organs, and immune systems. The core funding areas include: (i) Gene expression and regulation, structure and function of immune molecules; structure basis of immune recognition; recognition, activation and effects of innate immunology; molecular mechanisms of antigen

presentation; structure, function and immune-pathogenic of cytokines and chemokines; (ii) The differentiation, development, migration, tissue distribution of immune cells and sub-cells and their functional modulation, evolution and comparative immunity; (iii) Identification, response and regulation of innate and adaptive immune; infectious immunity; tumor immunity; self-immunity; hypersensitivity; initiation, progression and elimination of inflammation; mechanisms and intervention of non-infectious diseases; (iv) Cell and molecular mechanisms of immune tolerance; malfunction of immune tolerance; mechanisms of transplant immune tolerance; abnormal immune response and immunodeficiency; (v) Molecular and cellular mechanisms of immune regulation; abnormal of immune regulation; nerve-endocrine-immune network; immune metabolism; (vi) Immune heredity; genetic basis of immune-related diseases; epi-genetic regulation of immune response; (vii) Immunological mechanisms of reproduction and pregnancy; cross-interaction between reproductive endocrine and immune system; (viii) The function and mechanisms of mucosal immunity and local immunity; (iv) Basic immunology problems during the manufacture of vaccine; (x) Studies of antibody engineering, including scientific problems on the establishment of new techniques and methods and new research system of immunity.

It is clearly demonstrated from the applications in 2016 that there is a rapid progress of immunological research in China, with the proposals covering a wide range of subjects, and the quality of research contents improved obviously. Most of the proposals were based on solid background and pre-studies; some applications analyzed the possibilities of technical failures and were able to provide alternative resolutions as backup plans; a few proposals were carrying out systematic cutting-edge studies based on novel hypothesis. However, there are problems such as lack of substantial subject intercrossing, etc.

In 2017, the discipline will support applications with creative academic thoughts; encourage applicants to concentrate scientific problems from their former research and practice to carry out in-depth exploration of mechanisms targeting at specific scientific target; encourage the establishment of typical research system and techniques platform, and highlight the setting-up and application of various novel methods and techniques in immunological studies; encourage study in areas of systems immunology, immunomics and computational immunology; encourage basic research relating to the structure of immune system and abnormal function, and the close cooperation of scientists working in basic and clinic studies.

Biomechanics and Tissue Engineering

This discipline is a branch intercrossing of life science with other research areas. The funding scope covers biomechanics and biorheology, biomaterials, tissue engineering, biomedical electronics, bionics and nano-biology.

The funding of biomechanics and biorheology fields includes: the coupling of molecules-cellular mechanics-chemistry on cellular-subcellular-molecular level, the mechanical property and its mechanisms on system-organ-tissues aspects, mechanical simulation and modeling, and mechanics of biomaterials.

The funding of biomaterials mainly covers studies on the regenerative medicine; biomaterials for tissue engineering; implants, interventional biomaterials, and biomaterials of artificial organs; drug or gene carrier biomaterials; surface and interface of biomaterials

and its biological effects, compatibility and safety of biomaterials.

The funding of tissue engineering fields includes: regeneration and construction of tissues and organs of normal human, studies on in vitro three-dimensional constructions of malfunction tissues such as tumor, as well as new techniques and methods on bioreactor, bio-manufacturing, micro-tissue and organ reconstruction, etc.

Bioelectronics and bioimaging mainly cover biomedical-signal detection and recognition, biosensor, biomedical imaging and image processing, appropriators and systems of biosystem detection.

Subjects mainly involved in the field of bionics include: molecular bionic, bionic function and mechanism, bionic materials, bionic surface interface, bionic device and system.

Nanobiology mainly covers studies in areas of nano-biodetection, nanocarriers and delivery, nano-biological effect and its safety.

According to applications in recent years, there is an imbalanced development among the above five sub-disciplines. In 2016, in the sub-discipline of biomechanics, projects were mostly in such fields as biomechanics of cellular and molecular biomechanics, bone and other tissues and organs of the movement, while biomechanics studies on other organs were rare; in tissue engineering, most projects focused on bone and cartilage tissue engineering, oral tissue engineering, stem cell transplantation and tissue regeneration, but were lack of proposals on other important organ tissue engineering, as well as novel methodology; in the biological image and bioelectronics devices sub-discipline, there was a lack of study on biomedical signal detection and analysis, biomedical sensing, biomedical detection and system applications; in the field of nano biology, few studies were proposed on nano-bio safety evaluation. Most of the proposals funded in 2016 showed solid research basis and provided clear scientific questions with novelty. The main weakness of applications was lack of original ideas, or lack of substantial interdisciplinary collaboration.

In 2017, the discipline will continue to encourage applications to carry out systematic multidisciplinary research in fields of biomechanics and biorheology, biomaterials, tissue engineering, biomedical electronics, bionics and nano-biology. Researches should aim at key scientific issues in the process of important tissue/organ reconstruct engineering, as well as interdisciplinary studies, especially long-term, systematic and in-depth study in tissue/organ replacement and repair, engineering reconstruct and transformation of regeneration.

In particular, the discipline encourages and supports the basic research in tissue biomechanics basis and the practical application, other than bone/joint motion system, and cardiovascular system; study on interaction mechanisms and new effect features between biological materials and the body; the novel methods and new technology of tissue engineering (such as 3D printing, biological manufacturing); studies on bioelectronics and biological systems related to the study of bionics, and nano biodetection, nanometer biological safety evaluation and application of ethics.

Special notes for applicants: biomaterial and bionic research other than biology/biomedical applications is excluded in this discipline.

Division IV of Life Sciences

The Division's funding areas cover three disciplines: neuroscience; physiology and integrative biology; and psychology.

Neuroscience

This discipline is to study the structure and functions of nerve system, and investigate the essence and mechanisms of human/animal behaviors and cognition activities. The goal of neuroscience study is to reveal the essence of human neural activity, from a primary sensory and instinctive behavior, to a higher level of language, learning, memory, attention, awareness, thinking and decision-making at all levels of the nerve function.

The funding areas of neuroscience cover molecular neurobiology, cellular neurobiology, developmental neurobiology, sensory neurobiology, system neurobiology, behavioral neurobiology, computational neurobiology, and other related studies concerning techniques and approaches of neuroscience.

About 32% of the proposals submitted and projects funded in 2016 are focused on molecular neurobiology and cellular neurobiology (research fields in neural plasticity, nervous system damage and repair, learning, development, memory and behavior of neural mechanisms). The third largest group of applications was abnormality of neuronal structure and function (for instance, development of neurodegenerative diseases), taking up about 17% of total number of applications, whereas there are fewer applications under the applying code of tactile neurobiology, computational neurobiology and neuronal informatics. The funded proposals normally demonstrate high degree of novelty, with precise description of scientific questions and proper research plans. Areas with the most funding include neuronal development, behavior, and neuro-degeneration diseases. Major reasons that applications not funded include lack of innovation, concise scientific issues unclear, weak basis of the previous work, as well as insufficient feasibility of the project. In addition, applications should have clear scientific hypothesis, research should focus more on key scientific issues, and the proposals should meet requirements of writing standards.

In 2017, the discipline will continue to encourage basic research in the following areas: analysis of molecular, cellular and circuit mechanism of brain activity; interdisciplinary study of neuroscience with chemistry, physics, and materials, etc.; studies related to malfunction of neuronal system to reveal mechanisms of diseases at various levels such as molecules, cells, circuit and body; neurobiological research on primates is encouraged. Applicants should design precise neurobiological scientific issues and research contents within the funding scope of the discipline, as well as choose the correct application code for the application.

Special notes for applicants: cognitive studies with human being should apply to the discipline of Psychology.

Psychology

Psychology studies human mind and behavior, aiming at ultimately understanding initiation, development, performance and regulation mechanisms of cognition, emotion, motivation, intelligence, consciousness, and personality, via various levels of investigations

from molecule, gene, physiology, brain, to behavior, population and computational modeling. Scientific experiments and quantitative analysis are introduced to allow psychology growing into an independent discipline from philosophy. Due to the complexity of study object, psychology research is becoming a combination of multi-level and multi-angle one, with more and more specialized branches and series of interdisciplinary layers. Armed with novel technologies and methodologies of neural science, information science, medical science and engineering science, multiple branches of psychology study are providing interpretations and analysis to the material basis of psychological activities: brain and its structure and function.

The main subjects supported in psychology discipline include cognitive psychology, experimental psychology, developmental and educational psychology, physiological and medical psychology, social and personality psychology, genetic psychology, health psychology, clinical psychology, consulting psychology and applied psychology (including engineering psychology, exercise and sports psychology, management psychology), as well as the brain structure and neural basis of cognition, learning and memory, attention and consciousness, language and thinking, and techniques and methods of cognitive science, etc.

There has been unbalanced development among the branches of this discipline. Many researchers are focusing on fields of cognition psychology, biology psychology, medical psychology, development psychology and social psychology, whereas fields in education psychology, applied psychology and sports psychology are relatively lack of research. In the near future, it is speculated that studies in the following fields will achieve breakthrough: psychology process and mechanisms of learning and memory, sensory perception and multi-channel integration, psychology mechanisms of emotion and behavior control, psychology stress and intervention, human cognition and development of social behavior, as well as mechanisms of mental disorders and early recognition.

In 2016, most grants applied to cognition psychology, making 24% of total applications. Development psychology, social psychology and medical psychology covered 10% each, while there were fewer grants on genetics psychology, stress psychology, individual psychology and cognition simulation. Statistics from funded grants showed that topic on perceptional information processing, memory and thinking mechanism in cognition and neural mechanism of decision making and problem were mostly funded in cognition psychology; social development and cognition development were the most funded areas in development psychology; social behavior and mental disorder in medical psychology were top sub-fields in social psychology.

In 2017, while continually supporting priority areas, the discipline will pay more attention to genetic psychology, personality psychology, medical psychology, etc. The discipline will continue to encourage multi-discipline study, applying novel neuronal imaging, gene analysis, brain stimulation, big data analysis, system tracking, etc., so that to prompt the increase of the scientific significance and research level of psychology study. The discipline encourages interdisciplinary studies so that to concrete national requirement of development, especially to stress researches on social hotspot with Chinese characteristics, and to encourage applied research to play fully the prompting role of psychology to the national social development.

Physiology and Integrative Biology

Physiology is a subject to study the phenomena of life activities, principles and regulation. The funding scope covers the physiological function and its mechanisms of homeostasis control under normal conditions, as well as the change of structure and function of human cells, tissues organs and the sustainable homeostasis control and the related research. Integrative biology is an emerging discipline of science to depict quantities and predict biological function, phenotype and behavior, and to investigate the operating law of information flow. The discipline emphasizes on innovative studies in the area of integrative biology from molecules to the body level, revealing the mechanisms of body homeostasis control.

In 2016, funding for circulation physiology is mainly for researches on blood pressure regulation, blood vessel malfunction and system, arrhythmia, and myocardial remodeling and function renovation; proposals funded in the area of respiratory physiology focus on respiratory dynamics; structure, function, regulation and abnormal in respiratory system; lung injury and repair; respiratory centers and respiratory regulation; pulmonary vascular smooth muscle and pulmonary arterial hypertension. The area of digestive physiology covers investigation on the function of stomach, intestinal, liver, gallbladder, pancreas and body's protection mechanisms upon damage. Proposals funded in the area of urinary physiology cover regulation and control mechanisms of water-salt metabolize of kidney, renal fibrosis, and functional regulation of ladder. Most of the applications supported in the area of reproductive physiology cover researches on the occurrence and fertilizing of germ cells, implantation of embryo, and the regulation and control mechanism of the placenta function. Most of the applications in neurosystem concentrate their researches on the hypoxic-ischemic encephalopathy, neurodegeneration, injured nerve repair, brain and cognitive behavioral, etc. Most of the applications in the area of exercise physiology mainly focus their researches on the physiology mechanisms of the health by exercise, and the prevention and treatment of diseases. Most of the applications in the area of human anatomy concern about basic research of applied anatomy. The embryology, which covers regulation mechanisms of embryo development, tissue damaging and regeneration, is the major funding area as well. Moreover, endocrine, and glucose metabolism, lipid metabolism, insulin resistance, trace elements (include calcium and phosphorus metabolism) nutrition, senescence, and biological rhythm as well as hemopathology are the key funding areas as well. The discipline will continue to encourage innovative researches on aging and biorhythms, as well as studies on the functional integrative and regulative mechanisms between different systems. In 2017, basic scientific problems based on disease model will continue to be encouraged.

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

Division V of Life Sciences

The funding scope of the Division covers the following three disciplines: genetics

and bioinformatics; cell biology; and developmental biology and reproductive biology.

Genetics and Bioinformatics

Genetics is to study the inheritance and variation of organisms on various levels of molecules, cells, individuals and populations. Bioinformatics is an interdisciplinary field of biology and computing science, aiming at the exploration and improvement of methods and means to obtain, store, manage and analyze biological data.

The funding scope of the discipline mainly covers human genetics, plant genetics, animal genetics, microbe genetics, genomics, molecular genetics, epigenetics, cell genetics, population and evolution genetics, bioinformatics, behavioral genetics, biostatistics, synthetic genetics and systems biology, etc.

The genetics discipline will give priority support on the following fields: the study of genomic variation and evolution law of complex biological characteristics, including the identification, analysis of key genetic function and its regulating rules; genetic diversity; the correlation between phenotype and genotype; the genotype in analysis and the express prediction of complex traits and complex diseases; the evolution model and mechanisms of genetic variation for important populations; study on the genetic and molecular basis of genetic disease of single gene and complex diseases of multi-genes, including identification of genomic function variation, recognition and prediction of disease genes, and molecular signal route concerned; studies on basic genetic laws and the molecular mechanisms of gene expression and regulation by using model organisms; the establishment of genetic operating system, new methods and technologies of phenomics and genetic breeding; basic researches on the genetic law of typical resources, major agriculture crops, microbe, etc.; and the molecular basis of genetics and variation of organisms under extreme or special environment; novel genetic fields such as genetic editing, chemical genetics, photo-genetics, phenotype-nomics, 3D/4D genomics, algorisms and methodology in biological big data, etc.

In 2016, the numbers of applications received in areas of animal genetics, microbe genetics, cellular genetics, population genetics, behavior genetics and evolution genetics were relatively small, whereas those fields are pivotal concepts in classical genetics research. The discipline will prioritize proposals with solid previous studies and novel scientific questions in the above branches. Heredity and variation in human genetics support studies on molecular mechanisms of heredity and variations. In 2017, the discipline continues to encourage original studies on genetic mechanisms and basis.

As for bioinformatics, the discipline mainly supports the development of new algorithm and analysis techniques, which are used to study genomic structure, function and evolution; mass data integration and systems biology analysis; curation of biological data, integration, standardization and visualization of bio big data; design and synthesize of molecular module and network. It is encouraged to carry out combination study between bioinformatics analysis and experiment verification of organisms. The discipline will continue to encourage and support research on new theory and methodology, as well as interdisciplinary study of genetics.

Cell Biology

Cell biology is to study the principles and mechanisms of life activity. Cell biology is mainly aimed at revealing the structure, function, phenotypes and regulation mechanism at

molecular, cellular and individual levels within organisms, as well as studies on cytological mechanisms of phenotype and functional abnormal occurrence of organisms.

The funding scope of the discipline mainly includes: cellular and organelles structure, components and their assemblage mechanisms; regulation mechanisms of cell growth, division, and cell cycle; stem cell biology; cell differentiation; cell polarization; maintenance of cell homeostasis; cell senescence; cell death; autophagy; movement of cells; cell signal transduction; extra cellular matrix; vesicle transportation (including endocytosis and exocytosis); material and energy metabolize of cell; intercellular interaction; cell and environment; cell and microbes; host cell interaction with virus; new materials, new technology and methodology used in cell biology study.

Studies on the structure and function of cells have been the major aspects supported by the discipline. Applicants are encouraged to carry out integrated studies on the mechanisms of synthesis, modification, degradation, localization, and translocation of protein with the aggregation, dissociation, location of its components, and the activity diversification with time and space of protein complex during the process of cell signal transduction with dynamic change mechanisms of life activities of cells. Highlight will be given to endeavors on solving important problems in basic cell biology upon using cell models or model systems, in combination with techniques and methods of genetics, developmental biology, chemical biology, and cell imaging technologies, etc.

Among the applications accepted in 2016, there were fewer applications in areas of cell growth and multiplication, extra cellular matrix, establishment of cell polarity, cell substance transportation, cell metabolism, plant cell biology and research of new methods, whereas the above areas are pivotal in cell biology and have foundations in related researches in China. The discipline will prioritize funding to applicants who present their proposals with scientific issues from their solid research background on these aspects.

In 2017, the discipline will continue to emphasize on functional and mechanism issues, highlighting the utilization of various novel research technologies and methodologies in cell biology. The discipline will actively promote the development of techniques in cell in situ and real time, dynamic and high-resolution analysis, and highly value integrated researches from molecular to cellular and individual levels, so as to reveal different molecular mechanisms closely linked with cell function and biological effect and regulation network.

Developmental Biology and Reproductive Biology

The funding scope of this discipline covers three research fields including developmental biology, reproductive biology and stem-cell biology. The ultimate goal is to explore the basic rules of gametogenesis, fertilization, embryo development, the occurrence and growth, homeostasis, damage recovery and regeneration, aging of various organism tissues and organs.

The key biological issues in developmental biology (animals, including human) include: proliferation and migration of embryo cells; the determination of embryo polarity; the inducement and differentiation of germ layers; cell lineage and cells fate determination; morphogenesis of tissues and organs; growth and shape control of tissues and organs; organ homeostasis maintain and regeneration; tissue and organ senescence; abnormal development and related diseases; evolution of development mechanisms and influence of

environment to development, etc. The key biological issues in the area of plant developmental biology concern mechanisms of organogenesis and cell differentiation, especially the molecular regulating mechanisms study of fertilization, zygotic activation, the development of embryo and endosperm, nutrition, and the occurrence and development of breeding organs; organ aging; resolution of signal transduction of flower induction and gamete development; the study of the maintain of stem-cells and its function of growing point; and the exploration of the relationship between development and evolution.

The key biological issues in reproductive biology include: sex determination; gonad differentiation, development and aging of reproductive organs; the fate determination, migration, multiplication of primordial germ cells; the occurrence and maturation of gamete; development of plant anther and ovary; occurrence of follicular and ovulation; interaction of germ cells and somatic cells; the sperm-egg reorganization and fertilization; early embryo development and implantation; and apomixes; influences of genetics, epigenetics and environment factors on reproductive health; the mechanisms of reproductive system diseases; the security of assisted reproductive techniques; and the regulating role of reproduction, and the regulation function of reproductive endocrinology.

Key scientific issues in the area of stem cell biology include: embryonic stem cells; reproductive stem cells; tissue stem cells; disease related stem cells; plant stem cells; stem tip and root tip; plant cambium; cell reprogramming and induced pluripotent stem cells; nuclear transfer of somatic cells; embryogenesis of plant somatic cells; resting and activation of stem cells; the proliferation of stem cells and maintaining of pluripotence; self-renewal of stem cells; cell cycle regulation of stem cells; the directional differentiation of stem cells; senescence of stem cells; malignant transformation of stem cells; stem cells and microenvironment; immunogenicity of stem cell; cell trans-differentiation.

In 2016 the number of applications on organogenesis and stem cell was relatively big, some of which were able to aim at the international frontier. In reproductive biology branching, research was closely related to human reproductive clinical practice, taking into account the basic and applied studies, reflecting the research trend of transformation from basic research to clinical medicine. In the future, this discipline will continue to encourage applicants to carry out cutting-edge basic research closely related to human needs for reproductive medicine.

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

Division VI of Life Sciences

The Division covers two disciplines: basic agriculture and crops, and food sciences.

Basic Agriculture and Crops

The discipline mainly supports basic researches targeted at crops. The studies emphasize on scientific questions of the laws of crop growth and development, the interaction between crops and environment, the genetic improvement of crops and the production of crops covering branches of basic agriculture, crop cultivation and farming system, physiological ecology of crop, germplasm resources, genetic breeding of crops and crop seed science, etc.

The main aspects of crop science are as follows: the germplasm and gene resources of crops; genetic and molecular mechanisms of important crop property formation; the interaction between crop and environment; the high-yield theory of crop, rules of resource utilization with high efficiency; and the quality control of crop seed and yields. The discipline encourages scientists to carry out researches driven by scientific issues based on crop production and sustainable development of agriculture, focusing on basic study around the above fields. The discipline will encourage basic research with the combination of modern genomics, biotechniques, bioinformatics and traditional crop science for targeting on scientific frontiers of crops and the national future demands of agriculture industry. Studies on crop information science, which combine information techniques, computing biology, systems biology with crop science, will be promoted. Researches on crop physiological ecology and cultivation regulation carried out around the high-yield, fine quality, high efficiency, the resilience production of crop, and as well as the high efficient utilization of resources will be encouraged. Endeavors on studies of cultivation, physiological and genetic system by using crop varieties and their parental materials which are broadly used in production, and studies on germplasm resources innovation by using new techniques and methods (like atomic energy, etc.) and related theory will also be encouraged.

It is reflected from the applications in recent years that there was a climbing number of proposals with basic issues on topics meeting the national demand of agriculture, an obvious increase in interdisciplinary studies around basic agricultural issues. However, major problems remain as the following: (i) researches on crop genome are generally concerned, but more attention is yet to pay on further exploration of mechanisms of physiology and genetics; (ii) following-up work with the international frontier is increasing, but it should be performed in close combination with practical issues of national agricultural production, so that to provide potent support of basic research to applied research; (iii) some of the applications are lack of systematic and sustainable studies; (iv) there are more applications in agricultural information, utilizing physical methods (such as spectrum, infrared, remote sensing, 3D photography, etc.) to acquire agricultural information, but there is a lack of in-depth theoretical study, and difficulty exists on actual utilization; (v) some of the proposals are not standardized with inaccurate information, such as untrue or incorrect contents in the resume part, especially in the order of authors for publications, or the list failed to present the real contribution of the applicant and others.

Applications to this discipline should take crops and crop products as their research objects, and the interdisciplinary studies with other subjects should not depart from the principal object; otherwise proposals will be rejected. The discipline will encourage the organic combination of new theory, techniques with traditional methods, laboratory work with field experiments, and support will be preferentially given to continuous and systematic work.

The discipline does not accept applications with research objects of agricultural animals, animal products, microbe, forest, vegetable, traditional Chinese medicine, algae, woods, and model plants of Arabidopsis thaliana. Branches of mathematics, physics, agriculture and agricultural meteorology, agricultural information and agricultural system engineering accept closely crop-related research only; Branch of medicinal crops do not accepts application other than medicinal crop breeding and planting. Please fill in the application code to the final level (four digits or six digits, such as C1302, C1305, C1306, C1307 or C13XXXX). Applications fail to provide the detailed code will not be accepted for further review.

Food Science

Food science studies the physical, chemical, biological, nutritional and safety properties of food and food materials, as well as principles of food storage processing, the theory and methods enhancing the nutrition value of food and security. Integrating theory and methodology of various subjects in biology, chemistry, physics, nutrition, microbiology, and agriculture, food science covers a broad spectrum of food material science, food biochemistry, food fermentation and brewing, food nutrition, food processing, food storage, transport, and preservation and, food safety, etc. The discipline mainly supports basic researches based on food and raw food material as research objects, covering basic food materials science, food biochemistry, food fermentation and brewing, food nutrition and health, biological basis of food processing, food storage and fresh keeping, food safety and quality control.

Problems existing in proposals accepted in 2016 include: (i) a small number of proposals excessively emphasized on the technology and product development; (ii) Incorrect or incomplete application code; (iii) the writing of proposals is not up to the required standards, especially with untrue or unprecise CV contents; (iv) lack of continuity for some of the applicants; (v) loose research contents, failing to concisely demonstrate their key scientific issues, etc.; (vi) some proposals were tracking up study, lack of novelty or in-depth research.

The discipline will not accept proposals in the following areas: (i) food technology, processing technology, food development, chemical modification and studies related to the prevention and treatment of diseases; (ii) health products; (iii) disease prevention and treatment research with food and food ingredients; (iv) drug development; (v) growth, development and metabolic physiological studies of plant and animals; and (vi) preclinical experimental research directly using human body. In addition, in recent years quite a few projects applied to this discipline is declined with the most prominent reason that the research content does not belong to the funding scope of food sciences, with the following four reasons: (i) research related to health care products; (ii) the food and food ingredients to the prevention and

treatment of diseases of the project; (iii) plant growth and metabolism physiology; (iv) drug development and research.

Please fill in the application code to the final level (i.e., the six-digit code, e.g., C200101). Applications fail to provide the detailed code will not be accepted for further review.

Division VII of Life Sciences

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

Plant Protection

The discipline covers plant pathology, agricultural entomology, agricultural weeds, agricultural rats and other pest, plant chemical protection, biological prevention and cure, quarantine of agricultural pests, invasion biology, and biological techniques of plant protection, etc. Recently, the theory and technologies of genomics, proteomics, metabolic and molecular genetics are widely applied in the innovation of theory and techniques of pest control. However, basic research of plant protection in China is relatively weak, and especially there is a large gap between China and developed countries in the basic research on functional genomics of the interaction of important pests and crops, mechanisms of pest's virulence and crop resistance (sensibility), law of pest disaster, production and safe utilization of new pesticides with high efficiency, low poison, and environment-friendly property, etc.

The following problems exist in the 2016 applications: (i) for some of the researches, emphasis was put on the simulation studies in the laboratory at the molecular levels, whereas more attention should have been paid to the field study and verification; (ii) quite a number of applications simply traced or imitated researches related at home and abroad, or grafted one research method (or material) to another material (or method), with a lack of original ideas; (iii) in some of the applications, the research topics were over broadly laid out, with a lack of concrete of scientific problems, and the research contents were not precise, lack of in-depth studies and substantive subject intercrossing; (iv) some of the proposals aiming at too large target with too many goals that were not achievable, as well as the lack of a deep mechanism research plan; (v) some of the grants are inadequate of working basis and lack of systematic continuity.

In 2017, the discipline will continue to encourage researches focusing on the national security of agricultural production, quality safety of agricultural products, and eco-environmental safety. Researches should focus on scientific issues concreted from practice of agricultural production, and put more emphasis on the innovation of new theory and methodology in plant conservation, and on the original creativeness of research. As for research contents, it is encouraged to carry out explorations of the reciprocity mechanisms of crop-pest-environment (biotic and abiotic) at either microscopic or macroscopic level; principles of disaster of hazardous organisms; monitoring, forecast, prevention and control of pests; and the basic and applied basic research of pesticide toxicology and its safe utilization. Special attention should be paid to new scientific issues, combining with the

factors of the national crop of ecological features of different regions, to study the adjustment of industrial structure, improvement of cultivation measures, and the global climate change, etc. On the research approaches, emphasis should be put on the combination of new theory and new technologies with traditional methods, as well as integration of laboratory work with field experiment. For interdisciplinary studies, the specific aim of solving major scientific questions in the plant protection field should be elaborated. Preferential support will be given to continuous and systematic research. Excellent proposals will be prioritized funded in the field of agriculture weed, farm rats and diseases and pest forecasting of agricultural crops, etc., in order to promote the balanced development of different branches in plant conservation.

Applications taking woods or model organisms such as Arabidopsis and Drosophila as main research objects will not be accepted.

Horticulture and Plant Nutrition

The funding scope of this discipline covers two research subjects, namely horticulture and plant nutrition.

The funding scope of horticulture covers pomology, olericulture and fruit science, ornamental horticulture, horticultural facilities, post-harvest biology of garden crops and food mycology. In recent years, there has been a rapid development of basic research in horticulture in China. The quality and activity of research work have been much improved in the field of horticulture: the research objects have broadened and diversified, and research approach has been gradually transferred from traditional organism level and cell level to molecular level; studies based on -omics have been actively carried out in horticulture. Great achievement has been made in the study on basis of trait formation of horticulture crops, regulating measures, gene mining and function identifying, germplasm excavations and innovation, mechanisms and control of quality formation, response mechanisms to adversity, mechanisms of rootstock-scion interaction, the formation and regulation of unfavorable components of horticultural products.

The funding scope of plant nutrition covers the heredity of plant nutrition, physiology of plant nutrition, manure and fertilizer science, nutrient resources and recycling, crop-soil interaction and regulation, etc. Based on the frontier of the discipline and the national demands on agricultural resource environment, plant nutrition has been focusing its basic research on the interdisciplinary study of the plant-soil-microbe interactions, especially on root microbe-omics and regulation so as to reveal the coupling mechanism of high efficiency use of plant nutrition elements and water resources; studies on the functional genomics, genetics and physiology of plant nutrition, which are formed by the combination of plant nutrition with modern biotechnology; quantitative study in the process of soil-crop system in the combination of plant nutrition with information techniques, etc.; researches on the new theory and methodology in manure and fertilizer science; and the exploration and sublimation of modern plant nutrition theory from practice of traditional agricultural production.

In 2016, major problems in the application for horticulture were the following: (i) the research content in some of the applications was too broad and lack of the precise layout of basic technique requirement for research approach and method, indicating low level of feasibility to achieve proposed research goals; (ii) there were a large number of

proposals pertaining to copying and tracing research, but only a few demonstrated original creativeness and systematic study; some applications concentrated their researches on practical problems of horticulture, but lacked of sufficient scientific issues; (iii) some of the applications in the field of facility horticulture neglected the combination of facility gardening environment and its regulation with biological problems of garden crops; (iv) some of the grants were inadequate of working basis and lack of systematic continuity. Main problems in the applications for plant nutrition were as follows: (i) many applications put their study emphasis on molecular biology of plant nutrition, without in-depth study on mechanisms on the physiology and genetics aspects of plant nutrition; (ii) there was a lack of substantial interdisciplinary studies among crop-soil-microbe, and in-depth study on the efficient nutrient utilization under intensification conditions; (iii) lack of basic researches on nutrient resources and fertilizing science.

In 2017, the discipline will continue to encourage endeavors on scientific issues based on national agricultural practice and agricultural industry development, with a close combination of new approaches with traditional methods. Priority funding will be given to original, continuous and systematic and distinctive research. The discipline of horticulture will support proposals which take horticultural crops as their research objects, and address scientific problems on the features of horticulture crops, and production yield, quality, fastness, and constancy. Proposals originated from the assessment, extravagant and utilize of germplasm resources of the nation or wild garden crops will be strongly encouraged. Research on specific biological problems, such as winter dormancy of horticulture crops, flowering phase, scion interaction and organ formation and development, is especially encouraged. As for applications in facility horticultural studies, proposals should emphasize on the substantial combination of facility gardening environment and its regulation with biological problems of garden crops. Studies on the genetic, physiologic and molecular mechanisms of nutrient utilization of high efficiency, interaction between crop, soil and microbe and its control, and the coupling mechanisms of soil water and fertilizer, and its effectiveness to crops will be prioritized in funding. It is especially encouraged to apply for the experimental testification of laboratory research in the field and excellent proposals in “manure and fertilizer science”. Researches on the nutrient mechanisms of middle and trace elements will also be encouraged for an active promotion of healthy development of all branches in plant nutrition.

Applications using forest or model plant like Arabidopsis as its research objects will be not accepted by this Division.

Division VIII of Life Sciences

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

Zoology

Zoology studies the life phenomena and principles in animal morphology, taxonomy, physiology, behavior, ecology, evolution and genetics. The effective application of theory and techniques in molecular biology, bioinformatics, computing biology, and related

subjects has greatly enriched the research contents of zoology. Studies on animal diversity, ontogeny and phylogeny, co-evolution and phenotypic evolution, animal behavior and adaptability have become cutting-edge research areas; whereas research on animal taxonomy, zoogeography and animal resource utilization, and conservation biology has been deepened and integrated continuously. Laboratory animal science has acquired more and more recognition.

Applications accepted by the discipline in recent years have demonstrated that researches in some subjects have already formed their own features and acquired significant international impact. It can be also observed that not only the formulation of scientific problems as well as rationality of designs, but also the creativeness of academic thoughts of the proposals are greatly improved. However some problems still exist, for example, the excessive pursuit of hotspots without solid research basis, and the lack of justification for proposed research and feasibility of technical routes; insufficient experimental accumulation was provided by some of applications, or the description of detailed research progress and contents; some proposals were lack of scientific problem or hypothesis with explicit definition, or overstating research objectives; the budget for research is impractical in some proposals; repetitive application still exist on a small scale.

In the future, the identification and description of unknown species of animals, and revised study of known species of animals will remain the key funding areas by the branching field of taxonomy. Taxonomy of ocean animals should also be highly valued. Key research areas currently focus on the animal phylogeny and zoogeography, as well as the life history around the evolution. The discipline will encourage researches on animal physiology, animal behavior, and the establishment of model animals, etc. Support will be strengthened for researches on conservation biology for endangered animals, the sustainable utilization of important resource animals, and related biological researches for important alien invasive species and bio-safety. Basic research of zoology for specific species in China and fragility of western and remote areas will be continually encouraged. In addition, the discipline will pay more attention to basic research on zoology; encourage original studies and exploration based on animal resources and regional features in China and the application of new theory and technologies. Interdisciplinary studies will be encouraged.

Special attention for applicants: this discipline will not accept grants for clinical diagnosis and treatment as well as with model organisms as study materials.

Animal Husbandry and Grassland Science

The major funding scope for animal husbandry and grassland science is to study the growth, development, feeding and breeding of domestic animals; the utilization of animal products, and grassland plant resources; quality and higher yield forage grass and the synthesized utilization of resources for maintaining pasture conditions and increasing productivity of grass and livestock.

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

Applications accepted and funded in 2016 covered all branches of this discipline, among which, the majority of applications focused their studies on mining excellent genes of typical excellent domestic animals of the country and their functional genome, molecular genetically breeding, reproduction and development model, molecular mechanisms of regulation, new theory and methods related to molecular nutrition, and the development of fine grass germplasm resources and fine variety cultivation, the livestock of low emission, and the interaction of animal husbandry development and its environment. Quite a few studies in the above fields have formed their features in many aspects. Moreover, researchers started to pay close attention to international and domestic cooperation and exchange, and endeavors have been put to the research which may acquire independent intellectual property rights.

In 2017, the discipline will give more priority to studies on excellent gene mining of typical livestock, poultry, grass, silkworm and bees of China, and cultivation of fine species; encourage basic research on nutrition of domestic animals, prolificacy of live stocks, and the genetic breeding of grazing; and the high efficiency utilization of feedstuff and forage resources. The discipline will also give moderate preference to researches on the environment of domestic animals and pollution, behavior and welfare, mechanisms of the physiological adaptation of productivity, and grassland pasture, sericulture and apiculture, etc.

Special notes for applicants are the following: (i) study object of the research should be livestock, poultry, grass, silkworm, or bee; interdisciplinary studies with other subjects are not allowed to depart from the main research aspect above; otherwise the proposal will be not funded; (ii) for research topic selection, please grasp the essence of key scientific issues in related fields, instead of simply following up the new research progress at home and abroad.

Veterinary Science

Veterinary science is to study the occurrence, development, diagnosis, prevention and cure of animal diseases. The discipline covers the following branching: animal diseases, zoonoses, public hygiene, laboratory animals, veterinary medicinal industry, etc., as well as other related novel interdisciplinary research areas.

The discipline supports basic researches taking animal diseases as major objects on animal infectious diseases, zoonoses, most common diseases and comparative medicine. The funding scope covers: basic veterinary science, animal (veterinary) pathology, veterinary immunology, veterinary parasitology, veterinary epidemiology, traditional Chinese veterinary, veterinary pharmacology and toxicology, and clinical veterinary science.

Proposals accepted and funded in 2016 covered all subjects of this discipline. Among them, the majority of applications were focused on veterinary epidemiology, basic veterinary, clinical veterinary and veterinary immunology. Some of them were able to aim at the international frontiers, highlight the creativeness in the selection of their research themes, and actively prompt the international standard of research work. However, problems still existed as demonstrated here: some of the applications paid much attention on the international hotspot, but were lacking of enough concentration of scientific issues; basic research on topics such as traditional Chinese veterinary, animal (veterinary)

pathology, etc., were yet to be concerned.

The discipline will continue to encourage studies on the epidemiology, pathogenic biology, mechanisms of pathogenic infection and immunity about important animal epidemic diseases and zoonoses, meanwhile, strengthen researches on the basic veterinary immunology, the non-infectious disease of animal mass populations, food safety of animal source, and related research, and give moderate preferential support to studies on traditional Chinese veterinary, and animal (veterinary) pathology, etc.

In 2017, the discipline requests applicants to take animal diseases as their main research objects and interdisciplinary studies should not deviate from the research objects. This discipline encourages research for the development of national animal husbandry and veterinary science, aiming at defeating new and recurrent animal diseases. Special note to applicants: when involving highly pathogenic microbes, the operation of the project must strictly abide by the relevant provisions of the state, with the biological safety of the appropriate conditions.

This discipline does not accept research on the prevention and control of aquatic disease.

Aquatic Science

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

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

In 2016, most of proposals accepted and funded were in areas of immunity and control of diseases and pests of aquatic organisms, aquatic basic biology, genetic breeding of aquatic organisms, as well as aquatic resources and conservation, etc. Relatively in-depth studies were conducted on important economic traits of aquatic animals, molecular characters of important pathogens and their pathogenesis, etc., and some of studies have formed their own research features and superiority in some aspects. It can be seen from peer review and panel meetings that the creativeness of academic thoughts of proposals were obviously improved. However, only a small portion of applications were able to propose original research on the important scientific issues of aquiculture, whereas for most of the studies, concentration of specific scientific issues was yet to be improved.

In 2017, the discipline will request applicants to focus their studies on research fields of aquatic science, and aim at the frontier and important demands of production. The interdisciplinary study on aquaculture subjectively with other disciplines will be encouraged. It will be strengthened to support proposals with original ideas. Applicants should choose topics based on new development of subjects concerned at home and abroad, and their research background, aim at scientific problems, focus on original innovation, and avoid over emphasizing on R&D for technology while lacking of key scientific issues. Research on model organisms should be based on aquaculture science. The discipline will encourage

cooperation of applicants with superior units and teams, so as to fully exert regional and resource priority, and enforce cultivation of talents. The Division will prioritize applications in the following areas: genetic rules and gene function of economic traits of important breeding organisms; epidemiology and pathogenesis of important aquatic organisms; host immunity and diseases prevention and treatment; molecular basis and regulation mechanisms of breeding and development of important aquatic organisms; regulation mechanisms of the utilization as well as metabolism of nutrient stuffs for aquatic animals. Moderate support will be provided in the following areas: basic research of aquatic breeding and interaction with eco-environment, conservation of aquatic resource, new model and new techniques of breeding, etc.

Department of Earth Sciences

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

The above sub-disciplines of earth science are the core and bases for the progress of earth science. The General Program is aiming to promote the balanced and harmonized development for all disciplines of earth science, facilitate original innovation and expend the frontier of research, and hence to build up a robust basis for the development of the earth science. In 2016, the Department received 5,867 proposals for the General Program submitted from 683 institutions. Among them, 1,573 were funded with a total budget of 1.0826 billion yuan (direct expenses, and hereinafter), with a success rate of 26.81% and an average budget of 688,200 yuan for individual project. Among the funded projects from the General Program in 2016, 891 (56.64%) were from universities and 661 (42.0%) from research institutions. The PIs of 1,058 projects (67.26%) were younger than 45 years old. There were 124 interdepartmental and interdisciplinary projects, and the proportion of interdisciplinary projects supported by different divisions inside the Department of Earth Sciences is even higher. Small Fund for Exploratory Studies with 1-year research is set up for highly exploratory, innovative and high risk projects or projects with uncertainty. Altogether, 8 proposals were approved as the Small Fund for Exploratory Studies projects in 2016 and 1.7 million yuan were allocated.

The criteria for the selection of General Program projects in 2017 are still as follows: (1) Innovation and academic value of the overall research approach; (2) Research capability of the applicants; (3) Clear stated scientific issues and well defined ideas; (4) Availability of necessary research basis and conditions. During the selection of the proposals, the department pay close attention to the importance of the basic or traditional disciplines, maintain the international status of the privileged discipline or fields in China, promote the disciplines which are still weak or even “endangered” in China yet predominant in the world, encourage the intercrossing, integration, infiltration and synthesis among disciplines, improve the development of the frontier and basic sub-disciplines, foster the development of the sub-disciplines closely related to experiment, observation, data integration and simulation, and recognize the importance of the intercrossing of the earth science and other

disciplines. While advocating innovations, the accumulation of research work should be emphasized. Under the same condition, preferential support will be given to those applicants who have a good accumulation of previous studies and high-quality results obtained from their recent completed projects, as well as who apply to continue their studies. Applicants are required to address the relation between the proposed research work and their accomplished projects. In regard to the exploratory, unforeseeable and long-term running for basic research, special attention will be paid to the high risk, interdisciplinary and frontier research. Scientists will be encouraged to face the great challenging scientific issues and to carry out risky and exploratory research. The average amount of individual grants will be constant to that of the previous year.

Funding for General Program Projects in Department of Earth Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Average funding for direct cost	Funding rate^{+} (%)	Projects	Average funding for direct cost	Funding rate^{+} (%)
Division I	Geography (including soil science and remote sensing)	524+3*	35,000	24.10	534+2*	35,017	23.83
Division II	Geology	360+2*	26,844	29.03	365+2*	26,488	27.72
	Geochemistry	137+1*	10,048	28.11	137+1*	9,809	28.93
Division III	Geophysics and space physics	180+1*	12,980	29.34	182+1*	12,816	29.85
Division IV	Marine science	189+1*	13,365	25.78	191+1*	13,349	26.82
Division V	Atmospheric science	155+1*	10,993	30.41	156+1*	10,781	32.17
Total		1545+9*	109,230	26.83	1,565+8*	108,260	26.81
Direct cost funding per project		70.29 (70.58**)			68.82 (69.07**)		

Notes: * The number of projects of Small Fund for Exploratory Studies for 1 year; ** Average amount for individual projects with a full term (not including Small Fund for Exploratory Studies projects); + Funding rates include the projects of Small Funds for Exploratory Studies.

Division I of Earth Sciences

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

The main research areas funded by the Division are aiming at the understanding of evolution processes, spatial heterogeneity and interaction mechanisms of natural and human elements in the terrestrial surface system. Physical geography focuses mainly on interactions, spatial heterogeneity and evolution processes of modern natural environmental elements at multiple tempo-spatial scales, and concerns the human-land relationship since the Quaternary Period, especially Holecene. Human geography concentrates mainly on the different types of modern human elements, spatial structure and evolution processes of their information carrier, and concerns natural background, historical development and human

mechanism of regional human elements' spatial structure formation. Soil science is an independent discipline for the understanding of pedogenic processes and spatial distribution, soil physical compositions and characteristics, and spatiotemporal evolution processes of soil functions. It emphasizes on the physical, chemical and biological mechanisms about the changes of soil quality and soil function caused by excessive human utilization. Geographic information science (remote sensing and geographic information system) is a discipline of acquiring, processing, analyzing, presenting, transmitting, memorizing and managing geographic tempo-spatial information of terrestrial surface assisted by the modern technologies of remote sensing (RS), geographic information system (GIS) and global position system (GPS), especially concerns the study on geographic information interpreting. Environmental geography focuses mainly on environmental pollution, ecosystem conservation and restoration, natural hazards and risk, and resource utilization and management, which concerns about the negative effects on human living and development space by human activities, and analyzes the interactions of human and environment, mechanisms and strategies of the sustainable development. It should be reminded that technology research and development, production technique, product development related to solar energy, wind energy, biological energy and water treatment, etc., are out of the funding scope of the Division.

In 2016 the Division received 2,249 applications for General Program, among which 536 projects including 2 projects of the Small Funds for Exploratory Studies were funded financially with a direct cost of 655,000 yuan averagely per application (not including the Small Funds for Exploratory Studies). The research fields of these funded projects were categorized into physical geography (including D0101, D0103 and D0104) with 151 projects, human geography (D0102) with 63 projects, soil science (D0105) with 115 projects, geographic information science (D0106, D0107, D0108) with 130 projects, and environmental geography (D0109, D0110, D0111, D0112) with 77 projects.

In 2017, a standardized selection of "application code", "research field" and "key words" will be tried out continuously in the Division. When filling out the application forms, applicants should visit the "special focus" under the item of "application acceptance" on the official home page of the NSFC (http://www.nsfc.gov.cn/), and read carefully the "list of application code, research field and key words (D01 and subordinate codes)" and make sure their applications in accordance with the funding areas of the Division.

Division II of Earth Sciences

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

Geology (Including Environmental Geology)

Geology (including environmental geology) is the knowledge system about the composition, structure and evolution of the solid Earth. The aim of modern geology is not only to elucidate the structure, the material composition and the mechanism controlling the transition of materials of the solid Earth, as well as the history of the environment and life evolution recorded by these materials, but also to reveal the agents and processes which

modify the surface of the Earth. The knowledge of geology can also be applied to explore the utilizable energy, water and mineral resources, to disclose the relationship between geological processes, life evolution and human activities, and to protect the earth environment and mitigate geo-hazard.

The development of geology is based on the progress of the fundamental theory and cutting-edge technology. The introduction of plate tectonic theory has brought about revolutionary changes to the understanding of the Earth. The disclosing of complexity of the continental dynamics and tectonic schemes predating the plate systems, is further raising new themes for the advancement of plate tectonic theory. The development of mantle plume theory and geo-fluid in recent years has closely linked the deep activities together with surface phenomena of the solid Earth. The enhancement of abilities to obtain and analyze data has become a major driving force to promote the development of geological science. The improvement of instrumentation, such as high precision, in-situ and real-time analysis of the terrestrial materials has enhanced the ability to determine the composition and evolution for the earth's specimen. The development of geophysical exploration, space-based observation, and geological drilling technology has increased the integrity and accuracy of the understanding of the structure of the Earth. New high-tech approaches such as information system, internet of things and photoelectron technology have helped to realize real-time monitoring of the crustal movements, Earthquake and volcanic activities. The developments of computer simulation and high-temperature/high-pressure experiments have made possible for reproduction and predication of important geological processes.

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

The geological program encourages characterized proposals of basic research on fundamental theory based on field and site observations by using of the abundant materials and data recently acquired and accumulated by the geology-related agencies and institutions. Multidisciplinary approaches, such as the application of the concept, theory, technology and methodology of mathematics, physics, chemistry as well as biosciences, are encouraged to study geological issues. International collaboration, which may combine the privileged local geological features, is encouraged to promote the progress of geological theories with global scientific views.

In 2016, 1,324 proposals for General Program projects were received and 367 were funded with a success rate of 27.72% and an average direct expense of 721,700 yuan per

project. The distribution pattern of the funded projects among main research fields is as follows: projects in areas of paleontology, stratigraphy and sedimentology account for 15.7% of the total funds, projects in areas of mineralogy, petrology, volcanology, economic geology and geo-mathematics for 20.6%, projects in areas of petroleum geology and coal geology for 11.3%, projects in areas of Precambrian geology, structural geology and tectonics for 12.2%, projects in areas of Quaternary geology and environmental geology for 13.8%, and projects in areas of hydrogeology, geo-engineering and geological drilling technology for about 26.4%.

The predominant defects in the applications in 2016 are as follows: The proposed topic is too broad to be supported by the General Program, the raised arguments failed to focus on the scientific frontier or are poorly addressed, the research activities fail to state the scientific significance clearly and thus could not demonstrate the necessity to be carried out, as well as key issues to be attacked were vague due to defectively designed scientific and technological approaches. In some proposals, the description of research methods and technological outlines was very general and there was a lack of essential feasibility on key approaches; and the linkage among main parts of the proposal was poorly stated. Careless mistakes in the proposals, such as misspelling, fault statements, poor English translations, and inappropriate preferences, etc., occurred occasionally.

Geochemistry

Geochemistry is the discipline that investigates the chemical composition, chemical process and chemical evolution of the epigeosphere and earth interior. Also, it involves cosmochemistry and comparative planetology. It applies primarily to analysis of elements and isotopes, observation of macroscopic and microscopic structure, molecular and microbiological tracing, isotope and chemical dating, etc. Geochemistry focuses mainly on substances evolution and interaction of different geospheres in the Earth's history. Also, it emphasizes the source, distribution, migration, transformation, cycle and fate of chemical elements and substances of the earth surface system under human activities stress, and these impact mechanisms on ecosystem. Geochemistry is an important tool to explore the formation and evolution of the solar system and its planets and satellites, which satisfies our curiosity of the unknown areas of nature. And, it plays an important role in the major problems of human survival, such as global climate change, volcanic and seismic activities, environmental pollution and protection. There are three aspects to promote jointly the further development of geochemical analysis techniques and applications: (1) the development of planetary science, earth system science discipline, (2) the needs of human sustainable development demanding on mineral resources and fossil fuels, environmental change and environmental pollution, and (3) the breakthrough of analysis technology. At present, the geochemical research area covers all aspects of chemical composition, chemical and chemical evolution of natural and environmental samples.

The characteristics of modern geochemical studies include the following:

(1) In the solid geochemistry field, the research hotspots have shifted from the material composition and chemical reactions of the interior Earth to the interactions of different geospheres and their boundaries. It gives full play to advantages of geochemical microprobe in situ analysis with high-resolution, high-precision and high-sensitivity. It pays more attention to geochemical processes and composition structure of Earth's layers. It

emphasizes the integration of plate tectonics evolution and global change research.

(2) In the research of earth environment changes, supergenesis and environment pollution process, it attaches importance to the superimposed effect of natural processes and human activities, and to the coupling mechanism of chemical and biological effect. It pays close attention to source apportionment & process tracing and their influence on ecosystem and climate change. The environmental geochemical and biogeochemical processes of the Earth's surface system have become an important geochemical research field.

(3) Research methods and techniques have shifted from statically semi-quantitative description to dynamically quantitative simulation, focusing more on the research of four-dimensional space-time evolution.

(4) It pays attention not only to the reconstruction of ancient geologic events on long time scales, but also to the description of physical, chemical and biological processes on short time scales, and the prediction and simulation of environment changes in the future.

The funding policy of this field is listed as follows: (1) to promote coordinated development of different branches of geochemistry; (2) to encourage the studies on the fundamental theory, the development of experimental analysis technology, and the establishment and improvement of geochemical model; (3) to broadly support the frontier fields of geosciences such as the evolution of the Earth and other planets, the environmental evolution and vital processes on earth, the changes and protection of ecological environment; and (4) to concentrate on the basic research about the formation mechanism and detection methods for mineral resources and fossil energy, the evolution and regulation of water-soil resources, and the prevention and treatment of natural disasters and ecological environment pollution.

In 2016, 473 proposals for General Program projects were accepted. The annual funding rate is 28.93%. The average monetary funding level (excluding the Small Fund for Exploratory Study projects) is 715,000 yuan per project.

Division III of Earth Sciences

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

Geophysics

Geophysics, which includes direct observation and theoretical studies on the basic physical fields of the earth and planets, for instance, seismic, gravity, magnetic field, electric field, stress field, heat flow, etc., is not only essential for effectively understanding of internal structures of the earth and planets and their components and dynamic processes, but also the foundation of new methods and technology development of resource exploration. Moreover, explorative study on mechanism of earthquake and other natural disasters has important significance for protecting the earth and disaster alleviation.

Space Physics

Through air-based and earth-based space physics observation and theoretical research, space physics studies physical phenomena of solar atmosphere, heliosphere,

middle and upper atmosphere interrelations, which make key contribution to space activities, communication, navigation and national security.

Geodesy

Through air-based, space-based and earth-based observation and theoretical research, geodesy studies the shape and gravity of the earth, the crustal deformation field and its changes, which provides geometrical and gravitational field information of the Earth, and lays standards for national economy and defense construction.

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

In 2016, 613 proposals for General Program in geophysics and space physics were received and 183 of them were funded with a success rate of 29.85% and an average funding of 700,300 yuan per project. In addition, 1 project of Small Fund for Exploratory Studies was funded with funding of 200,000 yuan. The funding is distributed in the following major research areas: geodesy (25.68%), solid-earth geophysics (27.87%), exploration geophysics (24.04%), space physics (20.22%) and experiment and facilities (2.19%).

In recent years, the Division awarded more innovative projects, which results in fruitful achievements. In the near future, encouragement for innovative ideas and cultivating team leaders will be continued as the major task of the Division. Besides continuous support to fundamental research, more efforts will also be given to new growth and pioneering studies, specifically those regarding to breakthroughs of well-defined scientific issues. Special attention will be given to the application of new technology, innovative tools and especially new observational data to the study of geophysical and space systems. Support will be focused on frontiers of space weather, satellite gravity, environmental geophysics, experimental geophysics, geophysics of the earth's deep interior, and comparative studies of the earth and other planets, as well as the theory of seismic wave propagation. In addition, during the research on the earth's interior structure, encouragement for more observational study in these areas where short of seismic data and developing new methods of integrating various data sources, so as to promote sharing of seismic data.

Division IV of Earth Sciences

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

Marine Science

Marine science is a discipline studying sea water and seabed, and various processes at interfaces between ocean and atmosphere, and between sea water and coastal estuaries, including physical oceanography, marine geology and geophysics, marine chemistry, biological oceanography, marine environmental science, coastal estuaries, marine

engineering, marine monitoring and survey techniques, marine remote sensing, integrated coastal zone management and other branches. Basic sciences, such as mathematics, mechanics, physics, chemistry and biology have been continuously applied to marine science. Meanwhile, new and high technologies, such as space technology, information technology, biotechnology and deep-diving technology, have been continuously applied to marine science. These have opened a new frontier in marine science. Research within this new frontier is also encouraged by the Division.

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

Marine science is a science essentially based on observation. The promotion of its academic thoughts and research abilities depends on long-term observation and data accumulation. To meet the demands of research projects in ocean observation, NSFC initiated the pilot Ship-time Sharing Project. Scientists are encouraged to participate in the NSFC Open Research Cruise (NORC) to obtain more continuous, systematic and comprehensive data. The program aims at encouraging scientists to conduct in-situ observation and laboratory analysis using new technologies and methods focused on the scientific issues to be investigated, and provide technical support for exploiting new research fields and new results. In order to promote a balanced development of marine science in China, it is also encouraged that scientists may join in existing cruise plans carried out by other agencies to do research on the deep ocean.

For those who want to participate in the NORC, it is required to describe the necessity, contents and expected data outputs of the proposed observations in the proposal. Applicants are suggested to pay close attention to the related bulletin and announcements for cruise timing.

In 2016, 716 proposals for marine science were received and 192 proposals were funded. The total funding amounts is 133.49 million yuan. The success rate is 26.82% and the average support is 695,300 yuan per project. Similar to the past few years, most proposals are focused on biological oceanography (D0609), environmental oceanography (D0608), marine geology (D0603) and physical oceanography (D0601), which together account for approximately two-thirds of the total submitted and funded proposals. The number of funded proposals has little change in the fields of marine chemistry (D0604), estuarine and coastal research (D0605), ocean engineering (D0606), marine monitoring and investigation (D0607), and marine remote sensing (D0610). However, the number of proposal in marine physics, which is an important funding direction in marine science including acoustics, optics and electromagnetic, were relatively small and hence the least share of funding was awarded.

There are some basic elements to support a successful proposal, including scientific innovation, appropriate scientific objectives and research scope and feasible scheme. One or more absences of the above elements may lead to a failure. Among them, the scientific

innovation is the most decisive. For the Young Scientists Fund applications, some frequent defects come from too broad scope and lack of research focus.

Polar Science

Polar science is a discipline studying various natural phenomena, including the processes and changing rules peculiarly in polar region as well as its interaction with other components of the Earth system. It is a comprehensive discipline consisting of several sub-disciplines including polar biology and ecology, polar oceanography, polar space physics, polar atmosphere science and climatology, polar geology, geophysics and geochemistry, Antarctic astrolithology, polar glaciology, polar mapping and remote sensing science, polar management and information science, polar observation and engineering technology, etc.

For the past few years, significant progress has been achieved in international polar research. However, it is still the weakest area in earth science. Comprehensive and interdisciplinary study is the current trend in polar science, which is focused on the key scientific issues on global change and sustainable development for carrying out research on large-scale interactions of the five spheres in the polar region as well as their interactions with the middle and low latitudes. Polar science in China should develop research by focusing on key scientific issues such as global change and sustainable development based on the accumulation of existing research.

In 2016, 51 proposals (counted for application code D0611) on polar science were received and 20 were funded, with a success rate of 39.22%.

Division V of Earth Sciences

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

Atmospheric science is to study various phenomena and their changing regulations occurring in the atmosphere so as to serve the mankind. In recent years, with the introduction of the Earth system science and sphere interaction concepts, atmospheric science enters into a new historical phase of development. The atmosphere is one of the most active spheres in the Earth system. Its changes are affected and controlled by other spheres in the system and celestial bodies such as the Sun; at the same time the response of the atmosphere to the changes simultaneously results in direct impact on the ocean, terrestrial surface, ice and snow, as well as the ecosystem on the Earth. The atmosphere plays an important role in the interaction among different spheres of the Earth system, and regulates the whole behavior of the Earth system with the interaction of other spheres. Therefore, beside the study of dynamical-physical-chemical process within the atmosphere, atmospheric science currently focuses on the comprehensive researches on the essence of the atmospheric change in terms of the interaction among hydrosphere, lithosphere, cryosphere, biosphere, human activities and global climate, the regulation of weather, climate system and theories and methods of climate change prediction, the regulating technology and measures affecting weather and climate, the impact of human activities on weather, climate and environment system, and the influence of weather, climate and

environment system change on human society. Atmospheric science deepens the study on its various sub-directions, and meanwhile, applicants are advised to pay attention to the mechanism of the disastrous events occurrence and development of the weather, climate and environment, as well as the forecast and prediction; study on issues of global climate and environment change, and its impacts, adaptation and mitigation; the comprehensive, integrated, modeling and systematical studies on various processes; the interdisciplinary study which can provide the scientific basis for the livelihood and the sustainable development of society.

In 2016, the Division received 488 proposals for the General Program and 157 projects were funded with the success rate of 32.17%, and the average funding intensity of 686,700 yuan per project (including 1 project for the Small Fund for Exploratory Study with 200,000 yuan per project).

In 2017, the Division will continually encourage proposals for exploratory, original and prospective basic studies in areas as follows: (i) the various phenomena, processes and mechanism in atmosphere, and the physical-chemical-biological processes of the substance and energy interaction between the atmosphere and other spheres by applying new ideas, methods, advanced equipment and technologies from mathematics, physics, chemistry, biology and information science; (ii) synoptic meteorology, atmospheric dynamics, atmospheric physics, atmospheric chemistry, atmospheric environment, atmospheric detection and remote sensing, boundary layer, stratosphere and mesosphere; (iii) the climatic change and its relevant extreme synoptic and climatic events; (iv) new theories and methods for weather forecasting and climate prediction; (v) applied research on the data received by satellite remote sensing and other sources; (vi) analysis and applied research on the data received from the large scientific experiments and science plans already initiated, conducted or already completed, as well as large observation network established in China and aboard; (vii) the principle and method for meteorological observation, data analysis and applications; (viii) the interdisciplinary research on the atmospheric science and the field of the livelihood and the sustainable development of society (agriculture, energy, transportation, forestry, hydrology, health, economy, and ecology, etc.).

Department of Engineering and Materials Sciences

Engineering and materials sciences provide necessary and significant S&T knowledge for the assurance of national security, the improvement of people's living standard and the sustainable development of the society and economy. Aiming at cutting-edge areas and meeting the national strategic demands of the social and economic development as well, and committed to discoveries, inventions and innovations concerned, researches in engineering and materials sciences should pay full attention to scientific creativity and innovation, especially original creativity and innovation with independent intellectual properties, promotion of the sustainable development of interdisciplinary integration, so as to achieve a higher level of sustainable development and broad

international impact in the field of engineering and materials.

The Department will continue to support interdisciplinary and cutting-edge researches, especially the researches with such great significance that new knowledge could be formed, industrial development could be promoted and international competitiveness could be raised. Researchers are encouraged to focus on original and integrated innovation and to pay more attention to key scientific issues coming from application and propose related research contents. Priority is given to the researches that can lead the development of disciplines, and have the potential to form independent intellectual properties, especially those combined with national conditions.

In the general guidance of the 13th Five-Year Plan for science foundation, the Department encourages various projects with distinctive characteristics of basic research and high technology. Applicants should pay attention to the following priority areas and put forward idea-driven proposals. The areas include microstructure and deformation mechanism of metastable metallic materials, preparation, processing, and property tailoring of high performance light metal materials, low dimensional carbon materials, new inorganic functional materials, new theories and methods of polymer materials processing, carrier materials for biological active materials controlled release/delivery system, theories of efficient development of fossil energy and disaster prevention/control, green metallurgical processes toward resource saving, highly efficient metallurgical extraction and processing, preparation and processing of high performance materials, mechanical surface and interface behaviors and regulation, technology foundation for additive material manufacturing, heat and mass transfer and advanced thermal system, regulation of combustion reaction, new generation energy power system, foundation of high efficiency high quality motor system, design theory for whole-life overall reliability of structures under multiple disasters, design theory and principles of green buildings, life cycle periodic performance evolution performance major dam and ocean platform, etc.

In 2016, the Department received 13,941 proposals (265 rejected), increased by 0.22% in comparison with that in 2015, and among them 2,851 were supported with a total direct cost of 1,769 million yuan. The average direct funding is 620,500 yuan per project and the success rate is 20.45% (slightly higher than 20.08% in 2015).

Applicants should pay full attention to the following:

(1) The Department will support preferentially basic research with scientific merits and applicable prospects, with considerations to practical conditions and resource characteristics of China, which can either give an impetus to the development of relevant sciences or lead to independent intellectual properties. Proposals that meet the needs of national economy and sustainable development of the society will be encouraged.

(2) Interdisciplinary researches will be encouraged so as to promote the progress of the cross disciplines involved. Applicants should put forward new conceptions and ideas as creative as possible with specific scientific issues.

(3) The fundamentality and innovation should be fully discussed in proposals. Applicants should pay attention to proposing key scientific issues, concentrating research contents and highlighting research focus. For different types of projects, please refer to the relevant project administrative policies, and put forward proposals according to the requirements.

(4) When applicable, applicants are required to provide the research achievements of the last completed project, and list the scientific papers published in domestic or foreign

academic journals. The provided information must be objective and accurate; otherwise it will affect where the application is going.

(5) Please refer to the funding amount of different projects, and put forward proposals with a reasonable budget plan according to actual demands of various expenses.

Funding for General Program Projects in Department of Engineering and Materials Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Average funding for direct costs	Funding rate (%)	Projects	Average funding for direct costs	Funding rate (%)
Materials sciences I	Metallic materials	214	13,743	20.56	219	13,573	20.86
Materials sciences II	Inorganic and non-metallic materials	303	19,388	20.29	315	19,536	20.43
	Polymer materials	217	13,852	20.55	220	13,611	21.19
Engineering sciences I	Metallurgy and mining science	296	18,983	19.71	305	18,938	20.00
Engineering sciences II	Mechanical engineering	545	34,442	20.46	540	33,486	21.38
Engineering sciences III	Engineering thermo physics and energy utilization	215	13,746	20.69	213	13,214	21.24
Engineering sciences IV	Architecture, environmental and structural engineering	560	35,040	19.69	579	35,918	19. 78
Engineering sciences V	Electrical science and engineering	191	12,078	19.69	195	12,161	19. 42
	Hydrology and marine engineering	253	15,998	19.43	265	16,463	19.98
Total		2,794	177,270	20.08	2 851	176,900	20.45
Direct cost funding per project		63.45			62.05		

Division I of Materials Sciences

The Division supports fundamental research on metallic materials. Research proposals should present the merits of the proposed fundamental research clearly, including clear objectives and scientific significance of the project, and the suitability of the methods to be employed. Proposals should target either to advance the materials science in cutting-edge areas or to promote development in the relevant areas that meet the national demands. The funding spectrum of the Division covers compositions, microstructures, phases, surfaces and interfaces, scales effect, impurities and defects in metals, alloys, metal matrix composites, intermetallic compounds and metal-like materials, and their influence on mechanical, physical and chemical properties and performance; basic issues in the preparation and processing of metallic materials, including heat treatment, casting, forging, welding and cutting; basic issues in the strengthening and toughening, deformation and fracture, phase transformation and alloy design; fundamentals in energy materials,

environment-friendly materials, biomaterials, and materials in transportation, aeronautic and astronautic industries; interaction mechanisms of metallic materials and environment, damage, functional degradation and consequent failure mechanism, recycling mechanism and relevant fundamentals; theoretical fundamentals on metallic materials; development of theoretical methods, calculating methods, modern analysis and test methods, big data analysis and processing methods incorporating basic and applied basic researches of metallic materials.

In 2016, the Division received 1,050 proposals for the General Program, increased by 0.86% in comparison with that in 2015. Totally, 219 projects were granted with an average funding intensity of 619,800 yuan per project and a success rate of 20.86%.

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

The Division would give more financial support to the selected areas that meet the national demands or is expected to achieve a breakthrough in the form of General Program project groups. In 2016, the following research orientations will be given preferential financing: (i) Design and corrosion control of high performance Magnesium alloys; (ii) Mechanism and related basic research of corrosion in natural environment.

Division II of Materials Sciences

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

Inorganic Non-Metallic Materials

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

In 2016, the Division received 1,542 applications for the General Program, with an increase of 3.21% compared with that in 2015, and 315 projects were funded with an average funding intensity of 620,200 yuan per project and a success rate of 20.43%.

Looking at the proposals submitted in the past three years, it is noted that with the increase of applications, the researches involve various areas with broad interdisciplinary range. Researches on the subject of functional materials, an active field, accounted for 57.67% of the total. These applications presented many innovative ideas and induced the hotspots of various areas including energy conversion and storage materials, nano-materials, ferroelectric and piezoelectric materials, carbon and super-hard materials, photoelectric information functional materials, composite materials and photo-catalysis materials and so on. Among them, applications regarding energy conversion and storage materials (accounted for about 16.81% of the total in the year 2016) ranked above all the others. There were also many applications regarding photoelectric information functional materials, new carbon materials, biomedical materials, in which the creativity needs to be further improved. The applications regarding structural ceramics accounted for 4.95% of the total and were relatively concentrated among a few institutions, and relevant researches significantly went towards the direction of high-toughness, easy processing ability, high reliability and low cost fabrication by new techniques. A fairly large number of proposals for inorganic non-metallic composites were also received, among which proposals on functional composite materials increased a bit more than before. However, in term of the quality, quite a number of them can be classified as follow-up, low level repetition, and lack of both innovation and basic issues in inorganic non-metallic materials. The Division will support the researches with creative and innovative ideas, and interdisciplinary researches of inorganic non-metallic materials cross-cutting with other related fields.

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

Organic Polymer Materials

The Division mainly supports the following areas in the field of organic and polymeric materials science: preparation chemistry of organic and polymeric materials; theory and method for the characterization of polymeric materials; processing of polymeric materials; the surface and interface of polymeric materials; the implementation of high performance and functional properties of general polymer materials; polymer-based

composite/hybrid materials; functional organic and polymeric materials and organic solid materials; biomedical polymer materials; organic and polymeric materials related to energy, transport, ecological environment and resource utilization; smart and biomimetic polymer materials; special polymer materials.

In 2016, the Division received 1,038 proposals for the General Program, with a decrease of 1.73% compared with that in 2015. Finally, 220 applications were granted with an average funding amount of 618,700 yuan per project and a success rate of 21.19%. Quite many of the applications were involved in the following areas: biomedical polymer materials, polymer blend and composite materials, structure-property relationships of polymeric materials, photo, electro, magnetic functional materials, and functional inorganic/organic composite materials, etc.

The Division encourages interdisciplinary basic researches involved with mathematics, chemistry, physics, life science, medical science, information science, energy, environment, mechanical and manufacturing science, transport and aerospace science, and oceanography, etc., which lead to creativity and innovation. To be specific, the researches in the following areas are encouraged: scientific issues in the preparation of polymeric materials, including high efficient and controllable synthetic methods of polymeric materials, the preparation of functional polymer materials, new method and theory in polymer processing, the relationship between the aggregation structures and the properties of polymeric materials and their composite materials; the method and theory in the implementation of the high performance and functional properties of general polymer materials; low-cost and green method in the preparation of functional organic and polymeric materials, the structure-property relationship and the implementation of their stability; performance-directed biomedical polymer materials and the evaluation method of their application; new concept in the design theory and preparation method of smart and biomimetic polymer materials; chiral polymer materials, including method in their controllable synthesis, assembly and construction, chirality at nano scale, and functional chiral polymer materials; eco-environmental polymer materials, including the structures, properties and efficient utilization of natural polymers, as well as the design theory and preparation method of environment-friendly polymer materials, the recycling and utilization of polymeric materials; polymeric materials for environmental control and improvement in water, soil and air pollution, and the stability and aging of polymeric materials.

Division I of Engineering Sciences

The Division supports fundamental researches in the mining and metallurgy engineering. It is mainly involved with resources exploitation, safety science and engineering, mineral engineering and separation sciences, materials and metallurgical physical chemistry, ferrous and nonferrous metallurgy, material preparation and fabrication, eco-environment of mining and metallurgy, and resources recycling, etc.

The Division received 1,525 proposals for the General Program in 2016, with an increase of 1.60%; wherein, 305 proposals were granted with the average of 620,900 yuan per project and the success rate of 20.00%.

In recent years, based on continuous supports and mainly driven by national needs,

the mining and metallurgy sciences have achieved great progress, got many significant achievements, reached to a leading position in some frontier areas. Research facilities have continuously improved. The current trends of the discipline funded by the Division are: (1) Differentiation and extension in the discipline. The transplant of novel methods and techniques from neighboring disciplines has broaden and deepen the theory in the traditional process from macro dimension to micro scale; (2) Interdisciplinary and integration in the disciplines. When the disciplines are more and more specific, the joint between them are strengthened. Further development of interdisciplinary make new research fields emerge. (3) Relationship between fundamental research and technology development is getting increasingly closer, such as mining and metallurgy equipment, monitoring and controlling of system, metallurgical reaction engineering and systems engineering, and metallurgical ecological technology, etc. More and more new technologies and development of the products derived from the further results of fundamental sciences. It is obvious that the characteristics of "process synthesizes, technology synthesizes, discipline synthesizes", and science and technology have been integrated. At present, mining and metallurgy is in the center of resources, energy and environment, imbalance between supply and demand make the concepts of "innovation, coordination, green development, opening up, and sharing" should be practiced in order to upgrade traditional industries and improve eco-environment system.

Oil and gas exploitation, safety science and engineering, preparation of metallic material processing, mineral engineering, metallurgical electrochemistry and battery electrochemistry are hot areas in the Division.

As an engineering sciences division, it emphasizes on "support quality" rather than "ensure quantity". The Division will continuously enhance the searching about interdisciplinary and new methods, and focus on the new theories, new concepts, new methods, and creative application on their own fields. More attention will be paid to the basic research with characteristics of specific resources that could enhance our competitiveness in petroleum, mining industry and preparation of metallic material processing. In the aspect of resources exploitation, emphases will be on the engineering science about recovery efficiency, safety and environment. In the aspect of technology, process and equipment, structure optimization, process intensification and theory of engineered equipment will be emphasized. Researchers are encouraged to work systematically and consistently in their specific fields. Priority will be given to these that fundamental research with theoretical importance, that with potential application, which may become new fields for knowledge creation, and to those young scientists who have creative capabilities and solid domestic and international cooperation background.

Encouraged research fields: (1) theories and methods of improving recovery efficiency in oil and gas resources; (2) safe and efficient development methods in complexly deep-layer or deep-water oil and gas resources; (3) scientific exploitation theories of mineral resources; (4) theories of environmental-friendly mineral separation; (5) clean extraction of multi-metallic mineral resources with low grade or complexity; (6) thermodynamic bases and metallurgical theories of metallic material production with high qualities; (7) formation, transportation and control of contaminants generated in metallurgical process; (8) high-performance materials preparation and near net shape under multi-fields; (9) information collection and data processing of mining and metallurgy; (10) accident prevention and systematic assessment of dangerous chemicals.

Division II of Engineering Science

Division II supports fundamental research in the fields of mechanical and manufacturing science.

Mechanical science is a fundamental technological discipline involving the study of the functional synthesis, quantitative representation, and performance control of various mechanical products. In addition, mechanical science involves applying related knowledge and technologies regarding mechanical systems to develop novel design theories and methodologies, including mechanics and robotics, actuation and transmission, mechanical system dynamics, the strength theory of mechanical structures, mechanical tribology and surface technology, mechanical design theory and methodology, and mechanical bionics.

Manufacturing science mainly involves studying manufacturing theories, methods, technologies, processes, equipment, and systems concerned with high-efficiency, low-cost, intelligent and high-performance production methods. It includes component forming and machining, manufacturing systems and automation, mechanical measurement and test theory and technology, micro/nano-mechanical systems, green manufacturing, and intelligent manufacturing.

In 2016, a total of 2,526 research proposals for the standard grants were received, a 5.18% decrease from the previous year. A total of 540 proposals were funded. The average funding of direct cost was 620,100 yuan per project and the success rate was 21.38%.

The focus areas supported by Division II are (1) fundamental research concerning national strategic priorities, developing the frontiers of disciplines, and realizing the potentials for industrial applications; (2) research aiming at environmentally friendly, resource-saving, and energy-efficient integration of sustainable design and manufacturing; (3) research concerning innovative design, manufacturing principles, and measurement theories for ultrahigh-precision, high-tech, and, in particular, large or heavy equipment and instruments, including processing mechanisms, prototyping theories and technology; (4) the development of methodologies for designing and manufacturing under extreme working conditions involving, for instance, macro- to meso-, micro-, nano-, and multi-scale tasks, and parameters ranging from conventional to extraordinary or extreme conditions; and (5) multidisciplinary research, multifield coupling analysis, and design methods including mechanical sciences, electronics, hydraulics, acoustics, optics, magnetism, information science, and other subjects.

To accomplish its mission, the Division will continue to support research in emphasizing on fundamentals, frontiers, explorations, and innovations by encouraging continuous in-depth research in specific fields and high-risk exploratory research. The division will preferentially support fundamental research that has achieved innovative results and requires further in-depth development. The division will also preferentially support substantial and profound interdisciplinary research, in particular that involving multi-disciplinary areas such as electronics, information technology, biology, materials, and medical science, with the main objective of solving scientific problems in the mechanical engineering field, provided that applications do not deviate from the funding scope of the division.

It is suggested that the principal investigator working on current projects focus on

these ongoing projects instead of applying for new short-term projects. Young researchers are advised not to participate in proposals that are irrelevant to their own research fields.

Division III of Engineering Sciences

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

In 2016, the Division received 1,003 proposals for the General Program, decreased by 2.52% compared with that in 2015. Totally, 213 were supported with an average funding intensity of 620,400 yuan per project with a success rate of 21.24%.

The main development trends of the discipline in the Division are as follows: (i) research on the basic issues has been deepen from macro-level to meso-level and micro/nano-level, from isolated studies to coupled studies, from common parameters to parameters under ultra- or extreme conditions, from routine thermo-physical problems to random, unsteady, multi-dimension, multi-phase and complicated thermo-physical problems and intercrossing research in the discipline; moreover, research becomes more quantitative and precise; (ii) research themes have been crossed over traditional disciplinary borders and integrated with related disciplines, for example, physics, chemistry, life science, information science, materials science, environment and safety. Researches in the following areas are active: the mechanism of new type thermodynamic cycles and non-equilibrium thermal dynamics, refrigeration and low temperature engineering, dynamics, optimization and control of complicated systems, turbulence properties of internal flows and properties and control of unsteady flows, porous media and micro-scale heat and mass transfer, radiation and heat exchange by phase transformation, clean, supersonic and micro-scale combustion, thermo-physical problems in the prevention of disasters, mechanism of interaction between phases and thermo-physical model in multi-phase flow, new principles and methods in thermo-physical measurement, and new thermo-physical principles in renewable energy transformation and utilization.

The Division will give priority to fundamental researches with theoretical importance, potential application and prior prospect, which might be the new fields for knowledge production, continuously promote interdisciplinary studies and the exploration of novel methods, and encourage original ideas and creations. The Division will continue to support the researches with interdisciplinary nature, or international cooperation background or good achievements achieved in the completed projects.

Division IV of Engineering Sciences

The Division's funding scope mainly covers architecture, environmental engineering

and civil engineering. The development trend of architecture is to study the development of region, city and building, and the innovation of construction techniques from the viewpoint of human-environment relationship, as well as the basic theory, methods of planning and design, and construction technology innovation based on sustainable development strategy. The environmental engineering research is focused on the water or air pollution control and quality amelioration, as well as theories and methods for the treatment, resourcelized and harmless disposal of various pollutants and wastes. Civil engineering stresses that studies should be closely combined with engineering practice to investigate basic theoretical issues and solve foresight key technological issues arising from engineering construction. The interdisciplinary interaction, application of advanced experiment and information technologies and adoption of new materials, new structures and new technologies are the major features in the development of these research fields.

In 2016, the Division received 2,927 proposals for the General Program, increased by 2.92% in comparison with that in 2015. Totally, 579 were supported with an average funding intensity of 620,300 yuan per project with a success rate of 19.78%.

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

Division V of Engineering Sciences

The Division mainly supports researches in electrical science and engineering, hydro-science and water research, hydraulic engineering and ocean engineering.

Electrical Engineering

The subject of electrical engineering includes two parts: electric (magnetic) energy science, the interaction between electromagnetic fields and materials. The related research fields mainly include the electrical energy conversion (mutual conversion between electric power and other kinds of energy), electric machine and its control, power system, power electronics, superconducting technology, pulse power technology, high voltage and electrical insulation technology, engineering dielectrics, discharge and plasma technology,

electromagnetic biological technology, environmental electro-technology, electromagnetic compatibility, electric drive and motion control, communication and information for power system, new technology of energy storage and power saving, etc. Furthermore, the two parts share some common basic research contents, such as electric network theory, electromagnetic field theory, electromagnetic measurement technology, and so on.

In 2016, 1,004 proposals were received for the General Program and 195 proposals were funded with an average funding intensity of 623,600 yuan per project with a success rate of 19.42%.

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

As to electromagnetic field and interaction between electromagnetism and matter, the priority is given to investigation on new phenomena, exploration of new principles, and the establishment of new models and discovery of new applications, as well as the safety and reliability, which are related to power apparatus, novel high power electronic devices, new dielectrics and its application in electrical engineering, measurement of electromagnetic characteristics, coupling between electromagnetic pulsed energy and its applied objects, discharge theory and high active plasma generation. The proposals are highly encouraged for investigations based on electrical science for the interaction between electromagnetic field and biomatter, processing and utilization of biologic electromagnetic signals.

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

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

In 2016, 1,326 proposals were received for the General Program, and 265 proposals were finally granted with an average funding intensity of 621,200 yuan per project with a success rate of 19.98%.

In 2017, encouraged research areas are urban flooding, aquatic ecology and eco-hydraulic engineering. Those who are interested in these areas should focus the research on one of the above encouraged research areas in their proposals.

In the field of hydrology and water resources, one of key tasks is to study the impact of climate change and human activities on hydrological cycling, extreme flood and drought

disasters, and water resources management. Researches in the field of water/soil science and irrigation engineering are mainly focused on the transfer and interaction of water, heat and chemicals in farmland, mechanism of crop water-saving and high-efficient irrigation and drainage scheme and their ecological and environmental impacts. Physical, chemical and biological processes related with hydrological cycling and their responses to large projects are emphasized by researches in the field of water environment and water eco-system. Since water resource is closely correlated with economy, society, environment and energy, the interdisciplinary and integrated research is encouraged in fields of water resources, water environment and water eco-system. Researches in the area of river and coastal hydrodynamics and sediment dynamics should give their focuses on the fundamental theory of sediment transport, river and estuarine evolutionary, and sediment problems related to large hydraulic works. The key frontiers of hydraulics consist in the subjects related to water disaster mitigation and eco-environmental protection. The current emphasis of hydro-machinery is on the transit process. Hot topics in the field of soil/rock mechanics and geotechnical engineering include constitutive modeling of geo-materials, multi-fields and multi-phases coupling, mechanism and process of geo-deformation, mechanism and prevention of geo-hazards. New breakthroughs need to be made in the basic research on hydraulic structural engineering under complicated conditions. Environment-friendly and function-based design is an important trend of development in the field of hydraulic engineering and materials. The recent hot research topics in coastal engineering include: port and waterway engineering, marine resources and offshore renewable energy as well as environment protection, disaster prevention and mitigation in extreme situation; in the area of ship and ocean engineering, more emphasis are put on the motions and response theory of ship and marine structures, new hull form design theory, deep-sea probing technology and relevant theory of deep water resources exploitation, numerical experiments and field test technology, new type underwater sound transducer and communication technology.

Department of Information Sciences

The Department of Information Sciences funds researches in areas of the generation of signals, acquisition, storage, transmission, processing and information utilization. Based on the trends of disciplinary development and social progress, the following priorities are set for funding: nano electronics and bioelectronics, radio wave transmission and new types of antenna, information acquisition and information processing, future communication theory and system, space communication network and system, space information processing and application, key problems in theoretical computer science, computer software, computer system configuration and storage system, key technologies in computer application, computer network and distributed computing system, network and information security, bionic sensing and advanced sensors, modeling, analysis and control of complex systems, basic theory and application of intelligent science, advanced robot technology and application, basic research on semiconductor integrated chip system, quantum communication, quantum computation, basics of quantum information technology, optical information display and processing, advanced laser technology, biomedical optics, next generation network and applications, data science and computing science, cognitive science

Funding for General Program Projects in Department of Information Sciences in 2015 and 2016

Unit: 10,000 yuan

Science divisions		2015			2016		
		Projects	Direct cost Funding	Funding rate [++] (%)	Projects	Direct cost Funding	Funding rate [++] (%)
Division I	Electronics and technology	163	10,198	21.94	165	9,698	23.95
	Information and communication system	156	9,390	21.97	161	9,343	23.96
	Information acquisition and Processing	149	9,030	22.51	147	8,605	23.98
Division II	Theoretical computer science, computer software and hardware	143	8,779	21.57	141	8,310	23.15
	Computer applications	248	15,137	21.29	263	15,585	22.29
	Network and information security	149	9,048	21.63	151	8,941	23.30
Division III	Control theory and control engineering	191	11,609	24.24	185	10,932	25.37
	Systems science and system engineering	47	2,664	15.46	42	2,372	16.73
	Artificial intelligence and intelligent systems	149	9,038	21.17	157	9,087	23.29
Division IV	Semiconductor science and information devices	173	10,523	22.21	173	10,139	23.60
	Information optics and photoelectric devices	112	6,889	21.92	117	6,879	23.40
	Laser and technical optics	113	6,695	22.55	118	6,754	23.94
Total		1,793	109,000	21.76	1,861	108,600	23.28
Direct cost funding per project		60.79			58.36		

and intelligent information processing, etc. Preferential support will be given to basic researches that meet social demands and have far-reaching importance in promoting the national economic and disciplinary development.

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

In 2016, the Department received 7,995 applications for General Program, decreasing 2.97% from that in 2015, and funded 1,861 projects with a total direct cost funding of 1.086 billion yuan. The average direct cost funding is 583,600 yuan per project. Some projects are related to interdisciplinary areas with mathematics and health. In 2016,

we received 331 applications for the projects of interdisciplinary research between Information Sciences and Mathematical Sciences and funded 70 projects with average direct cost funding of 500,700 yuan per project and the funding rate of 21.49%.

In 2016, we funded 103 small grants in the General Program, with a total direct funding of 16.66 million yuan, and average funding per project was 161,700 yuan.

In 2017, the PIs of NSFC-funded projects making important progress will be given preferential support towards their new applications.

The Department of Information Sciences encourages creative basic research different from traditional research ideas.

Interdisciplinary Research between Information Sciences and Mathematical Sciences

In 2017, the Department of Information Sciences and the Department of Mathematical and Physical Sciences will continue to fund interdisciplinary researches that require combined efforts from information sciences and mathematical sciences. The direct cost funding will be about 500,000 yuan per project. The areas to be included are mathematical theory in information sciences, mathematical methods in information security, information system and advanced control theory.

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

1. Theory and algorithm of integer representation of real numbers

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

2. Theory and methods of formalized representation of software systems

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

3. Theory and methods of designing security software systems

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

4. Theoretical studies on new software system structure

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

5. Theoretical studies on the validation of software systems

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

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

It should be noted that previous proposals were lacks of fundamental nature and

challenge, and did not show complementary feature of information science and mathematics. This type of project will supports only exploratory research having substantial interdisciplinary nature with information sciences so as to promote the development of interdisciplinary studies between information and mathematics. **Applicants to this category should select appropriate application codes in the application form. This category belongs to free exploratory research, and is supported only under the category of General Program.**

Division I of Information Sciences

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

Electronic science and technology involve in areas of circuit and system, electronic science and technology, magnetic field and wave, as well as electronics and applications. Funding areas mainly cover the design, test and verification of circuits and system, diagnosis, reliability, micro-nano circuit and system design theory, methods and technology and low energy consumption design method, power, radio electronic circuit and system design theory and method, circuit and network theory, electromagnetic theory and computational methods in electromagnetic fields and waves, characteristics of electromagnetic field and waves in new types of media, scattering and back-scattering, mechanism of interaction between electromagnetic field and wave and objects, electromagnetic compatibility and electromagnetic environment, electronic wave transmission and antenna, micro wave optics, tera-hertz science and technology, transient electromagnetic field theory and application, vacuum device, cathode electronics, surface and membrane electronics, superconducting electronics, quantum electronic theory and device, plasma electronics, molecular and nano electronics in physical electronics, electromagnetic effect in bioelectronics, biochips, medical imaging, medical information detection and processing, medical imaging navigation and key medical instrument technology; information processing and analysis in bioinformatics, analysis of bio big data, detection and identification of cell and biomolecular information, information network and analysis in biosystems, modeling and simulation of biosystem functions, methods and technology of bionic information processing; sensitive electronics and physical, chemical, bio and biochemical sensors, properties of new types of sensitive materials and sensors, and sensor theory and technology.

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

network, future information network theory and transmission mechanism, network communication theory and system, etc.

Information acquisition and processing involves the theory, methods and applied technology of information sensing, acquisition and processing. The main funding areas include signal theory and signal processing, the processing of multidimensional signals and array signals, and processing of radar, sonar, remote sensing and voice signals; mathematical theory and methods in information acquisition and processing, and information acquisition mechanism and technology, weak signal detecting and processing, detection and imaging system in information detection and processing, image processing and interpretation, integration of multi sensor signals, multimedia information processing and presentation, space and marine information acquisition and processing, and applied basic research in mobile network big data, etc.

In 2016, the Division received 1,974 proposals for General Program, and funded 489 projects. The funding rate is 24.77% and the average direct cost funding intensity is 581,800 yuan per project.

In 2017, the electronics and information system disciplines in this division will continue to test the use of standard selections for application code, research directions and key words. Please make correct selections when writing proposals according to "the table of application code, research directions and key words for some disciplines".

In 2017, the Division will continue to support researches in areas of basic theory and key technologies that are significant to the national security in areas of detection and imaging technologies, detection data decoding, normalized interpretation of multi-source and multi spectrum data, acquisition of natural energy, bioinformation acquisition and processing and space information acquisition and processing, under water information acquisition and processing, electromagnetic environmental effect, network information acquisition and processing, communication system security, electromagnetic vortex communication, ambient intelligence communication, wireless multi domain recognition communication, indoor high speed large capacity wireless communication, low energy consumption communication, under water communication, short range communication, special communication, internet of things and internet of energy resources. The innovative and cross-disciplinary research and exploratory studies that may have some risk and are non-consensus will be supported. Preferential funding will be given to the projects which have scored outstanding achievements in previous research. Preferential support will be given and encouraged to the projects which could open and share their research results, and research on the design of software and hardware on the opening data base. The Division encourages the combination of theory and practice to focus on innovation and to study and solve basic problems in important application areas, so as to improve China's research capabilities in this discipline.

Division II of Information Sciences

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

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

The Division emphasizes that proposals shall focus on key scientific issues and technologies in computer science, and original, fundamental and far-sighted research. We encourage researches on the theory of computer science, software theory and engineering, network security, architecture and system software, computer network, natural language interpretation, data and knowledge engineering, computer graph and virtual reality, image, audio and video processing, man-machine environment, mobile and generic computation, embedded computation, pattern recognition and computer vision, artificial intelligence and machine learning, bio-data processing and analysis, computation intelligence, etc. The Division also stresses on funding of studies on theoretical method of new computation, big data analysis, brain insight computation, mass smart computation, new mechanism of information security, new types of searching, mixed reality, robot software system, and man-machine coordinated computation, automatic construction of software system, etc.

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

In 2016, the Division received 2,437 proposals for General Program, and funded 555 projects (including 31 interdisciplinary projects with mathematics). The success rate is 22.77% and the average direct cost funding is 591,600 yuan per project

It should be noted that such problems as lack of basic science problems, lack of clear scientific topics, lack of originality in research ideas, lack clear application background and lack of clear research goals and preparations still existed in proposals received in 2016. We suggest applicants aim at the national needs and research frontiers in the discipline, select fundamental, explorative and key scientific issues, and strive to make innovations and breakthroughs so as to make important achievements.

Division III of Information Sciences

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

Research in control theory and engineering includes control theory and applications, process or moving object control, trouble shooting and system service, system emulation and evaluation, navigation, guidance and telemetry, sensor technology and sensor network, multi-information acquisition and fusion, etc.

Research in systems science and system engineering includes system modeling and analysis, system dynamics and application, system simulation and visualization, emergence and laws of the evolution of complex systems, system biology, information physical system, system reliability and applications, engineering system design and optimization, engineering system scheduling and decision making, and supply chain, etc.

Researches in artificial intelligence and intelligent systems covers basic theory and applications of pattern recognition, method and application of machine learning, method and application of the understanding of natural language, network information searching and processing, knowledge expression, reasoning and discovery, intelligent sensing and system robotics and robot technology, bionic sensing and bioinformation processing, cognitive science and intelligent information processing, etc.

In 2016, the Division received 1,747 proposals for General Program and funded 405 projects. The success rate is 23.18% and the average direct cost funding intensity is 576,300 yuan per project. Some projects are related to interdisciplinary areas with mathematics.

Statistics in recent years show that the following areas are becoming hot spots: intelligent and self-adaptive control of complex systems, design and application knowledge automation systems, theory and application of control of network security and protection, monitoring, warning and unified control of production process, coordinated control of multi autonomous system, data and model based system analysis and control, quantum system analysis and regulation, network system analysis and control, intelligent traffic and internet of vehicles, theory and application of complex network analysis, analysis and application of biomolecular network, theory and application of the internet of things and industrial cognition network; optimal dispatching management of large engineering systems; theory and application of dynamic optimization of multi targets; advanced navigation and guidance theory and techniques; quantum navigation theory and system; new types of transducers and bionic sensing; sparse representation and compress cognition; new theory and methods of pattern recognition; new theory of computer vision and realization of high performance system; target identification and tracking in complex background and interference; natural language understanding and syntax computation; recognition of oral language and speakers in complex scenarios; new method and application of knowledge expression and reasoning, large scale knowledge correlation and discovery of new knowledge and application; efficient analysis and computation of big data; theory and application of particle computation; inter media analysis and searching; online machine learning methods of complex dynamic data, mechanism, new models and application of deep learning; advanced robot and bionic robot; limb rehabilitation and life assistant robot, micro and nano controlled robot and micro nano robot; life like integration system and soft body robots; brain-machine interface theory and application, brain-like information processing method and application, cognitive science and computation models. In addition, the Division gives due support to farsighted and interdisciplinary researches such as modeling analysis and control of micro-nano scale systems, modeling, analysis and control of hypersonic aircraft, optimization, decision and control of complex process, analysis of social network behavior, navigation and guidance and control in deep space and deep ocean exploration, new energy control, management and efficient use, smart medicine, smart city and agricultural information technologies.

In 2017, the Division will continue to encourage and support interdisciplinary research with mathematics, mechanics, mechanical engineering, semiconductors, optics,

energy, environmental science, management, economics, biology, neuroscience and psychology, etc.

Division IV of Information Sciences

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

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

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

In 2016, the Division received 1,726 proposals, and funded 412 projects with a funding rate of 23.87% and an average direct cost funding intensity of 581,800 yuan per project.

In recent years, along with the development of information sciences, the above areas are now having more and more interactions with physics, chemistry, materials sciences and life sciences, and many new research directions are emerging. Among the major branch areas, applications remained the same in the following areas: semiconductor photoelectric devices, IC design and test, semiconductor crystals and membrane materials, photon and photoelectric devices, transmission and exchange photonics, optical information acquisition and processing, nonlinear optics and quantum optics, laser and applied optics, etc. Applications are increasing in such areas as semiconductor electronic devices, semiconductor micro nano mechanical electronic devices and system, IC manufacturing and packaging, semiconductor physics, inferred physics and technology, biomedical photonics, optics and photoelectric materials, spectroscopic technology, etc.

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

development.

Statistics in the applications in 2016 show that proposals following international frontier and hot spot and frequently changing research directions have reduced in number. Researchers are advised to take concrete steps in their research by making in-depth and persistent studies, and propose more creative research topics according to the international research trend and the national development needs.

Department of Management Sciences

Management is an interdisciplinary science which aims at revealing and applying the basic laws of various management activities. The research findings can be used to optimize the utilization of limited resources. The Department consists of three divisions, handling proposals of four disciplines of Management Science and Engineering, Business Administration, Economic Sciences, and Macro-Management and Policy.

During the 13th Five-Year Plan, the Department will further encourage innovative studies, give preference to proposals of discovering universal scientific issues based on Chinese management practices to explore these issues, and enrich the knowledge of human management sciences.

The Department emphasizes applying "scientific methods" to explore the objective laws of management sciences, and therefore ordinary management research will not be supported. The Department supports experimental research that observes and discovers the new management phenomena based on data obtained from experiments, observations, and measurements, etc. The Department also supports theoretical research that aims at addressing management issues by analyzing and explaining management phenomena through modeling, computation, induction and deduction. The Department will offer higher funding support than the average funding level for experimental research projects that do need long-term and large-scale data collection, data processing, and filed investigation, and high performance computing and experiments.

The Department encourages and supports scientists from diverse academic backgrounds to take an active part in management science research and contribute to the development of management science, a comprehensive interdisciplinary science. However, applications focusing on social science and humanities, as well as those within the funding scope of other scientific departments of NSFC, will not be accepted by the Department. Applicants are advised to propose their research topics from the perspective of management science research.

General requirements for applications in 2017 are as follows:

1. No repetitive funding with the National Social Science Fund

To optimize the allocation of the National Natural Science Fund and to ensure that project leaders invest adequate time and energy in their on-going national projects, the Department will decline proposals by the following applicants in 2017:

(1) Applicants who were supported by the National Social Science Fund as a project leader within the past 5 years (from Jan. 1, 2012), and have not yet got the project completion certificate awarded by the National Planning Office of Philosophy and Social Science until the deadline of this year's fund application.

Funding for General Program Projects in Department of Management Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Average funding for direct costs	Funding rate (%)	Projects	Average funding for direct costs	Funding rate (%)
Division I	Management science and engineering	198	9,522	21.95	193	9,264	21.69
Division II	Business administration	210	10,100	20.55	209	10,032	20.31
Division III	Macro-management and policy	292	14,038	17.81	318	15,264	18.10
Total		700	33,660	19.64	720	34,560	19.59
Direct cost funding per project		48.09			48.00		

Note: if an applicant has gained the project completion certificate from the National Planning Office of Philosophy and Social Science, and is applying for an NSFC project with the application code starting with G in 2017, he/she must provide a copy of the certificate with an official signature and seal of his/her home institutions.

(2) Applicants who submit proposals to both the Department of Management Sciences of NSFC and the National Planning Office of Philosophy and Social Science in 2017.

2. Accuracy and integrality of information

Applicants are responsible for the accuracy, integrality, and reliability of the contents of their applications, and their home institutions are obligated to undertake serious check on the relevant information. The following requirements should be complied with when applicants prepare and submit the project proposals:

(1) Applicants are required to give a detailed description on their previous research work related to the proposed work, as well as the publications published in previous work. For publications that are accepted and waiting to be published, a copy of the acceptance notice should be provided in the proposal.

(2) The Department treats it unacceptable that applicants submit the same proposals to more than one science funding agency. Applicants who propose new research topics based on their previous NSFC projects are required to describe the progress of the previous NSFC project and clarify the relations and differences between the newly submitted proposals and the previous ones. For applicants who are undertaking projects funded by other agencies, such as MOST, NSSF or local science funding organizations, they are required to clarify the similarities and differences between their on-going projects and the new proposals submitted to NSFC.

3. Special requirements for project leaders starting NSFC projects in recent years

To ensure that project leaders invest adequate time and energy in their on-going projects, the applicants in 2017 who gained any kind of NSFC projects as a project leader in 2015 or 2016 (especially in 2016) will be reviewed and assessed through stricter procedures.

4. Consideration of the performance of accomplished projects

The Department conducts performance evaluation for all General Program projects,

Young Scientists Fund projects, and Fund for Less Developed Regions projects one year after these projects were complete. The evaluation results will be released to the public on the NSFC website. Researchers with good performance evaluation results will be given priority for funding when they apply for new projects. However, researchers with poor performance evaluation results will undergo stricter review procedures when they apply for new projects.

In 2017, the average funding intensity for direct expenses of General Program projects will be from 450,000 to 550,000 yuan per project.

Division I of Management Sciences

The Division of Management Science and Engineering mainly supports research associated with fundamental theories, methods and techniques in the field of management science, which include general management theory and research method, operations management, decision-making theory and method, game theory and method, evaluation theory and method, forecast theory and method, management statistics theory and method, management psychology and behaviors, management system engineering, industrial engineering, logistics and supply chain management, service science and engineering system, reliability and management, information system and management, technology and approach of risk management, financial engineering, complexity science, knowledge management, and engineering management, transportation management, etc.

The Division emphasizes basic theories and frontier areas, gives funding priority to fundamental and frontier research in the above-mentioned field, and encourages innovative research on management theory and method integrated with China's management practices, management philosophy, and cultural characteristics.

In 2016, the Division received a total of 890 applications for General Program and funded 193 projects. The funding rate was 21.69%.

For the past few years, the discipline of management science and engineering has experienced rapid development in China. The quantity of academic papers in the fields of operation and optimization method, and information technology and management is increasing significantly. However, the number of papers published by Chinese scholars in high-level international journals is still relatively small. Therefore, the quality of academic publications needs to be further improved.

In 2017, the Division will continue to support proposals aiming at innovative fundamental scientific issues, and provide consecutive support for projects and teams that have shown great research abilities and innovative potentials. The Division will strengthen the support for the projects associated with production and service practices, and encourage scientists to integrate theories and methods with the practical issues of enterprises, to solve the problems from management practices in China, and to form the management theory and methods for China. The Division also encourages integrations of management sciences and mathematics, economics, behavior sciences, information sciences, as well as other disciplines, supports studies that address the scientific issues of management science by developing new theory, methods, and practices though multi-interdisciplinary. The Division encourages the project leaders to track closely the international academic frontier, publish

their research work in reputable international journals, and have innovative research achievement with much impact worldwide.

Division II of Management Sciences

The Division of Business Administration mainly supports fundamental research and applied fundamental research on management theories and new management techniques and methodologies, taking micro-level organizations (all types of industries, enterprises, institutions, and nonprofit organizations) as research objects. The funding areas of the Division include strategic management, organization theory, enterprise technology innovation and innovation management, organizational behavior and company culture, human resource management, financial management, accounting and audit management, marketing, production and logistics management, enterprise information management, e-commerce, operation and supply chain management, service science and management, project management, entrepreneurship management, international business and multi-culture management, etc.

In 2016, the Division received a total of 1,029 applications for General Program and funded 209 projects, with a success rate of 20.31%.

In 2016, many applications were focused on marketing management, finance management, operation and supply chain management, accounting and audit management, enterprise technology innovation and innovation management, strategic management, organizational behavior and company culture, and correspondingly, the number of funded projects in these fields was larger than in other fields. The number of applications in the fields of service science and management, and project management was small, and the number of funded projects in these fields was relatively low. In general, the proposals aiming at new methods and technologies have shown some innovation, and the number of applications focusing on new issues and China's practical needs was increasing. From a perspective of funding structure, a balanced distribution of funding areas has been formed.

In 2017, the Division will continue to support innovative and frontier research, encourage theory innovation and new knowledge discovery and creation, encourage scientific accumulation and discovery research by integrating empirical analysis, case studies, and observation experiments, encourage those focusing on scientific issues derived from China's management practices that have potential social application values, and those research with substantial international cooperation. The Division advocates scientific spirits, encourages exploration, and supports original fundamental research.

In order to promote the balance within the discipline, the Division will give priorities to fundamental research frontier in areas of corporation strategy, enterprise technology innovation and innovation management, organizational behavior, financial management, accounting and audit management, marketing, enterprise information management, e-commerce and business intelligence, operation and supply chain management. Preference will be given to areas of human resource management, organization theory, service science and management, project management, and tourism management. Meantime, the Division will strengthen the support for theory innovation research based on Chinese management practice.

Division III of Management Sciences

The Division III of Management Sciences supports fundamental research of Economic Sciences and Macro-Management and Policy.

The Economic Sciences discipline primarily consists of the economic research fields in the previous discipline of macro-management and policy, and takes some economy-related research fields from the disciplines of Management Science and Engineering and Business Administration. The Department also supplements and amends the previous Macro-Management and Policy discipline, and makes it a new discipline code which focuses mainly on macro-management and public policies.

Economic Sciences (G03)

The Economic Sciences discipline mainly supports the fundamental research of revealing development rules of economic activities, explaining economic development phenomena, and discovering economic theories by using scientific research methods such as empirical study, quantitative study, and behavior study. The funding areas of the Economic Sciences discipline include game theory and information economy, experimental economy and behavioral economy, econometrics and economic calculation, financial management, industry economy and regional economy, monetary policy, fiscal and tax policy, agriculture and forestry economics management, international economy and trade theory, economy development and growth, etc.

In 2016, the Economic Sciences discipline (the economy-related areas in the previous Micro-Management and Policy discipline) received a total of 776 applications for General Program, 7.93% higher than that in 2015 (719 applications), and funded 141 projects. The funding rate was 19.6%.

During the recent years, within the Economic Sciences discipline, the number of applications in the fields of agriculture and forestry economics management, financial management, and macro economy management was relatively higher, while the number of applications in fiscal and tax management was rather low, which indicates the differences in scale of research teams and research capacity between various research areas. Many applicants concentrated on hot topics associated with China's economy development and growth, and submitted high-quality research proposals.

In 2017, the Economic Sciences discipline will pay more attention to research proposals aiming at macro-economic models based on China's actual situations, econometrics experimental economy theory and method, internet financial management, industry transformation and upgrade, and public finance. In particular, special preference will be given to the research areas focusing on China's economy development and growth, including economy structure adjustment, technology innovation and productivity, population and labor, resource and environment, and income distribution.

Macro-Management and Policy (G04)

The Macro-Management and Policy discipline is a group of disciplines that study the behaviors of all levels of governments and related public sectors in formulating macro policies and implementing comprehensive management policies, in order to achieve the

social and economic development goals. It covers public administration, policy science and theory method, non-profit organization management, technology management and policy, innovation management and policy, health management and policy, education management and policy, culture and leisure industry management, public security and crisis management, social welfare management, environment and ecology management, resource management and policy, regional development management, information resources management, etc.

In 2016, the Micro-Management and Policy discipline (all areas in the previous Micro-Management and Policy discipline excluding the economy-related areas) received a total of 981 applications for General Program, and funded 177 projects. The funding rate was 18.04%.

During the recent years, applications focusing on the areas of resource and the environment management, and public health management and policy are relatively more than other areas. The number of applications in the areas of public security and crisis management, public health management and policy, and resource and the environment management increased rapidly, and the number of applications focusing on urbanization and aging increased even more rapidly. Many applicants concentrated on hot topics associated with macro-management and policy practices in China, and submitted high-quality research proposals.

In 2017, the Macro-Management and Policy discipline will pay more attention to research proposals in the fields of public policy, social governance, health service management, public security and crisis management (emergency management), and the aging society within the context of big data.

Through funding research projects, the Division aims to facilitate discipline development, promote academic innovation, and support talent scientists and research teams. In particular, the Division encourages researchers to provide scientific support and evidences for macro policy makers while developing theory and method. The applications should take China's practical management issues as the main research objects, and bring up scientific theoretical issues from the research objects accurately. Special attention should be paid to the scientificity and normativeness of the research methods. Applicants are advised to differentiate between management science research and actual management work, and between an NSFC project and a humanity and social science project in terms of research methods. The scope of the research topic needs to be appropriate, the research goal should be concentrated, and the research content should be specific and concrete. The research method and technology roadmap, as well as how to address the key scientific issues, are supposed to be clearly clarified in the application.

Department of Health Sciences

In view of the fact that scientific research is both curiosity-driven and national needs-driven, the objective of the funding for General Program in the Department is to support basic research on issues concerned with disease prevention, disease control and disease treatment in China. For the purpose of improving the scientific research in medical science, this program mainly supports basic research (including clinical-related basic research) in the following areas: the structural, functional, developmental, genetic and

immune abnormalities of human body, the occurrence, development, outcome, diagnosis, treatment and prevention of diseases.

The Department encourages research areas as follows:

Innovative theoretical and methodological research aimed at the scientific issues emerging from medical practices; systematic and indigenous study on key scientific issues emerging from medical disciplines; translational medicine through combination of basic research and clinical research; integrative medical research on the occurrence, development and regression of diseases at various levels from molecular, cellular, tissue to organ, individual and population level by using new multidisciplinary and comprehensive techniques or methods; in-depth systematic and innovative study based on existing accumulated researches; Interdisciplinary medical research crosscutting with other scientific fields; the development of new animal models of human diseases; Substantive international joint research and exchange.

The Department will give priority to basic research on major key diseases closely related to the national welfare, human livelihood, major emergency event of public health, and common or frequently encountered diseases that severely affect human health. Meanwhile, the Department will also highlight research of rare diseases and other weak research areas in an effort to keep the balance and coordinative development of various disciplines.

1. Specific instructions for applicants

(1) Applicants are encouraged to carry out in-depth basic research toward scientific issues, especially the original research. Applications with unique academic ideas or solid previously accumulated research work are encouraged to carry out further systematic research. Simple descriptive or observant applications and applications tracking others' without innovative scientific ideas, or applications merely pursuing new high-technology rather than scientific novelty will not be in consideration for grant.

(2) Applicants are expected to propose a defined scientific issue or a specific hypothesis based on analysis of the relevant latest literature and research progress in the field, and elaborate the scientific values and potential clinical applications of the anticipated research results in detail. To elucidate the research theory and application value is needed as well.

(3) Applicants are expected to propose adequate research contents, detailed research design, clear research methods and reasonable budget; the proposed research is supposed to be specific, feasible and logical. Besides, applicants are expected to elaborate how the proposed research will possibly solve the specific scientific problems or verify the hypothesis.

(4) Applicants are expected to provide detailed information about relevant previous research. In case of extensive applications of previously funded project, the innovative ideas and further scientific problems of the research are expected to be elaborate in detail. Besides, all the relevant published papers are expected to be listed, and relevant unpublished results including experimental data, tables and graphics, pictures, etc., are attached.

(5) Applicants are expected to provide true and accurate information in their applications, including the curriculum vitae of applicant and major participants (both education and working experience are expected to be included, in chronological order with exact months and years, keeping the timeline consistent), previous grant information and relevant publications. For publications, detailed information including the names of all

authors (in the same order in which they appeared in the publication), the article and journal title, book title, volume number, page number, and year of publication (abstracts or meeting proceedings should be specified) are supposed to be included. The first authors and corresponding authors should be noted in accordance with the instructions and guidelines of application form. Accepted manuscripts should be listed along with an attached acceptance letter or online publication link, unaccepted submitted manuscripts or manuscripts in preparation should not be included. Patents and awards should also be listed.

(6) Applicants are expected to provide a signed written institutional certification or approval (the scanning copy should be attached to the electronic proposal) to meet the related ethical or informed consent requirement if applications involve special medical research objects such as human subjects.

(7) Applicants are expected to follow all appropriate guidelines for the use and handling of pathogenic microorganisms, including the guideline "Bio-safety Administrative Rules of Pathogenic Microorganism in Lab" released by the State Council of China and the ethical and bio-safety regulations by other governmental agencies. Additionally, a commitment letter to guarantee bio-safety should be provided by the research institutions when applications are involving highly pathogenic microorganisms.

(8) Applicants with good performance records in their previous grants will be given priority funding.

(9) Applicants are expected to notice that: in 2017 the Department will generally not give further funding to applicants who either have got high funding intensity in 2016 from NSFC (such as Key Program, Major Program, Major International and Regional Joint Research Program, etc.), or are applying for repetitive or similar research to their on-going national scientific projects funded by other agencies.

(10) **Applicants are expected to provide PDF copies of no more than 5 representative papers (PI's papers only) in their electronic applications.**

(11) Applicants are expected to refer the specific requirements for various programs via the website of the Department (http: //health.nsfc.gov.cn).

2. General overview of applications in the Department in recent years and instructions to research institutions

The number of applications has been increasing in the Department of Health Sciences ever since its establishment. In 2015, the number of applications was 44,635 (from 985 research institutions), accounting for 26.62% of the total applications in NSFC, including 19,587of General Programs which account for 26.82% of the total applications of General Program in NSFC. In 2016, the number of applications was 48,646 (from 996 research institutions), accounting for 27.50% of the total applications in NSFC, including 20,318 for General Program which account for 27.44% of the total applications for General Program in NSFC.

To enable the rapid and healthy development of both scientific fund and medical research in China, the research institutions are expected to further strengthen their management in the process of NSFC grant applications, and to make an effort to further improve the scientific quality of applications (rather than increase the number of applications) under the guidance of "Requirements of NSFC for Institutions to Improve Management of Scientific Projects".

3. Specific explanations on application codes

Peer review activities of the applications in the Department are organized according

to the application codes attached to this guide. The application codes of the Department compose of 31 primary application codes (H01 to H31) and many relevant secondary codes. The basic characteristics of the application codes are as following: (i) the primary application codes, which are mainly arranged in the order of organs or systems, include research areas relevant to both basic and clinical research, in an effort to ensure that applications on similar scientific issues from different disciplines are reviewed in the same reviewing system; (ii) the secondary application codes, which are arranged in the order from basic to clinical research and from structural, functional and developmental abnormalities to diseases, cover both basic and clinical research relevant to the given organ or system.

The applicants are expected to carefully choose the primary application code and the relevant secondary one. For the details, please refer to the following contents in the guide of each division of the Department.

4. Special Projects under General Programs and relevant policies

(1) Animal models development

Animal models for mimicking human diseases are requisite to biomedical research, not only for understanding mechanism of diseases, and identifying new drug targets, but also for drug evaluation in clinical trial phases. The Department will give special support to applications for General Programs involving the development of animal models of human diseases. Basically, animal models for mimicking human diseases include both spontaneous animal models and inductive (laboratory) animal models, the latter may include gene modified animals (transgenic models, gene knock in/out models, ENU inductive models and cloning models), surgical animal models and physical- or chemical-induced animal models.

The funding intensity of direct cost is averagely 0.8 million yuan, and the duration is four years. Research in the following areas are especially encouraged: (i) identification of spontaneous animal models of human diseases; (ii) the development and standardization of various new inductive animal models; (iii) studies on the impacts of various environments on animal models; (iv) comparative medical studies on various species of animal models of the same disease; (v) resource information and databases of animal models; (vi) technical improvements in developing animal models. New animal models for human diseases are one of the fundamental works in experimental medical research, so the Department will give long-term continuous support in order to provide technical platforms and facilitate research progress in this area in China.

The applicants are expected to choose the proper secondary application codes attached to the primary application codes (H01 to H31) based on their proposed research, and **"The development of animal models for human diseases" should be written in the annotated column of the application form**. The similarity and differences in disease susceptibility and clinical symptoms between animal models and human diseases should be elaborated, and a detailed analysis of the available animal models of a given human disease is required to avoid repeated research. **All the government requirements concerning animal welfare and ethical issues should be met. There is an "animal model" special column on the website of the Department (http://health.nsfc.gov.cn), and the principal investigators are expected to submit the progress report of the project in time, and to contribute to the validation, spread, and application of the animal model.**

(2) Etiology and prevention study of human rare diseases

In 2017, the Department will continuously give special support to research aimed at studying the development and prevention of human rare diseases. The rare

diseases are defined by WHO as diseases accounting for 0.65‰ to 1‰ of the total population. Applicants are expected to take the advantage of rich genetic resources in China, and to carry out in-depth research on prevention, diagnosis, and drug development of rare diseases, making achievement with own proprietary intellectual properties, and high international impacts. Meanwhile, case studies of major key rare diseases are highlighted in an effort to advance the understanding of pathogenesis underlying the development of major key diseases, thus providing theoretical bases for their novel diagnostic and therapeutic strategies. The applicants are expected to choose the proper secondary application codes attached to the primary application codes (H01 to H31), and to **write "Mechanism underlying rare diseases (including case studies) and their prevention and treatment" on the annotation column of the application form**.

(3) The development and function of lymphatic system

In 2017, the Department will also give special support to research aimed at the development and function of lymphatic system. Research aimed at the regulation mechanism underlying the generation, maturation and homeostasis of the lymphatic system, the relationship between lymph and blood, the roles of lymphatic system on lipid metabolism, the immune defense function of lymphatic system, and the pathogenesis of major key diseases related to lymphatic system, are all encouraged. The applicants are expected to choose the proper secondary application codes attached to the primary application codes (H01 to H31), and to **write "Mechanism underlying rare diseases (including case studies) and their prevention and treatment" on the annotation column of the application form**.

Specific annotation of the above Special Projects should be specified in the annotated column of the application form. Otherwise, these applications would not be treated as Special Projects.

5. Funding plan and budget for General Program in 2017

The funding intensity of direct cost for each project of the General Program in the Department is expected to be averagely 600,000 yuan, roughly the same as that in 2016, and the duration will still be four years. Doubled funding will possibly be given to excellent innovative research built upon previous strong background. Applicants are expected to request the adequate budget for their proposed work by filling out the budget form with detailed justification.

Funding for General Program Projects in Department of Health Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Average funding for direct costs	Funding rate[++] (%)	Projects	Average funding for direct costs	Funding rate[++] (%)
Division I	Respiratory system, circulatory system, blood system	439+25[*]	25,499+625[*]	22.13	445+22[*]	25,720+550[*]	21.91

Division II	Digestive system, urinary system, endocrine system/metabolism and nutrition support, ophthalmology, otorhinolaryngology head and neck science, oral and craniomaxillo-facial Science	543+17*	31,394+425*	21.54	545+24*	31,432+600*	20.61
Division III	Neurological and psychiatric diseases, gerontology	347+14*	20,457+350*	21.71	356+13*	20,688+325*	21.50
Division IV	Reproductive system/ perinatology/neonatology, medical immunology	228+12*	13,137+300*	24.84	229+11*	13,215+275*	24.92
Division V	Medical imaging and biomedical engineering, special medicine, forensic sciences	223+13*	12,859+325*	20.63	220+11*	12,565+275*	19.43
Division VI	Medical pathogenic microorganisms and infection, orthopedics and sports medicine, emergency and intensive care medicine/trauma/ burns/laboratory medicine/plastic surgery/ rehabilitation medicine	367+15*	21,165+375*	20.38	369+21*	21,208+525*	19.02
Division VII	Oncology (leukemia not included)	752+31*	43,229+775*	19.57	746+29*	42,784+725*	18.73
Division VIII	Skin and appendages, preventive medicine, endemiology, occupational medicine, radiology	224+12*	12,849+300*	24.89	225+11*	12,917+275*	24.11
Division IX	Materia medica and pharmacology	241+13*	13,808+325*	22.18	237+11*	13,567+275*	21.74
Division X	Chinese medicine, Chinese materia medica, integrated Chinese and western medicine	558+28*	32,043+700*	18.61	550+27*	31,494+675*	17.76
Total		3,922 +180*	226,440 +4,500*	20.94	3,922 +180*	225,590 +4,500*	20.19
Direct cost funding per project		56.30 (57.74**)			56.09 (57.52**)		

Note: *One year program; ** One year program not included; ++ One year program included

The support research areas of each Division, and an overview of the award number, funding, and success rate of the General Program in 2015 and 2016 in the Department are listed in the table below.

Division I of Health Sciences

The division I of Health Sciences provides grant support for basic research on the diseases of respiratory, circulatory, and hematological systems.

Respiratory System (H01)

The division of respiratory discipline mainly funds the basic and clinical basic research on the diseases of lung, airway, pulmonary circulation, mediastinum, pleura, thoracic cage, and diaphragm. Our funding areas cover disease mechanisms, pathophysiological changes and treatment strategies involving the studies on lung and airway structure, function and developmental abnormalities, lung, airway immunity and transplantation, pulmonary alveoli and blood-gas barrier, lung fluid transport and pulmonary edema, respiratory regulation abnormalities, respiratory infections, host-pathogens interactions, lung injury, repair and remodeling, airway inflammation and asthma, chronic obstructive pulmonary disease, pulmonary circulation and pulmonary vascular disease, interstitial lung disease, pulmonary nodules, granuloma, sarcoidosis, and sleep-disordered breathing, pleural disease and new methods, techniques and animal models of the respiratory system diseases.

Circulatory System (H02)

The division mainly supports the basic researches in cardiac and vascular (including lymphatic vessels) diseases, as well as microcirculation and shock. In recent years, most proposals were focused on cardiac/vascular injury and protection, and followed on atherosclerosis, coronary heart diseases, arrhythmia, heart failure and hypertension, etc. Applicants are encouraged to carry out original and translational basic research, working together with clinicians, developmental biologists and genetic biologists, to study on the mechanisms of cardiovascular diseases development and the therapeutic strategy. In the cutting-edge fields of cardiovascular diseases, researchers are encouraged to establish international collaborations, to propose innovational hypothesis based on their own research data, and eventually gain achievements with independent intellectual properties. Researches on the biological and pathological effects of the biological active substances on the heart and vessels are encouraged, and further screening the potential biomarkers for diagnosis, therapeutic targets and innovative treatment technologies. Studies on the molecular etiology, regulation network and intervention targets of the metabolic disorder related cardiovascular diseases are encouraged, and the effects of other system diseases on the cardiovascular system are also encouraged. Pericardial diseases, infective endocarditis, immune related circulatory system diseases and lymphatic circulatory diseases are still the relative weak fields in cardiovascular system, and the basic and applied basic research are encouraged. Applicants are encouraged to conduct the study on the cardiovascular diseases in children,

and one or two innovative proposals in this direction may be funded with higher funding in 2017.

Hematological System (H08)

The Division will mainly support original research in the areas of hematopoietic cells/organs development and formation, hematopoietic stem/progenitor cell and hematopoiesis regulation, erythrocyte and its diseases, leukocyte and its diseases, platelet and its related diseases, aplastic anemia and bone marrow failure, myelodysplastic syndromes, myeloproliferative diseases, blood infection and its treatment, bleeding, coagulation and thrombosis, leukemia, hematopoietic stem cell transplantation and its complications, mesenchymal stem cell and blood disease treatment, blood typing and blood transfusion, hereditary hematologic diseases, lymphoma, myeloma, and plasma cell diseases, technologies and methods for diagnosis and treatment in hematological diseases, novel research methods for hematological diseases.

Currently, most applications and funding are concentrated in leukemia, lymphoma, myeloma, hematopoietic microenvironment and stem cell transplantation fields. Applications in other categories are relatively low in number, especially in the areas of red blood cell diseases, blood coagulation and thrombosis, cell therapy. Thus in 2017, the applicants are strongly encouraged to submit applications in the fields of hematopoietic microenvironment and hematologic disease development, clonal evolution in hematologic malignancies, heterogeneity of diseased cells, and precision medicine. Applications are encouraged to initiate clinical-based basic research and propose basic research projects from clinical perspective, translational research fully utilizing clinical resource, research using the state-of-the-art technologies with hematological research platforms and innovative disease research models, basic or applied basic research in biotherapies in hematological fields such as HSC transplantation, MSC therapy, cell immunotherapy, gene therapy, etc. In addition, researchers are encouraged to submit applications on the following research hotspots in hematological field: regulation of hematopoiesis and hematopoietic cell reprogramming; interaction between hematopoietic cell and leukemic cell and their microenvironment under the disease condition; clonal evolution of malignant hematologic diseases; drug resistance in treating malignant hematologic tumors; hematopoietic stem cell transplantation and its biological and immunological issues; hematological disease omics, hematologic biomarkers and their functional validation; the mechanism for leukemic stem cell maintenance and its clinical correlation; cell therapies and molecular targeting of hematological diseases; in vitro differentiation of stem cells to hemogenic cells; the interaction and mechanisms of platelets, blood vessel and coagulation factors.

All applicants who tend to apply for pulmonary circulation and pulmonary vasculature studies can choose the codes of either respiratory system (H01) or circulatory system (H02), according to their specific research contents. The application in hematological fields now includes all hematologic malignancies (H0818: lymphoma and other lympho-proliferative diseases; H0819: myeloma and other plasma cell diseases). The division VII for cancer research (primary application code H16) will no longer accept applications for hematologic malignancies.

Division II of Health Sciences

Division II mainly supports basic and clinical-related basic researches on digestive system, urinary system, endocrine system/metabolism and nutrition support, ophthalmology, otorhinolaryngology, head and neck science, as well as oral and craniomaxillo-facial science.

Digestive System (H03)

The funding scope mainly covers basic researches on various diverse non-infectious and non-neoplasm diseases of the digestive system. The amount of proposals in 2016 increased 11.4% compared with that in 2015. Proposals on liver diseases, such as hepatic fibrosis, cirrhosis and portal hypertension, were still accounted the most dominant research areas in this field, amounts for 14.3% of all proposals in 2016. Other research interests in liver diseases were hepatic regeneration, liver protection, liver failure and artificial liver (10.3%), metabolic dysfunction of liver and related diseases (8.2%). Other proposals included the mechanisms of immune-related diseases of digestive tract (8.4%), internal environment disturbance of GI tract, intestinal mucosal barrier impairment and related diseases (9.7%), abnormal GI motility and functional GI disorders (7.0%), pancreatic exocrine dysfunction and pancreatitis (6.1%), digestive organ transplantation (5.8%). It should be noticed that the number of applications on the structure and functional impairment of abdominal wall/peritoneum, endocrine and neuro-humoral regulation of digestive system, acid-related diseases and vascular circulation abnormalities of digestive system still witnessed at a relatively low level. Various liver diseases, especially fatty liver diseases, hepatic fibrosis, cirrhosis, liver damage and regeneration, and liver transplantation are the hot areas in this field. Among the gut diseases, the number of applications of the mucosal barrier impairment of digestive tract and related diseases increased obviously than that last year. The number and proportion of above-mentioned areas are the top three of total applications. The intestinal microecology disturbance, immune diseases of digestive system and the mechanism of gastrointestinal motility and functional GI disorders got consistent attention. Drugs, toxicants or alcohols-induced digestive diseases are also hot issues in this field. Research focused on these important areas mentioned above, and studies on the patho-physiology of pre-clinical phase of these diseases and the mechanisms of functional disorders, relationship among different digestive organs in the pathogenesis of digestive diseases are encouraged.

Urinary System (H05)

Studies on the structural and functional disorders of kidney, ureter, bladder, prostate and urethral canal, and disease-related proposals except tumor research fall into the funding scope. The amount of proposals received in 2016 increased 5.54% compared with that in 2015. Hot areas were still related to prevention and treatment of chronic kidney diseases in 2016, mainly focused on damage and repair of the urinary system (21.59%), followed by secondary renal diseases (14.93%), renal failure (10.6%), as well as primary renal diseases (9.89%). The amount of proposals focused on kidney transplantation, urinary system

lithiasis and urodynamic studies was almost the same as that last year. More emphasis should be paid to infection of urinary tract, abnormal renal substrate transportation and renal endocrine dysfunction. The Division will continue to support consistent and innovative researches in these fields.

Endocrine System/Metabolism and Nutrition Support (H07)

The Division mainly supports studies on the structure and functional disorders of endocrine systems (except tumor research), including diseases related research of endocrine system, endocrine function and abnormality of classical and non-classical endocrine organs, and supports various dysfunctions of metabolism, malnutrition and nutrition support. The amount of proposals in 2016 increased 8.6% compared with that in 2015. The majority of proposals were diabetes-related, with the percentage of 52.8%. The percentages of proposals on energy metabolism/obesity, bone metabolic diseases, thyroid diseases and metabolic syndromes were 17.9%, 10.4%, 4.5% and 4.3% respectively in 2016. There were few proposals on disturbance of water and electrolyte metabolism and abnormal acid-base balance, amino acid metabolism, development or structure abnormal of adrenal gland, thyroid and parathyroid transplantation, as well as abnormal of calcium phosphorus metabolism. Division II will pay more attention and support preferentially on these areas in the future, and encourage innovative applications on questions arising from clinical practice, with proper research design and approach.

Ophthalmology (H12), Otorhinolaryngology Head and Neck Science (H13), Oral and Craniomaxillo-Facial Science (H14)

The Division mainly supports non-neoplasm diseases of related fields. In the field of ophthalmology, it mainly supports inflammatory diseases, immune diseases, hereditary diseases, as well as degenerative and neo-vascularized diseases. Researches on fundus diseases were still the most concentrated areas in 2016, accounted for 34.6% of total proposals, followed by corneal diseases (16.5%), glaucoma, optic nerve and visual pathway related diseases (14.9%) and optometry diseases (9.7%). The hot areas of ophthalmology were the researches on the molecular mechanisms of diabetic retinopathy, neovascular eye diseases, pathologic myopia and age-related macular degeneration (AMD).

Auditory abnormality and balance disorders were still the most concentrated areas in 2016, amounted for 41.18% of total proposals, followed by olfactory, nose and anterior cranial base diseases (27.17%), and throat and neck diseases (9.77%). Hearing related researches were key-issues in otology, including the genetic and molecular pathogenesis on various types of deaf, and signal pathways related with hear damages. Pathogenesis of rhinitis and sinusitis, allergic rhinitis and its immunotherapy were hotspots in the field of nosology. Proposals on the throat diseases were mainly focused on pararthria and functional repair. Obstructive sleep apnea hypopnea syndrome (OSAHS) is another concerned area. Pathogenesis and interventional treatments tinnitus, acoustic sensitivity, circumgyration, dysosmia will be the future direction. More general projects with high funding intensity will be supported in this field. The proposals on the periodontal and oral mucosa diseases were still dominant in 2016, accounted for 18.5% of total proposal, followed by bone and cartilage tissue development, repair and regeneration of the cranial and maxillofacial region (15.6%), dental pulp and periapical diseases (13.5%), as well as tooth defect, anodontia,

repair and correction of dentognathic deformity (13%). The studies in osteogenesis and tissue biomechanics and biomaterials were hot fields. The Division will continue to support researches on most severe, common, complicated diseases or functional disorders in the above fields, support research on pathogenesis, diagnosis, novel treatment procedures and functional reconstruction, and areas related to general health of human body.

The Division does not support researches on drug design and pharmacology. Please submit the related proposals to Division IX of Health Sciences (H30, H31). Proposals on the male reproductive system and male sexual dysfunction are not included under code H05, so please submit related proposals to Division IV (H04). It is specially noted that the proposals on teeth repair and implant material should use code H1409, and the proposals on craniofacial bone, cartilage tissue in the field of oral medicine should select code H1402. Other proposals related with characters of oral orthodontic and repair should submit to code H1408. Division II does not support cancer research. All applications on cancer research in those areas please refer to the general introduction of proposal guidance from Department of Health Sciences.

Division III of Health Sciences

Division III provides financial support primarily for basic research in the fields of neurological diseases, psychiatric disorders, and diseases associated with aging.

Neurological Diseases and Psychiatric Disorders (H09)

Under this code, Division III offers a wide range of grant opportunities that provide support for both basic and applied research investigating the pathogenesis, mechanism, diagnosis, treatment, and prevention of most neurological diseases. We provide research funding for common neurological disorders (e.g., cerebrovascular diseases, epilepsy and paroxysmal disorders), traumatic brain and spinal cord injury, headache, pain syndromes, and neurodegenerative disorders, as well as support for inherited metabolic, inflammatory, and immunological diseases of the nervous system. In addition, we encourage and stimulate research examining the cause of comorbid neurological diseases and psychiatric disorders as well as clinical investigations that focus on neurological diseases and psychiatric disorders independently. We do not provide funding for research concerning nervous system tumors.

One of the defining characteristics in the spectrum of modern human disease is the rapidly increasing prevalence of psychological and psychiatric diseases. Therefore, the most urgent need in these fields is the development of studies that aim to: (1) identify and/or classify the biological bases associated with specific disorders, and (2) better understand the biomedical causes and mechanisms that can be used to promote early detection, objective diagnoses, and targeted treatments. Applications submitted within this scope are considered to be among the highest of funding priorities for our division. Compared with research funding requests from previous years, most of the applications for psychiatric disorders submitted in 2016 remained focused on depression disorders and schizophrenia, though there has been a mild increase in applications for studies of autism and attention deficit syndrome. Yet, despite the growing need, the number of applications that focus on crisis

intervention remained very low. In an effort to reduce the growing burden of mental health in China, we also encourage the submission of research applications that aim to illustrate the effects of the environment on genetics and the impact of both factors on the development of psychiatric disorders.

In recent years, applications for research in neurological diseases were predominantly focused on stroke, epilepsy, and neurodegenerative diseases. 2016 saw a dramatic increase in applications for research of glia, immunity, and exosomes in neurological diseases, however, most of the proposed research focused on follow-up analyses and/or lacked originality. Our division will continue to fund studies on rare genetic diseases of the nervous system, particularly studies based on the molecular classification of individualized diagnoses and treatment. Studies using animal models such as non-human primates, Drosophila, and Zebrafish will be given priority.

Although the number of applications for clinical study of cerebrovascular diseases has increased, there is great need for consensus in defining the characteristics of these diseases, and for significant improvement in standardization of methods (e.g., trial design, data collection, etc.). A unified strategy for carrying out clinical trials and data collection is critically important for strengthening both basic studies and clinical trials for early intervention, revascularization, and functional recovery in stroke patients. The role of the vein in acute stroke, neurotrauma, and neurodegenerative diseases is also a topic of central interest. Research on the mechanisms underlying pain, especially chronic pain, need to be strengthened through the collaboration of basic and clinical studies.

Research on mental disease and disorders of the nervous system in children has been an ongoing concern of Division III, but the research in this field in China is weak. In 2017, combined with defining the characteristics of the child's developing nervous system, one or two general projects related to epilepsy in children and neurodevelopmental disorders will be generously funded to increase the pace of knowledge acquisition and encourage research in this vitally important field.

In summary, Division III will work to balance its support among applications from neurology, neurosurgery, and psychiatry, as well as related fields such as pediatrics and anesthesiology. Clinicians and researchers in basic neurosciences are encouraged to jointly apply for collaborative funding to carry out significant multifaceted investigations.

Gerontology (H25)

The funding scope under this code in our division mainly covers studies focused on the pathophysiological mechanisms of aging and aging-related diseases. Research on the effects of pathophysiological changes on organs and organ systems and common mechanisms of various diseases related to the aging process are also encouraged and supported. Of particular interest are studies examining the effects of factors such as genetics, metabolism, damage, stress, and inflammation on organ function and the development of aging-related diseases; molecular mechanisms of stem cell senescence and its association with organ function and maintenance; the anti-aging effect and mechanism of calorie restriction, exercise, health management, and other approaches to healthy aging. We do not offer funding for applications that focus on age-associated diseases that do not involve pathophysiological mechanisms of aging. Such applications should be submitted to the appropriate Divisions of Health Sciences. Similarly, we do not provide funding for research

concerning tumors, which should be submitted to the Division VII of Health Sciences.

Division IV of Health Sciences

The Division mainly supports basic research on reproductive system, perinatology, neonatology, and medical immunology.

Reproductive System/Perinatology/Neonatology (H04)

The Division mainly supports studies including: (1) abnormalities of the structure, function and development of reproductive system, damage and repair of reproductive system, inflammation and infection of reproductive system, and reproductive endocrinological disorders, hereditary diseases of reproductive system, non-neoplastic diseases of reproductive system; (2) oogenesis, spermatogenesis, fertilization, embryo implantation and fetal development, prenatal diagnosis, the structure and function of placenta, gestational and neonatal diseases; (3) abnormalities of breast structure, function and development; (4) contraception, birth control and termination of pregnancy; (5) female infertility and assisted reproduction, reproductive medical engineering; (6) new diagnostic and therapeutic technology for the reproductive system/perinatology/neonatology. Research priorities in this division include: (1) regulations of oogenesis, spermatogenesis, fertilization, development of embryonic stem cells, embryo implantation and placentation; (2) abnormalities of embryo/fetal development; (3) gestational adaptation and related gestational diseases; (4) Intrauterine and maternal environment on pregnancy success and impacts on the health of offspring; (5) regulation of neonatal organ development and related diseases; (6) environmental, genetic and nutritional impacts on reproductive endocrinology and related diseases; (7) etiology, pathogenesis, pathological changes and tumor-like behaviors of endometriosis and adenomyosis; (8) safety evaluation of reproductive technologies on the preservation/recovery of fertility, infertility treatment and assisted reproductive protocols; (9) studies on male infertility and male sexual dysfunctions.

The Division received 1,391 proposals in 2016, among which, 189 proposals at pregnancy and pregnancy related diseases,170 proposals were aimed at neonatal diseases, 121 proposals at female reproductive endocrine disorders, 118 proposals at female infertility and assisted reproduction, 91 proposals at abnormal spermatogenesis and male infertility, 87 proposals at endometriosis and adenomyosis, 86 proposals at prenatal diagnosis of fetal development, 79 proposals at embryo implantation and early embryonic developmental abnormalities, etc.

In 2016, a relatively large number of researches in female reproductive endocrinology abnormalities (H0404) focused on the etiology/pathogenesis of PCOS (polycystic ovary syndrome) and ovarian function regulation. It is suggested that the future applications should also focus on the direction of puberty onset and menopause related research. In the research of endometriosis and adenomyosis (H0406), a large number of studies focused on the etiology/pathogenesis, symptoms, and their tumor-like behaviors, it is suggested that future studies should also focus on the diagnostic and therapeutic aspects of the diseases. In the research directions of damage and repair of reproductive system (H0402), inflammation and infection of reproductive system (H0403), reproductive genetic

diseases (H0405) and female pelvic floor dysfunction (H0407), studies were mainly focused on the etiology/pathogenesis, and few were focused on other aspects of these diseases. Very few studies were focused on the female sexual dysfunctions (H0408) and breast structure, function and abnormality related research (H0409).

In the research directions of pregnancy related diseases (H0420), a large number of studies focused on pre-eclampsia and gestational diabetes in 2016, future applications are suggested to focus on parturition, gestational infection, pre-gestational/gestational nutrition's impacts on pregnancy outcome and offspring health, particularly how environmental factors (e.g., nutritional factors) induced genetic/epigenetic changes to affect offspring health. Parturition related research (H0421) were few and should be increased. In the research directions of embryo implantation and early embryo development (H0417), most applications focused on mechanisms and signal pathways involved in implantation, uterine receptivity, embryo-maternal interaction and immunology. Future applications are suggested to also focus on pre-implantation embryo development and embryonic stem cells. In the research directions of reproductive immunology (H0427), most applications are focused on immune-tolerance of embryo-maternal interactions, recurrent miscarriage, etc., future applications on autoimmune diseases impact on gestational success, and related immunotherapy. In the research directions of fetal development and prenatal diagnosis (H0427), most applications are focused on genetic/genome-wide screen/analysis, small RNAs, molecular pathways and clinical genetic diagnostic technology. Future applications on fetal organ development and congenital defects related early diagnosis and treatment are recommended.

In the research directions of neonatal related diseases (H0422), most research applications focused on neonatal nerve system diseases, respiratory system disease, digestive system disease and neonatal high-risk disease. Future applications are suggested to expand to neonatal circulation system disease, inherited metabolic disease, infectious disease, as well as normal neonatal development and neonatal nutritional regulations.

In the research directions of assisted reproductive technology and reproductive engineering (H0425), most research applications focused on embryo implantation, in vitro fertilization in vitro oocyte maturation, etc. In the research directions of abnormal spermatogenesis and male infertility (H0424), most research applications focused on spermatogenesis, spermatogonia, non-obstructive azoospermia, spermatogenic arrest, etc. In the research directions of reproductive medical engineering (H0426), most research applications focused on germline stem cells, fertility preservation, somatic cell nuclear transfer, mitochondrial transplantation, etc. Future applications on in vitro spermatogenic cell maturation, new technics on testicular sperm retrieval and improvement of spermatogenesis are encouraged; studies on in vitro oocyte maturation, embryonic stem cell differentiation, stem cell transplantation and new animal disease models are also encouraged.

In the research directions of male sexual dysfunction (H0415), most research applications focused on erectile dysfunction, future applications should also focus on sexual desire disorders and ejaculation dysfunction. Few studies are focused on male reproductive structure and developmental abnormality (H0410), male reproductive system damage and repair (H0411), male reproductive system inflammation and infection (H0412), male reproductive endocrinology disorder and disease (H0413) and male reproductive system genetic diseases (H0414). Future applications are encouraged to focus on the basic and

applied research on contraception, fertility control and gestational termination (H0423).

Focusing on the development and improvement of research facility/research platform/research approach/research resources, the division will continuously support researches that aims to use innovative research methods and platforms (e.g., targeted molecular therapies, in vivo tracking systems, and primate animal models) to study human genetic and developmental diseases, focusing on the regulation and abnormalities of human gametogenesis and fertilization, human embryonic stem cells and early embryo development, human organ development, human reproductive system structure and function, human neonatal development, human pregnancy establishment and maintenance, parturition, etc. We also encourage researches using the rich source of Chinese diseases samples and genetic diversity to study the etiology/pathogenesis, early diagnosis and treatment of congenital malformation, congenital metabolic diseases, single-/multi- gene inheritance diseases, chromosomal disorder, etc. We will also support studies applying cutting-edge technologies such as genome-editing in the researches of contraception, birth control, assisted reproduction and related safety evaluations. We support basic and applied researches using directional stem cell differentiation, and in combination with novel advances in tissue Engineering for treatment of reproductive system diseases. We support researches to use the population resource of Chinese people to perform comparatively study gender-specific and region-specific diseases. We also support basic and translational researches using novel real-time imaging techniques (MRI, PET, confocal, in vivo live cell imaging, embryo time-lapse imaging, etc.), next-generation sequencing, epigenomics, single-cell -omics, bioinformatic analysis, etc., on projects relating to reproductive system/perinatology/neonatology.

Medical Immunology (H10)

The discipline mainly supports the basic and applied basic researches in the morphology, structure, function, and development of immune cells, tissues, organs and system as well as their abnormalities; immune pathological mechanisms of various human diseases; immune regulation; immune tolerance; immune-relevant prevention, diagnoses and therapies of human diseases; and so on.

The areas of research direction and focus are: new immune cells and subsets, new immune molecules and their signal pathways in human diseases, stem cells and immunity, the in vitro differentiation and preparation of immune cells, epigenetic modification on the immune cell differentiation and function as well as their effects on human diseases, exosome and human immune diseases; metabolism and immunity, the interaction between intestinal and genital tract micro-ecology with the immune systems, the regional immunity and human diseases, the immune recognition-response-effect and human diseases; infectious diseases, inflammatory diseases, hypersensitivity diseases, autoimmune diseases, tissue injury and repair, the primary and secondary immunodeficiency diseases, transplantation immunity and organ transplantation and other human diseases-related basic and clinical researches; new biological products for immune therapies such as biological carriers, vaccines, and adjuvants, as well as their biological mechanisms.

Overview of the applications in 2016 and suggestions to applicants in 2017 by research fields are as follows: Medical Immunology discipline received total 881 grant applications. The projects were mainly concentrated in autoimmune diseases (393),

inflammation, infection and immunity (144), organ transplantation and transplant immunology (67), immune response-related factors and diseases (50), and so on. Among them, the grants in the basic immunology mainly focused on signaling pathways, epigenetic regulation of immune molecules in the immune tissue and cell development, differentiation and the effects of such regulation on immune responses. Some of the projects involved the study of the interaction between metabolism and the immune. The applicants should pay more attention to the new immune molecules and immune cell subsets, the development-differentiation-function of lymphatic systems, and their roles and mechanisms in immune-related diseases as well as the roles of sugar/lipid metabolism in the development of immune-related diseases. Applications in the field of organ transplantation and transplantation immunology mainly focused on the new immune molecules and epigenetic regulation of induced transplantation immune tolerance and studies using mouse models of heart, liver, small intestine transplantation. The applicants should pay more attention to the newly identified immune cell subsets, antibodies, complements and innate immune cells in the process of acute and chronic rejection of transplanted cells and organs. Applications in the field of inflammation, infection and immunity mainly focused on the studies of macrophages, T cells and their subgroups. The applicants should further broaden their vision in the immune cell subsets which are involved in inflammatory responses, strengthen studies on the cross-talk of inflammation and tissue injury and repair (including inflammatory response and inflammatory cytokines in immune intervention, promoting tissue repair and organ function protection). In the field of hypersensitivity, the application projects mainly focused on the immunomodulatory molecules-induced immune tolerance or type I hypersensitivity. The applicants should pay more attention to the new biological roles of IgE, new molecules involved in hypersensitivity pathogenesis, screening for new allergens, allergen component analysis, standardization, and diagnosis methods. The applicants should also pay attention to studies of type II, III, IV hypersensitivity. In autoimmune disease studies, the applicants mainly focused on the roles and mechanisms of microRNAs, signal transduction pathways, and macrophage polarization. Strengthening in vivo studies on autoimmune disease using animal models and broadening crossover studies with other disciplines are encouraged. Applications in the field of vaccine mainly focused on the anti-infection prophylactic vaccine. It is encouraged to explore the new vaccine and delivery system, and therapeutic vaccines for human immune-related diseases. For the new technology of immune-related disease diagnoses and treatments, the research applications focused on the chimeric antibodies, nanoparticles, and RNA interference. More attention should be paid to the new progresses in immunology, new technology applications in the clinical diagnoses and treatments, as well as the application of visualization technology, high throughput technology in immunology research. It has been recommended that the applicants should pay more attention to the immune omics and large data, the animal models of autoimmune diseases, the interaction between tissue engineering materials and immune microenvironments, the interaction between micro-ecology and the immune system, and so on.

Focus in the development and improvement of research facility/research platform/research approach/research resources: Medical Immunology discipline will continue to support the studies of processes and characteristics of human immune-related diseases through the establishment of distinctive research systems and corresponding technical platforms (e.g., searching for targeted molecular techniques, cell models, and

animal models, etc.) and immunology researches using human disease and genetic resources available in China. The Division will also support the systemic immunology researches and understanding the immunological disease-specific characteristics through carrying on the studies of immune informatics, immuneomics, immune repertoireomics, and computational immunology. Moreover, the discipline will support the collaborations of clinicians and immunologists. Furthermore, the discipline will also pay close attention to and support the usage of state-of-art technologies such as real-time dynamic imaging (e.g., MRI, PET, laser confocal microscopy, living cells dynamic observing system, etc.) and new generation of sequencing in immunological studies on human diseases.

Division V of Health Sciences

Division V mainly supports the basic and clinical basic research in the fields of medical imaging, biomedical engineering, medical aspects of specific environments, and forensic medicine.

Medical Imaging and Biomedical Engineering (H18)

Medical Imaging and Biomedical Engineering are featured by multidisciplinary intercrossing, such as the intercrossing between medicine and mathematics, physics, chemistry, information sciences, materials sciences or engineering, and life sciences, etc. The Division supports researches in the areas of medical imaging and medical engineering.

In the field of Medical Imaging, the research of medical imaging and its application to solve the scientific problems related to medicine is mainly funded, including magnetic resonance imaging (MRI), X-ray and computed tomography (CT), ultrasound in medicine, nuclear medicine, and interventional medicine, etc. Meanwhile, the explorative interdisciplinary studies in the scientific forefront of this field, including the areas of multimodal imaging, molecular imaging, functional imaging, precision interventional medicine, theranostic integration, medical image processing and analysis, radiomics, and translational medicine are also encouraged. In addition, the research of new imaging technology which can be applied in the early diagnosis, the early treatment, the prognosis, and the therapeutic effect evaluation of various diseases are also supported.

In the field of biomedical engineering, the Division mainly funds the research on medical engineering associated with disease prevention and early-warning, disease detection and diagnosis, disease treatment and rehabilitation, as well as the basic research related to regenerative medicine and nanomedicine, including processing and analysis of biomedical signals and images, biomedical sensors, medical optics and magnetics, chips and micro-nano system, biomedical system modeling and information system, physical therapy, rehabilitation engineering, neural engineering and brain-computer interface, treatment planning and navigation technology, robot-assisted therapy, biomedical instruments and medical equipment, micro-nano sensors and system, gene/drug delivery materials and transfer systems, medical biomaterials, tissue engineering, regenerative medicine, artificial organ, and other scientific issues. Researches on brain imaging and intervention, implantable electromechanical system, bio-manufacturing and 3D-printing, biological micro electromechanical system, new medical methods and technologies of multiphysics coupling,

non-invasive and minimally invasive medical engineering technique, new-type scientific equipment for medical application, cell therapy, bioreactor of tissue construction, and tissue regeneration-induced biomaterial are also encouraged.

Medical Aspects of Specific Environments (H21)

Medical aspects of specific environments are aimed at the special health care needs from the population under different special environments, to solve various special medical problems in practice, and to provide theoretical support for major national strategic needs. The relative studies will be focused on understanding the physiological and pathological phenomena and regular patterns of the human body under special environments on the level of molecule, cell, tissue, organ and entirety. In this area, the Division mainly supports researches on the resolve of pathophysiological phenomena and the prevention and cure of the diseases under the condition of aeronautical, astronautic, nautical, submarine, plateau, polar region and other special or extreme environmental conditions. The Division encourages applying medicine, physics, chemistry, biology, and modern engineering technologies to perform thorough and systematic researches on specific medical issues under the extreme environment and explore new methods and theories of biomedical engineering for keeping healthy status under the special environmental conditions. Internal disciplinary in the medical aspects of specific environments, interdisciplinary between the medical aspects of specific environments and biomedical engineering or other natural sciences are also supported. The Division funded one application in high funding intensity in 2016, and will fund at least one application in high funding intensity in 2017.

Forensic Medicine (H23)

In the field of Forensic Medicine, the Division mainly funds the research on resolving the biomedical identification problems in the judicial practice with the studies of human body and other relevant human biological samples. The funding fields mainly include the identification of cause of death, the estimation of postmortem interval and wound age; the pathophysiological changes caused by abuse and dependence of drugs and poisons, in vivo metabolic process of poisons; the forensic evidence associated with the evaluation of the degree of injury and damage, the identification of the level of disability and loss of the working ability; the objective evaluation of the legal capacity of persons with mental disorders; the individual characteristics determination (age, height, appearance), individual identification from difficult samples, the paternity identification, the tissue origin identification and ethnic origin identification. The profound and systematic research using the theories and techniques of physics, chemistry, biology, medicine, law and informatics, etc., is strongly encouraged. The researches of the interdisciplinary between forensic medicine and bioengineering, other natural sciences and even social sciences are also strongly supported.

The development of medical imaging and biomedical engineering has been accelerated by multidisciplinary studies. In 2016 there were totally 1,189 applications in the areas of medical imaging, biomedical engineering, medical aspects of specific environments and forensic medicine, of which 220 applications were funded, the funding rate is 18.50%. Meanwhile, there was a slight increase in the number of applications in Medical Imaging, and there are significant increases in the number of applications of Biomedical Engineering,

Medical Aspects of Specific Environments and Forensic Medicine. However, the number of total applications was still small. In particular, the number of applications in Medical Aspects of Specific Environments saw a negative growth. To further promote the rapid development of medical imaging, biomedical engineering, medical aspects of specific environments and forensic medicine disciplines, the division will continue to encourage multidisciplinary researches and cooperation between scientists with different scientific backgrounds. At the same time, preferential supports will be provided to young investigators working in the interdisciplinary scientific frontiers mentioned above. To promote the developments of the medical aspects of specific environments and the forensic medicine, the applicants with different academic backgrounds are encouraged to explore the scientific issues in both areas above.

The Division does not accept applications on radiation oncology or radiation prevention, which should be submitted to Division VII (H16) or Division VIII (H22) in the Department of Health Sciences, respectively. The applications on pharmacology and drug administration should be submitted to Division IX (H30, H31) in the Department of Health Sciences.

Division VI of Health Sciences

The funding scope of Division VI covers basic researches in fields of abnormalities and diseases of locomotor system, emergency and critical care medicine, trauma, burns, frostbite, plastic surgery, rehabilitation medicine, laboratory medicine and biological characteristics and infection of bacteria, fungi, viruses, parasites and other pathogenic organisms.

Abnormalities and diseases of locomotor system (H06)

The Division mainly supports the research on the abnormalities in structure, function and development of the bone, joint, muscle and ligament, and the research in the etiology, pathogenesis, diagnosis, prevention and cure of the musculoskeletal diseases including the genetic diseases, the immune-related diseases, inflammation and infection, injury and repair, grafting and reconstruction, fatigue and recuperation, degenerative disorders, sports injury, deformity and correction, and non-neoplastic diseases. Meanwhile, the projects on the emerging scientific issues such as precise medicine and medical biomaterials development in musculoskeletal fields are highly encouraged. In 2016, the submitted proposals mainly focused on research fields in the musculoskeletal damage and repair (H0605), and the degenerative diseases of bone, joint and soft tissue (H0609). Research projects on intervertebral disc degenerative disease, osteoarthritis and biomaterials have been hot spots in this field. In contrast, research applications in musculoskeletal fatigue and recuperation filed (H0608) were still at quite low volume. The research projects focusing on the biological mechanisms in emerging medical phenomena and clinical problems and the renewal and innovative grant application in basic research fields are preferentially encouraged.

Emergency and Critical Care Medicine/Trauma/Burns/Plastic Surgery (H15)

Focus on scientific problems including the pathophysiology, pathogenesis, diagnosis, treatment and prevention in the field of emergency and critical care medicine, trauma, burns, and plastic surgery. Funding areas of emergency and critical care medicine include early identification, rapid diagnosis and treatment, monitoring and evaluation, as well as organ function support and protection. Key funding areas of plastic surgery include wound healing and scar management, repair, regeneration and reconstruction against malformation and defect of surface tissue and organ, as well as medical cosmetology.

Rehabilitation Medicine (H17)

The Division mainly supports the researches on the mechanisms, clinical evaluation and therapy in the rehabilitation of dyskinesia and injuries caused by the diseases of locomotor system, nervous system or other relevant organ/systems.

Medical Pathogens and Infection (H19)

The Division mainly supports the research of medical microbiology and parasites, including etiology, biology、genetic variation and evolution of pathogens, pathogenic mechanism of pathogens, mechanism of drug resistance and host immune response, nosocomial infection, discovery and biological characteristics of pathogenic vectors, and so on. The genetic variation, drug resistance and the interaction with the host of the pathogen are the important scientific issues. The Division encourages innovation of basic research on the above scientific issues, and encourages the development of biomedical research on various types of pathogenic organisms, especially new and neglected pathogens.

Laboratory Medicine (H20)

The Division mainly supports researches on new theory, new technology, new methods and new markers for prediction, diagnosis, monitoring and prognosis of all kinds of diseases. The key-funding field includes the discovery and identification of sensitive and specific markers, the detecting techniques for personalized therapeutics, and the quality control, the reference methods and materials in measurement. Interdisciplinary researches are encouraged.

The applications on therapeutic drugs and pharmacology should be submitted to Division IX (H30, H31) or Division X (H28). Pathogenic mechanism of molecules and temporal and spatial expression and regulation of genes should not be sent to laboratory medicine, please apply it in other appropriate Divisions. Researches on drug-resistant pathogens should choose the code of Variation of Pathogen and Drug-Resistance (H1908). Researches that are not involved in the mechanism, evaluation and therapy of rehabilitation should not be submitted to rehabilitation medicine, please apply it in other appropriate Divisions. As for the applications involving highly pathogenic microorganism and tumor, please see the general part of Department of Health Sciences.

Division VII of Health Sciences

The Division mainly funds basic research in oncology.

Oncology (H16)

We provide funding opportunities for cancer research involving common features of tumors in occurrence, development and progression, as well as the distinctiveness of tumors of various systems/organs in etiology, pathogenesis, diagnosis, treatment and prevention. The scopes of funding cover not only tumor etiology, tumor development, tumor genetics and epigenetics, tumor immunology, tumor prevention, recurrence and metastasis, tumor stem cell, tumor diagnosis, chemotherapy, physical treatment, biological treatment, comprehensive treatment of the tumor, tumor rehabilitation including social and psychological rehabilitation, new techniques of tumor research, but also tumors of various systems/organs (excluding hematologic system) which include respiratory system, digestive system, nervous system (including special receptors), genitourinary system, breast and endocrine system, bone and soft tissue, head, neck and maxillofacial region, skin, body surface and other parts of the human body.

The scientific goal of the Division is to emphasize the common features of tumors, which focuses on the molecular mechanism of tumor biology, such as proliferation, differentiation, metastasis, autophage and apoptosis, thus to explore the mechanism and regularity of tumor occurrence, development, metastasis and recurrence, laying the foundation for tumor diagnosis, treatment and prevention. Also, the Division highlights the distinctiveness of tumors of various systems and organs, and to promote the clinical practice in tumor diagnosis and treatment by carrying out translational research based upon clinical experiences and observation of specific systems/organs.

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

Oncology is one of the most active areas in medical sciences. With the rapid development and integration of cell biology, developmental biology, genetics and immunology, the trends of cancer research are steered towards tumor epigenetics, tumor stem cells, tumor immunology, and tumor systemic biology. Recently, research on cancer epigenetics has emerged as a rapid moving field, especially the studies of epigenetically regulated functional RNA in tumorigenesis and tumor progression. Additionally, study on the interaction between tumor cell and its microenvironment has gained increasing attention, as it emphasizes not only the regularity of microenvironment on tumor cell's biological property, but also the biological significance of tumor cell's effect on microenvironment. Moreover, aberrant cancer metabolism and its underlying mechanisms as well as its role in cancer biology have been appreciated, especially the reciprocal causality of metabolism and

tumorigenesis and cancer development. Special interests have been aroused in the mechanisms of metabolic reprogramming of cancer cells and microenvironment, the association between specific metabolism of tumor cells and their biological behaviors, the roles of abnormal metabolites in oncogenesis and tumor development, and the crosstalk among different signal pathways in cancer cells. The other proposals have stressed the translational values of metabolic factors in tumor biology. For example, studies exploring in vitro and in vitro efficacy and mechanisms of agents regulating the metabolisms of glucose, lipids and nuclear acids in tumor cells may provide experimental evidence for the application of traditional drugs for cancer treatment. Studies probing the biology of tumor stem cells are making tremendous progress in recent years, which include the molecular mechanisms involved in maintaining the stem-cell like properties of tumor stem cells, abnormal metabolism of tumor stem cells, relationship between epithelial-mesenchymal transition (EMT) and tumor stem cells, formation and mechanisms of vascular mimicry, interactions between microenvironment and tumor stem cells, cancer cell dormancy, tumor heterogeneity, and resistance in therapy. Finally, tumor chemoprevention attacks more and more interest. By screening natural or synthetic compounds, new targets for cancer prevention and treatment were identified, reducing the incidence of cancer and improving survival for cancer patients.

In recent years, the quality of proposals in the field of oncology has been significantly improved, in terms of solid preliminary experimental data, scientific hypothesis based on sophisticated reasoning and complete and thorough studying items. Proposals derived merely through literature reviewing without preliminary experimental data, or descriptive and correlative studies are declined each year, and lack approval from reviewers.

Applicants are encouraged to conclude scientific questions from accumulated research findings or clinical practice, and to systemically investigate mechanisms for malignant tumors to improve cancer diagnosis, treatment, and clinical translation, as well as to develop new technology for cancer research. Integrated research proposals making the most of domestic clinical resources and focusing on common and high incidence tumors in the Chinese population are also encouraged.

Applicants should note that the proposals on tumor epidemiology should be submitted to the Division VIII of Health Sciences (H26), and proposals of hematologic system tumor to the Division I of Health Sciences (H0818 in place of H1616). Proposals related to distinctiveness of tumor from specific systems/organs should carefully choose application codes of corresponding systems/organs. Proposals submitted with wrong application codes would be objected.

Division VIII of Health Sciences

Division VIII of Health Sciences provides funding for basic research in fields of skin and its appendages, endemiology, occupational medicine, radiology medicine, and preventive medicine.

Skin and its Appendages (H11)

The funding scope mainly covers the basic research in the structure, function and dysplasia of skin and its appendages, as well as hereditary, autoimmune and inflammatory skin disease.

Radiology (H22)

Funding is given to basic research in radiation damage and repair, radiation toxicology and pathology, radiological hygiene and protection, and radiological therapy for non-tumor disease.

Endemiology (H2401)

Funding is open to basic research regarding to the natural focal disease, biogeochemical disease and work-related or life style-related disease.

Occupational Medicine (H2402)

Funding opportunities are provided to basic research concerning diseases due to exposure to occupational hazards.

Preventive Medicine (H26)

The funding scope covers the basic research in environmental health, occupational health, human nutrition, food hygiene, maternal and child health care, children and adolescent health, toxicology, hygienical analytical chemistry, epidemiology of infectious disease, epidemiology of non-communicable disease, epidemiological methods and medical statistics.

With the severe increase and high threats to the public health, applicants should pay more attention to the pathogenesis and prevention of immune-related and infectious skin diseases.

Funding for radiology, endemiology, occupational medicine and preventive medicine will be mainly focused on research aiming at discovering new theory and developing advanced technology and methods for disease prevention and control. Projects with important scientific significance and original innovation are highly preferred. Investigators must focus on population based studies according to the actual demand of national population health and disease prevention. It is required to conduct research using integrated advance technology. A combined laboratory and field research is highly encouraged. Applicants should pay more attention to the multidisciplinary approach, and look for a new growing point. In order to demonstrate our national characteristics and prestigious international standing, it is prerequisite to seek a novel research direction and to make great efforts in prospective research. Basic data accumulation and medical specimen collection will be encouraged in order to carry out in-depth, systematic study. The basic research in epidemiological cohort study is highly encouraged.

Tumor topics in the field of skin and its appendages are not accepted in Division VIII. These applications should be sent to Division VII (H1626). Division VIII does not accept applications for cancer radiotherapy. Applicants may refer to categories under Division VII of Health Sciences (H1610). Division VIII does not accept applications for

medical imaging and radiological diagnosis. Applicants may refer to categories under Division V of Health Sciences (H18). Applications for studying gynecologic diseases and pediatric diseases are not accepted. The former may refer to categories under Division IV of Health Sciences (H04), while the latter depends on the classification of system characterization. Application of clinical test is not accepted under the category of hygienical analytical chemistry. Applicants may refer to categories under Division VI of Health Sciences (H20). Applications of pure laboratory research are not accepted under the category of epidemiology. Application of hereditary disease without geographical features is not accepted under the category of endemiology. The criterion for selecting the category depends on the classification of system characterization. In addition, applications on drug toxicology will not be accepted, and applicants may refer to categories under Division IX of Health Sciences (H31). Other issues in preventive medicine (H2612) do not include applications for hygienical economics, hospital administration. Applicants may refer to categories under Department of Management Science. Also, applications for pathogen biology for infectious disease, as well as the pathogenesis, diagnosis and treatment will not be accepted. Applicants may refer to categories under Division VI of Health Sciences (H19).

Division IX of Health Sciences

The Division IX mainly supports basic researches in the discipline of Materia Medica and Pharmacology.

Materia Medica (H30)

Funding scope of Materia Medica in the Division covers research areas or sub-disciplines including Medicinal Synthetic Chemistry, Natural Products Chemistry, Microbial Medicines, Biotechnological Drugs, Marine Drugs, Special Medicines, Drug Design and Drug Informatics, Pharmaceutics, Pharmaceutical Materials, Pharmaceutical Analysis, Drug Resources, etc.

The discipline of Materia Medica puts emphasis on interdisciplinary researches and basic researches of druggability. Funding opportunities in Medicinal Synthetic Chemistry, Natural Products Chemistry, Microbial Medicines and Marine Drugs mainly provide to innovative theories, technologies and approaches for structural modification and synthesis of compounds with potential to be developed into new drugs, and also for drug discovery from terrestrial or marine plants, animals and microorganisms. Funding in Biotechnological Drugs mainly supports researches on innovative biotechnologies or approaches to obtain biotechnological drugs including therapeutic antibodies, vaccines, proteins, nucleic acid and cells, etc.; meanwhile, exploratory researches on new types of expression systems and large scale cultural techniques will also be supported reasonably. Funding in Marine Drugs mainly supports chemical, pharmaceutical and ecological researches of rare marine creature and marine microorganism from deep sea. Funding in Special Medicines supports drug researches involved in aeronautics, astronautics, deep sea, radiations, militaries, special environments, etc. Funding in Drug Design and Drug Informatics mainly supports researches on innovative theories or approaches for drug design and safety prediction,

meanwhile, supports researches on discovery and structural optimization of completely new chemical structures as hit by applying principles of drug design, computer-aided drug design, and pharmaceutical informatics. Funding in Pharmaceutics mainly supports researches on innovative theories, technologies and evaluation methods, which are associated with Physical Pharmacy, Biopharmaceutics, Molecular Pharmaceutics, and novel Delivery Systems for drug and Pharmaceutical Dosage Forms. Funding in Pharmaceutical Materials mainly supports basic researches on establishment and safety evaluation of new pharmaceutical excipients and carriers, which should have owned prominent features in pharmaceutical functions and structures and can be distinguished from researches in the area of pharmaceutics. Funding in Pharmaceutical Analysis mainly supports basic researches on establishment and development of innovative approaches and techniques for analysis of the pharmaceutical molecules or biofunctional molecules, especially, the pharmaceutical molecules with large molecular weight or in vivo effector molecules to solve key scientific problems in the field of Materia Medica and Pharmacology. As for Drug Resources, the Division mainly supports researches on key scientific problems associated with discovery, exploration, sustainable utilization and protection of new pharmaceutical resources.

Pharmacology (H31)

Funding in the discipline of Pharmacology supports researches on drug action mechanism or drug resistance mechanism, target validation, Drug Metabolism and Pharmacokinetics, Clinical Pharmacology and Drug Toxicology, etc. The involved drugs should be therapeutic drugs or drug candidates or bioactive substances with some advantages in treatment of diseases.

The discipline of Pharmacology put emphasis on in-depth study of action mechanism of drugs or bioactive products and their target, including exploring the basic rule of life and the pathologic mechanism of disease by using drug molecules as probes. In-depth and systematic studies should be strengthened in proposals related with research fields as below: discovery and validation of new target and sensitive biomarker, discovery of new pharmacological actions of drugs or bioactive compounds and elucidation of their action mechanism, strategies and methods to effectively overcome multi-drug resistance, drug epigenetics, new strategies of drug combination based on systematic biology, etc. Basic research should be strengthened in proposals as below: molecular regulatory network of complex disease and mechanism of drug intervention, individualized drug therapy and new treatment approaches, translational medicine, innovative pharmacological models, techniques and approaches. In the sub-discipline of drug metabolism and pharmacokinetics, new approaches and new models should be constructed and developed to strengthen the researches on molecular mechanism involved in the research areas of pharmacodynamics, toxicology, clinical medication and drug intervention. In the sub-discipline of clinical pharmacology, research proposals should focus on the exploratory research of interaction rule between Human body and medicine, research proposals should pay more attention to rational administration of special community such as children, pregnant woman and highest-risk population, etc. In the sub-discipline of drug toxicology, researches should be strengthened in the research fields as below: molecular toxicology, mechanism on genetic toxicity and reproductive toxicity, mechanism on metabolite toxicity, new models and new

approaches for drug safety evaluation.

In recent years, a large proportion of proposals in Materia Medica were from sub-disciplines of Pharmaceutics, Medicinal Synthetic Chemistry, and Natural Product Chemistry. Many proposals from sub-disciplines of Pharmaceutics and Medicinal Synthetic Chemistry involved in antitumor drug research. Even though these kinds of proposals decreased in 2016, the proportion was beyond estimation; thus, disease types and new ideas should be further expanded and interdisciplinary research between chemistry and biology should be further strengthened. The researches on the druggability of delivery systems and new compounds should be emphasized. In the sub-discipline of Pharmaceutics, researches on multi-functional delivery systems should focus on evaluation of druggability and rationality of combinational design and put emphasize on innovativeness.

In the discipline of Pharmacology, most proposals mainly focus on drug action mechanism or drug resistance mechanism, some special projects based on long-term accumulation could be founded; however, most studies on mechanism were still limited to the description of biological effects of drugs, and fewer proposals were focused on the discovery of new target, validation of new target and in-depth study on molecular mechanism. Some proposals with good ideas failed to be approved due to inadequate data, insufficient evidences, oversized research plan, insufficient study in depth, ambiguous research objects and incomplete scientific logic, etc. A few of proposals were not granted for lack of innovation or too simple without any preliminary data.

Innovative or continuous in-depth research projects will be given priority. Because translational medicine is of far reaching significance in improving clinical application value of basic research, laboratory basic research on discoveries of new drug, clinical therapeutics and diagnostics will be strengthened to reveal new targets for drug therapy, new biomarkers for disease diagnostic in the course of exploring the mechanisms on occurrence and development of disease, furthermore, to lay theoretical and experimental foundation for developing innovative drugs and diagnostic reagents with independent intellectual property.

The funding scopes do not cover conventional researches for drug development for new drug approval such as pharmaceutical process and general pharmacology. Usually, the entire chemical structures or backbone of compounds should be provided in application, but the applicants should pay special attention to the protection of intellectual property and carefully handle the relationships between application and secrecy. Confidentially core contents or techniques, which are not suitable to illustrate or describe in proposals such as chemical structures, should be sent directly to the office of Division IX by confidential letters and explained in proposals. Applicant of NSFC for young scholar should get the consent of applicant's supervisor and Letter of Authorization signed by applicant's supervisor should be attached with proposal, if research proposal is similar with or closely related with applicant's supervisor research work.

Division X of Health Sciences

The Division X of Health Sciences identifies its role as advancing the theories of Traditional Chinese Medicine (TCM) while highlighting advantages of the heritage. It

provides funds to basic research and clinic-based research programs in TCM, Chinese Materia Medica (CMM) and Integrated Chinese and Western Medicine (IM).

Traditional Chinese Medicine (H27)

Funding areas: (i) Fundamental theories of TCM: Essence of Viscera, Qi-Blood-Body Fluid, Body Constitutions, etiology and pathogenesis, basis of TCM Syndromes, Therapeutic Principles and Methods, Prescriptions and Diagnostics in TCM; (ii) Basic research in clinical medicine: Internal Medicine, Surgery, Orthopedics and Traumatology, Gynecology, Pediatrics, Ophthalmology, Otorhinolaryngology, Stomatology, Geriatrics, and Health Preservation and Rehabilitation in TCM; (iii) Acupuncture and moxibustion, Tuina and massage: Meridians, Collaterals, and acupoints, acupuncture, moxibustion and Tuina and massage; (iv) Other ethnomedicine.

Chinese Materia Medica (H28)

Funding areas: (i) Chinese Materia Medica: Resourceology, Identificology, pharmacodynamics substance, quality evaluation, processing, pharmaceutics of CMM, and theories in the properties of Chinese herbs; (ii) Pharmacology: Neuropsychopharmacology, cardiovascular and cerebrovascular pharmacology, anti-tumor pharmacology, endocrine and metabolic pharmacology, anti-inflammatory and immune pharmacology, antiviral and anti-infective pharmacology, respiratory pharmacology, digestive pharmacology, urinary and reproductive pharmacology, pharmacokinetics, and toxicology in CMM; (iii) Ethnopharmacology.

Integrated Chinese and Western Medicine (H29)

Funding areas: (i) Fundamental theories of IM; (ii) Basic clinical research of IM; (iii) Methodological or technical innovations in TCM research.

In recent years, the funded projects in the field of TCM, CMM, and IM have exhibited the following features: (1) Based on TCM theories and clinical effects of TCM, and conducted from both macroscopic and microcosmic levels, the projects explored the holistic rules of human life and the integrating regulatory effects of TCM. (2) Through introducing cutting-edge theories, methods and techniques exerted in the modern medical science and other sciences, incessant innovation of research thoughts and methods, dynamic integration of TCM and new emerging disciplines, the projects have particularly been promoting the TCM development. (3) These projects have also paid more attention to the clinic-based research of functional disorders, age-associated diseases, metabolic diseases, immunological disorders, and viral infectious diseases treated by TCM and/or Ethnomedicine and to identify underlying mechanisms.

The Division’s top priority is to support the best projects in basic research, continuous in-depth projects and research projects that discover the inner-connections between TCM or Ethnomedicine theories and biomedical sciences. We continue to encourage the integration of different disciplines, focus on matters of science in this field and particularly emphasize interdisciplinary research using multidisciplinary concepts, methods, techniques and approaches under the guidance of TCM or Ethnomedicine theories and thus promote the inheritance, development, and innovation of TCM fundamental theories.

In light of the current TCM research, the Division in 2017 will continue to value and support researches on the followings: Visceral Manifestation Theory, TCM syndromes, etiology and pathogenesis; therapeutic principles and methods, correlations between classical formulas and TCM syndromes, mechanisms for therapeutic effects of TCM on preponderant diseases and the preventive effects on major and refractory diseases, methodology in clinical therapeutic evaluation of TCM, mechanisms underlying the therapeutic and preventive effects of acupuncture on diseases and the theories of meridians and acupoints, theoretical and clinical basis for integrated TCM and western medicine, innovative techniques and methods in TCM research, CMM resources; CMM identification, CMM processing and preparation, CMM properties, material basis for effects, physiological disposition and the related regulation, pharmacological effects and mechanism of CMM, CMM toxicity, correlation between toxicology and toxicity-effect, ethnomedicine, and so on.

The Division will not support any proposal which is not associated with TCM and Ethnomedicine. Any pharmaceutical proposal without the guidance of TCM theories or Ethnomedicine theories should be submitted to pharmaceutics (H30) or pharmacology divisions (H31). Medical proposals without the guidance of TCM or Ethnomedicine theories should be submitted to other medical divisions (H01 to H26). Any proposal containing TCM or acupoints formulas which cannot be shown openly should be sent to the Division directly by confidential mails, and specifically explained in the proposal, or it will be unacceptable.

Key Program

The Key Program supports researchers to conduct in-depth, systematic and innovative research in directions with sound research basis or where new growth points of scientific disciplines might emerge, so as to promote disciplinary development and breakthroughs in some 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 existing major scientific research bases at national and ministerial levels, and conduct active international cooperation and exchange with concrete contents.

Applicants for Key Program should have the following qualifications:

(1) Experience of undertaking basic research projects;

(2) Senior academic position (title).

Post-doctors and postgraduate students are not qualified for application. NSFC sets research areas or directions for Key Program and announce in the *Guide*. Applicants should follow the guidelines to prepare proposals, be concise and specific in content within the research fields and directions, and make project title comfort to research content in specific and accurate ways.

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

In 2016, NSFC funded 612 projects under the Key Program, with a total funding of 1.71535 billion yuan, and the average funding for direct costs is 2.80 million yuan per project.

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

Funding of the Key Program Projects in 2016

Unit: 10,000 yuan

Department	No. of applications	Awards				Funding rate (%)
		No. of awards	Funding for direct costs	Average funding for direct costs	Share of NSFC total funding for direct costs (%)	
Mathematical and Physical Sciences	288	71	20,945	295.00	12.21	24.65
Chemical Sciences	226	61	17,748	290.95	10.35	26.99
Life Sciences	472	96	26,300	273.96	15.33	20.34
Earth Sciences	423	80	23,610	295.13	13.76	18.91
Engineering and Materials Sciences	441	90	25,970	288.56	15.14	20.41
Information Sciences	253	85	22,500	264.71	13.12	33.60
Management Sciences	87	22	5,060	230.00	2.95	25.29
Health Sciences	592	107	29,402	274.79	17.14	18.07
Total	2,782	612	171,535	280.29	100.00	22.00

Department of Mathematical and Physical Sciences

In 2016, the Department of Mathematical and Physical Sciences announced 95 areas for Key Programs, and received 288 applications. We funded 71 projects with direct cost funding of 209.45 million yuan and about 2.95 million yuan per project.

In 2017, the Department plans to fund about 73 Key Program projects. The average direct cost funding will be more than 2.4 million yuan per project for mathematics, and more than 3.2 million yuan for mechanics, astronomy, physics I and physics II. The funding will all be 5 years. Please provide with the proper application code in the application form.

To ensure the high quality of projects, applicants are required to have ever held 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. Please provide with the specific application code when applying.

In 2017, the main research directions are as follows:

1. Representation theory and categorization method (A0102)

2. Classification problems in algebraic geometry (A0102)

3. Geometric analysis in progressive space (A0103)

4. Low dimensional dynamical systems (A0105, A0107)

5. Functional space and operator theory (A0105)

6. Non- Archimedes dynamical systems (A0105)

7. Harmonic analysis and linear partial differential operator (A0105)

8. Theory of multi variant operator (A0106)

9. Banach space and coarse geometry (A0106)

10. Non local infinite dimensional dynamical systems (A0106, A0107)

11. Mathematical theory of Boltzmann equations (A0108)

12. Mathematical theory of high dimensional shock waves (A0108)

13. Nonlinear wave equation in geometry and physics (A0108)

14. Strange wave theory and its applications (A0109)

15. Mathematical method of string theory (A0109)

16. Analytical problems of random environment (A0110)

17. Non local operator probability problems (A0110)

18. Super high dimensional data statistic method (A0111)

19. Statistical prediction of non-stable and high frequency time sequence (A0111)

20. Coupling, characterization and analysis of multiple source data (A0111, A0114)

21. Optimal theory and algorithm of data representation (A0112)

22. Control theory of random distributed parameter system (A0113)

23. Optimization, control and numerical computation of random systems (A0112, A0113, A0117)

24. Analysis, dynamical system and related problems on fractals (A0114)

25. Modeling and analysis of multiphase flow interactions and transportation (A0114)

26. Mathematical modeling and analysis of biobehaviors in complex environment (A011403)

27. Computational differential algebra and approximate formalization (A0115)

28. Algebraic and random method in network theory (A0116)

29. Maximum problems in combinatorics (A0116)

30. Mathematical theory and computation of UQ (A0117)

31. Theory and experiments of multi-dimensional non smooth nonlinear system dynamics (A0202)

32. Modeling, analysis and control of complex system dynamics (A0202)

33. Deformation and damage mechanism of advanced materials and structures (A0203)

34. Solid strength theory and structure reliability (A0203)

35. Mechanical behaviors of material and structure in multi field conditions (A0203)

36. Unsteady complex flow mechanism and control (A0204)

37. Hydro dynamics of marine vessels and structures (A0204)

38. Aerodynamics of aircraft and space craft (A0204)

39. Biomechanical problems in human health and medicine (A0205)

40. Mechanical behavior of materials and structures in explosion and shock impact (A0206)

41. Computation methods for complex mechanical problems (A02)

42. New methods and technology in experimental mechanics (A02)

43. Key mechanical problems in environmental evolution and catastrophe (A02)

44. Key mechanical problems in high end equipment and advanced manufacturing (A02)

45. Key mechanical problems in extreme conditions (A02)

46. Key mechanical problems in new energy and resources areas (A02)

47. Theory and method of fluid solid coupling mechanics (A02)

48. Nature of dark matter and dark energy and physical process in early period of cosmos (A0301)

(1) Dark matter and dark energy and physical process in early period of cosmos

(2) Large scale cosmic structures

49. Galaxy evolution and impact of surrounding environment (A0302)

(1) Detection of medium high red shift celestial bodies and formation and evolution of galaxies

(2) Physical properties of galaxies and relations with surrounding dark matter and interstellar media

50. Structure, formation and evolution of large mass black holes and active galaxies (A0302)

(1) Structure and radiation of active galaxy cores

(2) Formation and evolution of large mass black holes and mutual evolution with the galaxies

51. Structure, composition, integration and evolution of the Galaxy (A0302, A0303)

(1) Galaxy structure, distribution dynamics and long term evolution of star groups

(2) Basic parameters and matter distribution (including dark matter) of the Galaxy

52. Formation of molecular cloud and stars, internal structure and evolution of stars and high energy process of dense celestial bodies (A0303)

(1) Formation of stars, molecular cloud, interstellar matter circulation

(2) Internal structure and evolution of stars and star systems

(3) Birth, explosion and high energy process of dense celestial bodies

(4) Discovery, time measurement and radiation mechanism of pulsars

53. Planet system exploration and dynamics (A0303, A0304, A0306, A0307)

(1) Exploration of solar system and outer planets, and dynamics of planetary system formation

(2) Atmospheric property and internal dynamics of planets

54. Solar atmosphere, magnetic field and activities (A0304)

(1) Structure and dynamics of solar atmosphere, fine structure of solar magnetic field, origin and evolution of solar magnetic field

(2) Solar eruption and its origin and evolution, forecast of solar activities

55. High precision astronomical frame and time frequency (A0306)

(1) Micro angular second frame celestial sphere, high precision earth reference frame and astronomical earth dynamics

(2) Precision time generation and transmission

56. Solar system dynamics and stability (A0307)

(1) Stability of solar system and orbit diffusion

(2) Discovery of small celestial bodies in solar system and its origin dynamics

57. Measurement, determination of precise orbit and dynamics of fast moving celestial bodies (A0306, A0307)

(1) Design and measurement of deep space probes and precision satellite navigation and positioning

(2) Monitor and dynamics of fast moving celestial bodies

58. Optical and inferred key technology based on large scale telescopes (A0308)

(1) Key technologies for extremely land-based large optical and inferred telescopes

(2) Super high-resolution, high-contrast imaging technology

(3) Large view, high-resolution imaging and spectrum detection technology

59. Key technology of radio astronomy (A0308)

(1) Key technology of low noise, array receiver

(2) Key technology for digital signal processing

(3) Single array interference imaging and VLBI technology

60. Key technology for space astronomy (A0308)

(1) Key technologies of X-ray, ultra violet and inferred space telescopes

(2) Key technologies for high-resolution cosmic ray, X-ray, inferred and ultra violet space detectors

61. Physical problems in new forms of energy (A0402, A0404)

(1) Exploration, design and physical studies of new energy materials

(2) Physical mechanism of advanced energy-saving materials and device physics

(3) Physical problems in efficient energy conversion and storage

62. Physical basis of quantum information (A0402, A0403, A0404)

(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 quantum computation for scalable physical system

(4) New mechanism and maintenance of quantum coherence

63. Physics of advanced functional materials (A0402, A0404)

(1) Surface, interface and artificial micro structure physics

(2) New functional materials and device physics of self- spin information carrier

(3) Physical problems of intelligent materials

(4) Physical problems of materials in extreme conditions (low temperature, strong magnetic field and ultra-high voltage)

64. Physical problems in confined or relevant quantum systems (A0402)

(1) Properties of electric transport, thermal transport and self-spinning transport in low dimensional system

(2) Interface regulation of topological quantum state topological physical properties

(3) Ultra-fast interference control of quantum state in micro nano structures

(4) Novel quantum state and quantum phase change in relevant electron systems

65. Physical problems in soft matter systems (A0401, A0402)

(1) Structure, property and regulations of soft matter system

(2) Multi scale effect and interactions of active matter system

(3) Basic physical problems related to life process

66. Computation and simulation of matter structures and properties (A0402)

(1) Computational design and physical property prediction of new types of functional materials

(2) Computational simulation of structure and properties of engineering material system and complex system

(3) Computation of structure and behavior of matters in extreme conditions

(4) New method of material computation based on super density functional theory

67. Novel magnetism and multi field regulation in dense matters (A0402)

(1) New physical phenomenon and physics related to self-spin in quantum matters

(2) Multi field regulation of self-spin injection, transportation and detections

(3) Induced magnetism, quantum self-spin liquid and its controls

(4) New effect and mechanism of electromagnetic and thermomagnetic couplings

68. New super conducting materials and related physical problems (A0402)

(1) New systems interface, low dimensional and topological super conductors

(2) Physical mechanism of non-conventional and interface superconductors

(3) Application and device physics of non-conventional superconductors

69. Atomic and molecular impact and physical properties of hot dense matters (A0403)

(1) Atomic and molecular property in high temperature and dense conditions

(2) Electron, highly charged atom, high excitation state atomic molecules and impact process

(3) New method and new technology of atomic molecular multi body relevant effect

70. Physics of cold atoms and molecules (A0403)

(1) Preparation and quantum simulation of cold atom and molecule gas

(2) New principles and new method of cooling of molecular gas

(3) Precision control of internal state, external environment and interactions of atoms, molecules and clusters

71. Ultra-fast, ultra-strong light physics and its interactions with matter (A0403, A0404)

(1) New physical effect of interactions between ultra-strong laser and matter

(2) Applications of ultra-fast spectrum technology in physical science

(3) Ultra-fast process and quantum state control of atoms, molecules and clusters

(4) New nonlinear phenomenon of ultra-strong and ultra-fast laser

72. Regulation and interference control of optical field (A0404)

(1) Generation, regulation of new spatial temporal multi-dimensional optical field

(2) Interactions between structure optical field and matter

(3) Nonlinear optical process of weak or few photons

(4) Generation and application of new light sources such as THz and EUV

73. New physical and new mechanism in optical electric conversion process (A0404)

(1) New mechanism of optical electric conversion in artificial micro nano structures

(2) Optical physics and applications in efficient energy conversion

(3) Efficient luminescence and spectrum control

74. Studies on meso scale optics (A0404)

(1) Generation and transmission of interference optical field breaking diffraction space limit

(2) Characterization and regulation of nano scale extreme optical field

(3) New mechanism of interactions between photon and matter in micro and nano structures

(4) New method of physical modeling and numerical computation of multi scale optical field

75. Basic problems in quantum optics (A0403, A0404)

(1) Interactions of confined photon, atom and molecule; photo-induced force effect

(2) Development and application of quantum light source

(3) Photon quantum simulation and quantum storage based on Photon

(4) New effect of quantum interference in the interactions between light and matter

76. Physical problems in new types of acoustic energy converter and its arrays (A0405)

(1) Acoustic energy converter and array

(2) Spatial temporal regulation of random media scattering and acoustic field

(3) New types of acoustic manmade structures and complex acoustic field

77. Generation, propagation, measurement and interaction of sound wave in complex media (A0405)

(1) New theory and methods for quantitative measurement of acoustic waves

(2) Noise and vibration control in fluid-solid coupled systems

(3) Regulation of sound propagation and thermal conduction in artificial structures

(4) Temporal and spatial characteristics of marine acoustic field

78. Key problems in acoustic and biomedical and information sciences (A0405)

(1) New mechanism and technology of acoustic and biomedical sciences

(2) Interdisciplinary studies of acoustic and information sciences

79. Frontier problems in basic theory of quantum physics (A0501)

80. Frontier problems in basic theory of statistical physics and physical systems (A0501)

81. Frontier problems in theory of gravitation, cosmology and dark matter (A0501, A0502)

82. Precision verification of standard models and new physics (A0502)

83. Studies on flavor physics (A0502)

84. Studies on the internal structure of hadron and strong interactions (A0502, A0503)

85. Quantum chromo dynamics and quark gluon plasma (A0503)

86. Novel structure, isotopic related decay spectroscopy of nuclei in drip line (A0503)

87. Studies on reaction of non-steady nuclei and laser nuclear physics (A0503)

88. Advanced techniques and experimental methods of reactors, neutron physics and scattering (A0504)

89. Basic research on nuclear technology and applications in material, life, energy and environmental sciences (A0504)

90. Studies on key problems in radiation physics and radiation protection (A0504, A0505)

91. Accelerator physics and its advanced technology (A0505)

92. Mechanism, method and technology of particle and rays (A0505)

93. Technology and method of nuclear electronics (A0505)

94. Frontier problems of strong laser plasma and inertia confined fusion physics (A0506)

95. Magnetic confined fusion plasma physics and advanced experimental technology (A0506)

96. Basic research on low temperature plasma physics and advanced technology and new methods (A0506)

97. Studies on advanced technologies and experimental methods of synchrotron radiation and free electron laser (A0507)

Department of Chemical Sciences

In 2016, the Department of Chemical Sciences funded 61 Key Program projects with 177.48 million yuan and 2.9095 million yuan of average funding intensity per project (direct cost). The duration of each project is 5 years. In 2017, the Department announces guidelines for Key Program projects and accepts proposals in 67 research areas, and the average direct funding intensity will vary from 2.5 to 3.5 million yuan for each project. In principle, no more than 2 projects will be funded in each area except the key program groups. In order to further improve the quality of projects, proposals from those groups and teams with excellent research resources and innovative ideas are prefered, and proposals for interdisciplinary cooperative research carried out by teams which have strong background are encouraged.

When filling in the application form, the applicants must indicate the selected research area in "the column of note", and select the proper discipline code marked in

brackets of the research area.

In 2017, the research areas for Key Program projects funded by the Department of Chemical Sciences are listed as follows:

1. Structure and properties of cluster compounds (B01)

2. Inorganic molecule functional materials (B01)

3. Inorganic solid state chemistry and porous materials (B01)

4. Rare earth chemistry and functional materials (B01)

5. Metal coordinative compounds and their catalytic properties (B01)

6. Basis of applied inorganic chemistry (B01)

7. Functionalization of inorganic nano-materials and their application foundation (B01)

8. Basis of bio-inorganic chemistry (B01)

9. Synthesis and properties of metallic/element-organic compounds (B02)

10. New reaction and new reagent in the organic synthesis (B02)

11. Photochemical reaction/free radical chemical reaction (B02)

12. Asymmetric reaction and its application (B02)

13. Synthesis of natural products (B02)

14. Discovery and activity of natural products (B02)

15. Molecular design and mechanism of ecological pesticide (B02)

16. Organic supramolecular chemistry (B02)

17. Organic functional molecular materials (B02)

18. Experimental research of function-oriented structural chemistry (B03)

19. New methods in theoretical and computational chemistry and their application (B03)

20. Physicochemical fundamental research of catalytic materials and catalytic processes (B03)

21. Experimental research on molecular reaction dynamics (B03)

22. Physicochemical fundamental research of colloid and interface (B03)

23. Electrochemical fundamental research in the process of energy and substance conversion (B03)

24. Physicochemical fundamental research of photochemistry and photoelectrical chemistry (B03)

25. Experimental and theoretical research of chemical thermodynamics (B03)

26. Experimental research of bio-physical chemistry (B03)

27. New spectrum and imaging methods of physical chemistry (B03)

28. Physicochemical fundamental research of utilization of resource/energy (B03)

29. Physicochemical fundamental research of new materials and devices (B03)

30. Physicochemical problems at the nano/microscale (B03)

31. Controlled synthesis of polymers (B04)

32. Optical-electric functional polymers (B04)

33. New methods for characterization of polymers structures (B04)

34. Theoretical, calculation and simulation of polymers (B04)

35. Physics in polymers condensed state (B04)

36. Fundamental topics of biomedical polymers (B04)

37. Relationship between hierarchic structure and properties of polymers (B04)

38. Polymers for biological imaging or biological detection (B04)

39. Separation analysis of complex systems (B05)

40. Micro-/nano-analytical chemistry (B05)

41. New analytical methods of electrochemistry (B05)

42. New analysis methods in spectral imaging (B05)

43. Analytic chemistry of mono-molecule and mono-cell (B05)

44. In vivo analysis (B05)

45. New methods for detecting markers of diseases (B05)

46. Chemical engineering basis of synthetic biotechnology and bio-conversion processes (B06)

47. Key scientific issues in the biorefinery processes of industrial biological products (B06)

48. Chemical engineering basis in the area of food and medicine (B06)

49. Chemical engineering foundation for the high effective and clean utilization of fossil energy (B06)

50. Chemical engineering foundation in the exploration and utilization of new type energy (B06)

51. Scientific foundation related to chemical product engineering (B06)

52. Scientific foundation in design, preparation and property regulation of new materials for chemical engineering (B06)

53. Chemical engineering basis related to the high effective utilization of resources and environmental protection (B06)

54. Scientific and engineering basis of typical chemical reaction and scale-up reactor (B06)

55. Scientific foundation for systematic engineering and safety of chemical engineering (B06)

56. Scientific foundation of transfer and separation process (B06)

57. Environmental migration and transformation of typical pollutants or radioactive materials (B07)

58. Environmental communication mechanism and health effects for antibiotics and resistance genes (B07)

59. Fundamental chemistry of the application of new functional materials in environment (B07)

60. Chemical principle in soil pollution control and remediation or solid waste treatment (B07)

61. New principles and methods in water control chemistry (B07)

62. Environmental exposure, toxicity mechanisms and ecological effects of pollutants (B07)

63. Synthesis and chemical decoration of biomacromolecules (B08)

64. Small molecule probes and targets (B08)

65. Design and biological function of optical probe (B08)

66. Design and synthesis of environmentally safe chemicals guided by toxicity studies (B0X)

This project will mainly support the research based on systematically toxicological hazards, in order to guide the design and synthesis of important chemicals, aiming at realizing the harm minimization and green alternative of chemicals for environment from

the origin.

67. Organic solar cell materials and devices based on non-fullerene electron receptors (B0X)

The group of key projects is aimed to make a breakthrough in the power conversion efficiencies (PCEs) and stability for organic solar cells (OSCs) by developing organic molecules to replace the fullerene as acceptors in OSCs. On the basis of electronic energy level and absorption regions improvement, this group of key projects will focus on the new designing ideas for raising the electron mobility of organic acceptors, designing and synthesizing stable non-fullerene acceptors for OSCs with high PCEs and the interface materials with proper energy level, carrying out research on the optimization of photovoltaic performance, investigating operational mechanisms of generation, transport and recombination of photogenerated charge, exploring the way to control the condensed state, the morphology and the stability of materials in OSCs device. The goal of this program would be the world-leading achievements with originality in the non-fullerene acceptors materials, milestone achievement in device performance, deep understanding of optical-electronic conversion mechanism and so on. The main research topics for the program include:

(1) Design and synthesis of novel non-fullerene electron acceptors for OSCs

Developing methodologies for enhancing and broadening absorption in the visible-near infrared region, and regulating LUMO and HOMO energy levels of non-fullerene electron acceptors; studying the relationship between their molecular structure and absorption spectra, electronic energy levels, electron mobility, dielectric constant as well as exciton binding energy; designing and synthesizing novel non-fullerene electron acceptors photovoltaic materials.

(2) Design and synthesis of novel conjugated polymer with n-type building blocks as electron acceptor in OSCs.

Designing and synthesizing novel conjugated polymer with n-type building blocks as electron acceptor in OSCs, with particular emphasis on the enhancement of the absorption in the long wavelength region, the enhancement of the electron mobility and the adjustment of the electron energy level. Carrying out the research of whole polymeric OSCs with high PCEs and studying the operational mechanism and regularity of the influence of structure of polymeric electron donor and acceptor on the photovoltaic properties of polymeric OSCs, including how to balance the electron and hole mobility, the energy level of electron donor and acceptor.

(3) Regulating aggregation structure of non-fullerene electron acceptor photovoltaic materials

Developing green processing technology for electron acceptor materials, regulating their topological structure, aggregation structure and crystallinity, obtaining interpenetrating network structure of organic electron acceptor/donor with nanoscale phase separation, and studying the phase matching of organic electron acceptor/donor with balanced electron and hole mobility and its influence on the photovoltaic properties.

(4) Adjustment and control mechanism for performance of OSCs based on non-fullerene organic acceptor

Investigating the energy level and mobility matching between the organic non-fullerene acceptors and the donor molecules, optimizing photovoltaic performance by introducing the electrode interface layer, studying the mechanism of generation, transport

and recombination of photocharge in non-fullerene electron acceptor photovoltaic materials, and illuminating the operational mechanism of the energy loss during charge generation and transport.

(5) Synergistic optimization of donor/acceptor and high-performance non-fullerene based OSCs

Investigating the effects of those factors, such as device structure-conventional or inverted, solvent and additives, heat treatment, on the performance of OSCs devices based on non-fullerene electron acceptor. Achieving synergistic optimization of the donor/acceptor materials, as well as high-performance single-junction and multi-junction OSCs devices. Improving the PCEs of OSCs significantly to create milestones, fabricating OSCs with service lifetime over 3 years.

The research guides from 66th to 67th listed above are the Key Program projects/Key Program project group driven by the disciplinary frontier. The applicant may organize the collaborative research teams to apply for one of them accordingly. When filling in the application form, the applicants should select the corresponding code based on the research contents (for code B0X, please select code from B01 to B08). The General Office of the Department will accept and handle the proposals.

Department of Life Sciences

The Department of Life Sciences accepts two types of applications for the Key Program. One of them, the majority of total applications, is guided by designated areas (ADA for short) and the other, complementary to ADA, is to freely select research areas (ANA for short). In 2016, the Department of Life Sciences received 472 applications, among which, 368 applications were for ADA and 350 were accepted, of which 78 projects being funded at a funding rate of 21.20%. The rest 104 applications were for ANA, with 94 projects accepted and 18 of them funded at a funding rate of 17.31% (counting by accepted applications).

In the fiscal year 2017, the Department will continue to accept applications for ANA. We strongly suggest that applicants should read this type of requirements carefully in each discipline described in the *Guide*. The five disciplines accepting the projects in both types (both ADA and ANA) are the following: botany; ecology; forest science; neuroscience; and genetics and bioinformatics. The other fifteen disciplines, which will only accept ADA projects (application for ANA will be rejected), include microbiology; biophysics, biochemistry and molecular biology; biomechanics and tissue engineering; immunology; neuroscience; cognitive science and psychology; physiology and integrative biology; cell biology; developmental biology and reproductive biology; basic agriculture and crops; food sciences and plant protection; horticulture and plant nutrition; animal husbandry and grassland science; aquaculture; veterinary medicine and zoology. In order to apply for the Key Program, applicants should read the application requirements, special notes, and the funding plan of the department in this chapter carefully. Moreover, since the research areas in the Department of Life Sciences cover a broad spectrum from fundamental biological sciences and basic medicine to agricultural science, the designated areas of Key Program in each discipline is closely correlated with the funding areas of the discipline. Please note that

applicants should correctly apply for the Key Program according to the funding areas. Those categories, which are not within funding areas as described in the General Program part of this *Guide*, are not applicable to Key Program.

The requirements for application to the Key Program projects of the Department are as follows:

(1) Applications to the Key Program projects in designated areas (ADA). For designated areas, applicants should propose research topics and compose every parts of the proposal following the guidelines of designated areas issued by the Department in 2017. In the column of Annotations on the basic information table of the application form, applicant should fill in the applied research area; with the corresponding application code lined out in each discipline's designated areas correctly. Please note that the designation of application codes for the Key Program projects is set for efficient project management, whereas the application codes appointed may not include all the research contents of the designated areas, therefore 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 for this category are required to specify with "Application for Free Areas" in the column of "Annotations". The ANA grant is set for applicants who have recently achieved major progress, and in an eager need of supporting for further investigation, while their research areas are not included in the ADA of the Department. Or for studies that are cutting-edge to the fields, or are shedding lights to new orientations of the area, are not yet covered in ADA of the year. For either case, applicants should have profound basis of research work in the field, and urgently require intensive financial support in order to further their investigations. Therefore, 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 expected to elaborate the rationale for ANA, as well as emphasize the important innovative progress closely related to this application, relevant research basis and publications in international major academic journals, etc. Research articles representing the "significant progress achieved" in the application should be published within three years, with applicants sitting as the first author or corresponding author.

(3) Applicants for the Key Program (including both ADA and ANA) of the Department are required to attach the first pages of five representative research articles closely related to the proposal. Applicants for ADA should correctly fill in the corresponding application code as listed in each Division when submitting proposals. Applications for ANA may choose the application code autonomously best suitable to its research content.

In 2017, based on the overall arrangement for the Key Program of NSFC, the Department of Life Sciences will arrange a total direct cost budget of 263 million yuan, to support 99 Key Program projects. The funding intensity is roughly the same as that in 2016. Applicants should put forward reasonable budget according to the actual financial needs of their research. The duration of the Key Program project is 5 years.

The designated areas of each Division in the Department of Life Sciences in 2017 are as follows:

1. The classification, adaptation and evolution of microorganisms (C0101)

2. Interaction mechanisms between microorganisms and environment (C0105)

3. The theory and methodology of microbial synthesis (C0103)

4. The regulatory mechanisms of plant growth and development (C0204)

5. The molecular mechanism of plant response to the environment (C0204)

6. Multiple-scale mechanisms of formation and maintenance of biodiversity (C0312)

7. Transportation of pollutants in soil ecosystem and its toxicological effects (C0312)

8. Formation, maintenance and improvement of forestry productivity (C1607)

9. Basic research on genetic improvement of important characters in forest trees (C1610)

10. Regulatory mechanisms of protein modification and degradation (C0501)

11. New techniques and methods for revealing the spatial structure of biological macromolecules and complexes (C0508)

12. Regulatory mechanisms of nucleic acid metabolism (C0502)

13. Discovery and function of novel immune cells and molecules (C0802)

14. Interaction between pathogen or symbiotic microbes and host immune system (C0803)

15. Basic research on new vaccines (C0809)

16. Biomechanical basis for tissue and organ reconstruction (C1001)

17. Interaction between artificial tissue and organism microenvironment (C1003)

18. Metabolic processes and in vivo effects of nano biomaterials (C1006)

19. Formation and functional regulation of neural circuits (C0902)

20. Molecular mechanisms of neurodegeneration (C0915)

21. Function and regulatory mechanisms of non-classical endocrine factors (C1103)

22. The mechanism of maintenance or malfunction of important tissues and organs (C1102)

23. Psychological processes and brain mechanisms in cognitive process and emotion (C2101)

24. Mechanisms of the occurrence and development of psychological behavior (C2114)

25. Formation, maintenance and function of epigenetic information (C0606)

26. Genetic analysis, network construction and regulatory mechanisms of complex traits (C0605)

27. Molecular mechanisms of cell proliferation and plasticity (C0704)

28. Dynamic changes and functions of organelles and subcellular structures (C0701)

29. Regulatory mechanisms of cell metabolism (C0711)

30. Epigenetic regulation of gametogenesis and embryo development (C1202)

31. Molecular regulation of the development of tissue and organ primordia (C1201)

32. Molecular mechanisms of the development and maintenance of stem cell (C1201)

33. The exploitation and utilization of crop germplasm resources and important genes (C1304)

34. Basic research on water use efficiency of crop (C1302)

35. Molecular basis for genetic improvement of important traits in crops (C1304)

36. Mechanisms of nutrients changes and in food processing (C2005)

37. Mechanisms of production and elimination of harmful substances in food (C2007)

38. The role of microorganisms or enzymes in food production (C2003)

39. The interaction and recognition mechanisms between crops and pests (C1408)

40. Mechanisms of disaster caused by crop pest damage (C1401)

41. The mechanism of prevention and control factors for crop pest and disease (C1405)

42. Exploration and innovation of good germplasm in horticultural crops (C1502)

43. Biological basis of high quality and efficient production of horticultural crops (C1501)

44. Mechanism and regulation of efficient crop nutrient (C1507)

45. Phylogeny and evolution of important characteristics of animals (C0402)

46. The molecular mechanisms of interaction between animals and coexisting organisms (C0404)

47. Mechanisms of animal adaptation to the environment (C0402)

48. Identification and functional study of major genes of important traits in livestock and poultry (C1701)

49. Regulatory mechanisms of nutrient metabolism and homeostasis in gastrointestinal tract of livestock and poultry (C1701)

50. Basic research on important forage germplasm resources and utilization (C1702)

51. Pathological and physiological basis of important diseases in livestock and poultry (C1801)

52. The mechanisms of immune escape and immune suppression on important pathogen of livestock and poultry (C1803)

53. Cellular and molecular mechanisms of pathogen infection in livestock and poultry (C1805)

54. Regulatory mechanism of growth and development of aquatic organisms (C1901)

55. The interaction between pathogen and host of aquatic organisms during pathogenesis of disease (C1906)

56. Genetic basis of germplasm improvement in aquaculture (C1902)

Moreover, considering common problems in the past years, the Department of Life Sciences particularly reminds applicants of avoiding the following listed mistakes. Otherwise, proposals may be rejected during the preliminary checking procedure:

(1) Applications for ADA do not specify the title of designated research areas in the column of “Annotations” on the basic information table in main body of the application text;

(2) Applications for ADA do not fill in the corresponding application code specified by this guide;

(3) Applicants applying for ANA to certain disciplines, which however, do not accept ANA applications;

(4) Applications for ANA do not specify "ANA" in the column of "Annotations" on the basic information table in the mail body of application text;

(5) Applications for ANA do not provide a description about 800 Chinese characters on the major innovative progress already achieved claimed by this guide;

(6) Applicants for Key Program projects (including both ADA and ANA) do not attach the first pages of five representative research articles to the application documents as requested;

(7) Similarity or overlapping with projects already funded by the National Basic Research Program of China (namely "973" Project), the National High-Tech R&D Program of China (namely "863" Project), etc., and the National Science 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 holding a full time position abroad, or who cannot ensure necessary time and efforts for implementing the proposed research in China.

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

Department of Earth Sciences

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 gone 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 their proposals for the Key Program in the Department of Earth Sciences. The application codes for interdisciplinary study should be filled in the application form.

For applicants, 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 obtained) 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.

The application codes for key project proposal should be filled in the application form upon the applicant's selection.

In 2017, a standardized selection of "application code", "research field" and "key words" will be tried out continuously in Division I (Geography). When filling out the application forms, applicants should visit the "special focus" under the item of "application acceptance" on the official home page of the NSFC (http://www.nsfc.gov.cn/), and read carefully the "list of application code, research field and key words (D01 and subordinate codes)" and make sure their applications are in accordance with the funding areas of Division I.

In 2016, the Department of Earth Sciences received 423 proposals for the Key Program, and 80 were funded with a total of 236.1 million yuan as direct expenses. The successful rate was 18.91% and the average grant was 2.9513 million yuan. In 2017, 80 projects will be funded, with a preferred range of 3 to 3.5 million yuan for each project. The research period of a Key Program project is 5 years.

Special notes for applicants:

In 2017, titles of 12 themes to accept proposals for the Key Program in the Department of Earth Sciences are as follows:

"New theories, techniques and methods of earth observation and information extraction", "Deep earth processes and dynamics", "Environmental evolution and biological processes on the planet Earth", "The formation mechanism and the application of detection methods for mineral resources and fossil energy" , "Ocean processes and their impacts on resource, environment and climate", "Change processes and effects of terrestrial surface environment", "Evolution and sustainable utilization of water and soil resources", "Process and function of the critical zone", "Process, change and mechanism of weather, climate and atmospheric environment", "Sun-Earth space environment and space weather", "Global environmental change and interactions among different spheres of the Earth", and "Impacts of human activity on environment and disaster".

In regard to the problems emerged when applying for Key Program projects in the past, applicants must fill in "Annotations" in the proposal sheet with ONE of the above TWELVE titles of the themes. Proposals with incorrect "Annotations" or without "Annotations" will not be accepted.

The applicants can decide the title, content, and research plan for their own proposals according to the key issues listed in the research themes based on the previous research work and new scientific problems, as well as new research approaches.

1. New theories, techniques and methods of earth observation and information extraction

Scientific objectives: Earth science is a science based on mathematics, physics, chemistry theory and observation, detection and experimental research. The application of new theories, new technologies and new methods has initiated great changes in the way of earth science research and thinking, and promoted the progress of earth science, which is the core of future earth science. The scientific objective of this field is to develop new theories, new technologies and new methods for the basic theory, experimental simulation, observation and corresponded information extraction in the research frontier of earth science, and also to provide theory and means for the breakthroughs and in-depth development of earth sciences and solutions of the major issues faced in China economic

growth and sustainable development such as resources, energy, disaster prevention and mitigation as well as environmental protection.

Key scientific issues include: experimental techniques of physicochemical properties and processes of earth materials; theories and techniques of deep earth exploration and surface detection; trace and micro-area experimental analysis technology with high precision and high sensitivity; theories and technology of earth system basic information collection and application; exploration theories and methods of deep space, deep earth, deep time, and deep sea; assimilation, integration, and sharing technologies of Geoscience big data; quantitative studies on remote sensing based on earth system science; observation systems and multi-source data fusion; numerical calculation and simulation of earth system science.

Research orientations in 2017:

(1) Theoretical and experimental studies on the earth materials and kinetic processes

(2) Theories and technologies of high temperature and high pressure experiment

(3) New methods and techniques for isotopic dating and tracing

(4) Micro-area and trace-element high-resolution component analysis technology

(5) High precision, high sensitivity and new experimental analysis technology

(6) Geophysical exploration method for deep structure of the earth

(7) High-resolution stratigraphic section detection technology

(8) Joint inversion technology of gravity, magnetic, electric and seismic data

(9) New principles and new methods of earth observation

(10) Comprehensive detection and analysis of different circles with high accuracy and high resolution

(11) New techniques for exploration of flux (energy, momentum, and component) in the complex land-air, land-sea and sea-gas interface

(12) New theories and new methods of quantitative remote sensing modeling and parameter inversion

(13) Multivariate data fusion and data assimilation theory and method

About 6 to 8 projects will be funded in 2017.

2. Deep earth processes and dynamics

Scientific objectives: The main subjects are the research of how solid Earth goes, understanding of the interactions among the multiple spheres of the Earth, and disclosing the linkage between the deep Earth and the surficial processes, which provide theoretical support for the natural hazard mitigation and mineral resource exploration. To promote the progress and innovation of the solid Earth science, the research will dedicate to accurate description the tempo-spatial trajectory of the continental materials, the correlation of the lithospheric structure, tectonics and dynamics of the typical regions (not restricted to China), construction of the architecture and evolution of the continents in a global scale, as well as the history of the form and evolution of the Earth with potential effects on the natural source, hazard and environment.

Key scientific issues include: crust-mantle structure, composition and interaction; origin, modification and evolution of the continental lithosphere; plate convergence and dynamics of the orogenic belts; deep Earth fluid and volatile; processes of the plate interface and subduction zone; coupling of the deep Earth and surficial processes; tectonic scheme and composition of the early Earth; seismogenic processes and mechanism for hazard generation; continental volcanic activities and induced geohazard and environment

issues.

Research orientations for 2017:

(1) Early Earth evolution, and forming, growth and rebuilding of the continents

(2) Dispersion of the continent and the role of mantle plume

(3) Rheological property of the continent and its effect on the continental deformation

(4) 3D structure of mantle velocity discontinuity, lithosphere-asthenosphere interaction and inter-layer material exchange

(5) Crustal and upper-mantle seismological anisotropy and deep-Earth dynamic

(6) Convergence of plates and the dynamic of the orogenic process

(7) Basin and range system evolution and basin dynamics

(8) Oceanic plates and continental margin (and marginal sea) process and ocean-continent transitional zone

(9) Coupling of the deep and surficial Earth processes

(10) Mechanism of magmatic activities and metamorphic process

(11) Volcano and geothermal activities and related deep processes

(12) Deep Earth fluid and water-rock interaction

(13) Cenozoic structural deformation, seismogenic process and geohazard mechanisms

(14) Correlation and interaction between the Earth and the terrestrial planets, geoplanetology in deep space exploration

(15) Important fundamental innovation related to this theme

Expectedly 6 to 8 projects will be funded.

3. Environmental evolution and biological processes on the Earth

Scientific objectives: elucidating the processes of major geological events and their environmental impact on the life evolution on the Earth under the high-resolution global timescale based on the unique records of the stratigraphic sequences and rich fossil resources of China through multidisciplinary approaches from geochemistry, sedimentology, mineralogy, tectonics, paleobiology, paleoanthropology, evolutionary developmental biology and geobiology, in order to gain new important achievements and theoretical advances in this field. The goal is to maintain and strengthen the international advantage position in some well-developed directions, to explore new directions and eventually take leading role in certain directions in the field.

Key scientific issues include: systematic paleontology of major fossil groups and Tree of Life; evolution and principle of deep-time biodiversity; origin of life and earth material evolution; high definition synthetic stratigraphy and geo-time study; geomicrobiology and chemical process and environmental evolution; life processes and geo-environments in extreme condition; major environment events and its origin in the geological history; human origin and coevolution with the environmental background; origin and evolution of terrestrial planets.

Research orientations in 2017:

(1) Origin and evolution of major groups of organisms and their environmental background

(2) Evolution of biodiversity and major life-environmental events

(3) Evolution of the terrestrial ecosystem in deep time

(4) Origin and evolution of humans and their environmental background

(5) Early history of agriculture

(6) High-resolution chronostratigraphy and geochronology

(7) Geomicrobiology and its environmental implications

(8) Biogeochemical processes, mechanisms and their impacts on environment

(9) Evolution of sedimentation system and its effects on natural resources and environment

About 6 to 8 projects will be funded in 2017.

4. The formation mechanism and the application of detection methods for mineral resources and fossil energy

Scientific objectives: to reveal the coupling between the mineralization and the geodynamic system evolution, and constraints of the structure deep and process on the mineralization of the important metallogenic belt; to establish genesis model of ore deposit, ore deposit model, theory of ore genesis; to explore the dynamics of large basin and the law of oil and gas accumulation, the accumulation conditions and distribution law of deep oil-gas reservoirs, and mechanism of formation and evolution of unconventional oil and gas reservoirs; to improve oil and gas geological system theory which is suitable to the complex geological conditions in China; to establish and improve the geophysical and geochemical exploration methods and theories of concealed ore deposits, deep oil-gas reservoirs and unconventional oil and gas reservoirs; to improve the speed, precision and depth of exploration; to reveal the formation and evolution mechanism of groundwater dynamic field and chemical field in different geographical units and in different geological media under the effects of humankind activities and natural factors.

Key scientific issues include: the occurrence and exploration of resources and energy in the deep earth; plate convergence, lithospheric reconstruction and mineralization; enrichment and mineralization of special elements; the dynamics of sedimentary basins and hydrocarbon accumulation; formation conditions and distribution of dense oil and gas and exploration; groundwater circulation and sustainable utilization; metallogenic models, metallogenic system and mineralization mechanisms.

Research orientations in 2017:

(1) The enrichment mechanism of the massive ore-forming materials in sedimentary basin and magma systems

(2) Mineralization and metallogenic regularity of unique metallogenic units

(3) Mineralization in different continental geo-dynamic setting

(4) Regional fluid system tracing and metallogenic system evolution in areas where large ore bodies are concentrated

(5) The characteristics, structural model and exploration indicators of different types of metallogenic system

(6) Formation mechanism and metallogeny of special or shortage nonmetal mineral resources

(7) Regional geo-dynamics evolution and hydrocarbon accumulation of large basin

(8) Accumulation conditions and distribution of law deep oil-gas reservoirs

(9) Systematic evolution of the Earth and the sedimentary environment of hydrocarbon reservoirs in basins

(10) The principle and method of ore bearing information detection and extraction of large, deep ore deposits

(11) The formation, evolution mechanism, geophysical characterization of

non-conventional oil-gas reservoirs

(12) Ore forming mechanism of metals and fossil energy in ocean

(13) The groundwater flow system in regional scale and the space distribution law of groundwater

(14) Groundwater hydrological process and its evolution in different geographical units

About 6 to 8 projects will be funded.

5. Ocean processes and their impacts on resource, environment and climate

Scientific objectives: applications should be focused 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 investigated. By studying the oceanic physical, chemical, geological and biological processes as well as the interactions among them on different timescales and spatial scales, the researches should enhance the understanding on the oceanic processes and mechanisms, promote the fundamental research on oceanology in China and extend ocean researches in China from marginal seas to deep oceans.

Key scientific issues include: multi-scale ocean processes and their effects on climate system; oceanic ecosystem and biological diversity; ocean biogeochemical process and eco-environment; formation and evolution of marginal seas in East Asia and island arc and mid-ocean ridge system; ocean-continent transitional zone: structure, tectonics and their interactions; environmental change and related oceanic process in the Polar Regions; process and mechanism of multi-spherical interaction in the ocean

Research orientations in 2017:

(1) Turbulence in the intermediate and deep ocean

(2) Ocean dynamics in the Indian Ocean

(3) Ocean-continent interaction and its environmental effects

(4) Geodynamics and tectonic evolution of lithosphere in East Asian continental margin

(5) Marine sedimentation and medium-to-small-scaled paleoenvironment

(6) Ocean acidification and its effect on ecosystem

(7) Interface process in marine environment and matter cycling

(8) Marine biological diversity

(9) Oceanic microbiologic ecology and biogeochemical cycle

(10) Change and prediction of ocean, ice sheet and ecosystem in the Polar Regions

About 6 to 8 projects will be funded.

6. Change processes and effects of terrestrial surface environment

Scientific objectives: This field mainly focuses on the interaction and interfacial processes of key components of the terrestrial surface and the relationship with human activities, and primarily analyzes the typical processes and the typical regions on the terrestrial surface. The scientific objectives are to reveal formation characteristics and mechanisms of surface environment, to elucidate change processes and effects of surface environment, to develop the methods of change-monitoring and effect-evaluating in terrestrial surface system, to expand theory and methodology of system science for terrestrial surface study, and finally to provide the scientific basis for the application of spatial administration and human-nature coordinated development under the background of global change and globalization.

Key scientific issues include: processes of terrestrial surface system, response mechanism and feedback of surface processes on environmental change, soil processes and its biogeochemical cycle, comprehensive study on surface processes in typical regions.

Research orientations in 2017:

(1) Interaction mechanisms between patterns and processes of terrestrial surface system

(2) Biogeochemical cycles and their spatial differentiation in typical regions

(3) Interactions between climate, hydrology and landform, and their environmental and disaster effects

(4) Processes and effects of cryosphere

(5) Interactions between soil and vegetation, and their spatial heterogeneity

(6) Mechanisms of ecosystem degradation and restoration strategies

(7) Ecosystem processes and services

(8) Resources and environmental processes in rural regional systems

(9) Surface environmental changes and the effect evaluation on public health

(10) Effects and responses of human processes on the evolution of terrestrial surface system

(11) Spatial evolution processes and its simulation of human-nature compound system

(12) Uncertainty of spatial information and spatial analysis

(13) Expression, analysis and visualization of terrestrial surface features

(14) Synthetical integration and simulation of terrestrial surface system processes

(15) Spatial governance path based on human-land coupling

About 6 to 8 projects will be funded.

7. Evolution and sustainable utilization of water and soil resources

Scientific objectives: This field mainly focuses on the formation, evolution and the ecological and environmental effects of soil and water driven by natural and human activities, and primarily analyzes the coupling mechanisms and processes of soil and water in the different scales. The scientific objectives of this field are to elucidate the evolution processes of water and soil and their coupling mechanisms, to reveal the principles of formation and evolution of water and soil resources, and to propose the approaches to sustainable utilization and scientific allocation of water and soil resources.

Key scientific issues include: soil processes and evolution, soil quality and resource effect, watershed hydrological processes and their ecological effects, formation mechanisms of regional water cycle and water resources, coupling of regional water and soil resources and their sustainable utilization, ecological function and environmental effect of soil biology, and eco-hydrological processes and ecosystem services.

Research orientations in 2017:

(1) Tempo-spatial variation of soil properties and informatization of soil and water elements

(2) Soil biodiversity and its function

(3) Interaction mechanisms and effects of soil processes

(4) Nutrient elements cycle, soil quality and environmental effect of farming ecosystem

(5) Mechanisms of soil degradation and soil remediation

(6) Soil and water quality, and safety of agricultural products

(7) Uncertainty of evaluation on food production by the method of quantitative remote sensing

(8) Mass transfer and conversion processes and its coupling models between energy, soil and water

(9) Regional soil erosion and soil and water conservation

(10) Effects of climate change on soil-water processes and the countermeasures

(11) Formation, transformation mechanism and safety of regional water resources

(12) Hydrological and soil changes and their ecological, resources and disastrous effects under extreme environment

(13) Coupling mechanism and regulation of soil-water processes

(14) Spatial allocation of soil-water resources and evaluation on regional carrying capacity

(15) Valuation of soil-water resources and ecological compensation

About 6 to 8 projects will be funded.

8. Process and function of the critical zone

Scientific objectives: Critical zone is a complex system of the shallow sphere of the Earth, where strongest interaction occurs among rock, soil, air, water, life, and anthropogenic force. The critical zone is the nexus of the material and energy cycle not only connecting the deep Earth, surficial process and the climate system, but also controlling the ecological environment and sustaining the inhabitability of life on the Earth. With the application of geology, geochemistry, pedology, hydrology and ecology, as well as other interdisciplinary approaches, the characteristics, process and evolution, of critical zone and its relations with social sustainable development will be explored. The research work will dedicate to the development of transformative research approach and theory on critical zone, construction of model for the critical zone system processes, prediction of evolution of the ecosystem and environment on multiple tempo-spatial scales, as well as the service to the societal sustainable development.

Key scientific issues include: structure, formation and evolution of the critical zone; material transformation and interaction of the critical zone; service function and sustainable development of the critical zone; modeling and systematical simulation of the critical zone. Critical zone science is the system science based on the multidisciplinary and integrated research on the surficial Earth system. From this rationality, multiple-disciplinary and systematic observation, experiments and theoretical modeling based on long term observation and research platforms are especially encourage.

Research orientations for 2017:

(1) Geological, climatic, hydrological and biological factors for the forming and evolution of the critical zone

(2) Material and energy cycling in the critical zone with relations to the variation of ecological functions

(3) Process, mechanism and prediction of the disturbance by global change and anthropogenic factors to typical critical zones in China

(4) Physical, chemical and biological processes and their coupling mechanism for the migration and transformation of the compounds and elements among the critical zone interfaces

(5) Structure of critical zone and bio-geochemical cycling of C, N, P, etc.

(6) Hydrological processes and cycling and variability of the structure and function

of the critical zone

(7) Weathering of rocks, forming and evolution of pedosphere and mechanism in different types of critical zone

(8) Structure, process and ecosystem evolution of critical zone

(9) Critical zone structure, migration and transformation of pollutants and mechanism of purification

(10) Evolution of service function of critical zone with application to evaluation and prediction

(11) Innovative theory, methodology and technology for critical zone observatory network and systematic observation

(12) Capacity and resilience of critical zone to the environmental and catastrophic events

(13) Modelling and simulation of the structure, process and function of critical zone in section, catchment, regional and global scales

Expectedly 6 to 8 projects will be funded.

9. Process, change and mechanism of weather, climate and atmospheric environment

Scientific objectives: to investigate various physical, chemical and biological processes of weather, climate and atmospheric environment, to understand their spatial and temporal characteristics, mutual relations and interactions mechanisms, to develop and improve the theory of modeling and prediction for weather, climate system and atmospheric environment, to provide a scientific foundation for the requirement of the high resolution, timing, fix point, and quantitative forecast of disastrous weather and atmospheric environment, as well as the improvement of the seasonal and interannual prediction.

Key scientific issues include: dynamical mechanism and predictability of the weather and climate change; prediction of the climatic interdecadal variability; processes of atmospheric physics and atmospheric chemistry, as well as the mechanism of their mutual influences; interactions among weather variations, climate change and atmospheric environment in Asia; exchange and cycling between substance and energy in climate system; frequency and amplitude of the extreme climate events.

Research orientations in 2017:

(1) Interactions among aerosols, clouds and precipitation

(2) Interaction between atmospheric boundary layer and climate system

(3) Variations of the middle and upper atmosphere and its interactions with troposphere

(4) Coupling mechanism of the atmospheric physical and chemical processes

(5) Development of high-resolution weather forecast model and cloud model

(6) Integrated sounding technology of dynamics-micro physics-electric processes in thunderstorm and weather modification

(7) Regulations of the disastrous weather occurrence, development and evolution, as well as theories and methods of the refined weather prediction

(8) Dynamical mechanisms of climate and climate change

(9) Causes and predictability of atmospheric sub-seasonal variations

(10) Prediction of atmospheric seasonal, interannual and interdecadal variations

(11) Exchange and cycling between substance and energy in climate system

(12) Mutual effects between regional extreme weather, climate and environment and

global climate

(13) Implementation and application of the new theories and methods in critical atmospheric variables detection

(14) Data assimilation for coupled model

About 6 to 8 projects will be funded.

10. Sun-Earth space environment and space weather

Scientific objectives: to form a theoretical frame of the global cause-effect chain of space weather processes so as to achieve 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 provide basic data for the safety of astronautic activities and the space-to-earth survey; 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 social policy making; 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 data from the Meridian Project observations; to encourage the related basic researches on space geodesy; to encourage the interdisciplinary study between space weather and space geodesy especially.

Key scientific issues include: frontiers of basic physical processes in space weather science; the coupling processes among solar-terrestrial space; space weather modeling and integrated modeling method; the mechanism and countermeasure of space weather on human activities; the influence of solar activity on space weather; the theory, method and technology of space and ocean geodesy, and its application in geosciences.

Research orientations in 2017:

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

(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) Space weather of the solar system and planet

(5) Prediction model and method in space weather, early warning of hazardous space weather

(6) Effects of space weather on astronautics, telecommunication, navigation, materials and human health

(7) New concept, principle, method and technique in space weather exploration, project pre-research in space exploration

(8) New theory for integrated geodetic observation by land, sea, air and space-based observation systems

(9) Theory of geodetic survey, and the process and mechanism of mass transport of the earth 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. Global environmental change and interactions among different spheres of the Earth

Scientific objectives: Under the background of global environmental change, this field aims to improve the understanding of global warming and its changing trends in the future through the investigation of key scientific issues in the ocean-atmosphere interactions, in particular for the Asian climate change, and to provide scientific and technical supports for addressing the enormous environmental stresses and challenges to human society.

Key scientific issues include: processes and mechanisms of global warming hiatus; ocean-atmosphere interactions and the Asian climate change; global climate change and hydrologic cycle; biogeochemical cycle and climate change; past global warming and its effects during the Cenozoic era; interactions among different spheres and Earth system simulations.

Research orientations in 2017:

(1) Regional hydrologic cycle and its linkage to climate change

(2) Changes in marine environment and their role in the climate system

(3) Global change and key processes of the biosphere

(4) Biogeochemical cycle and climate change

(5) Short-term prediction and long-term projection of the global climate change

(6) Inter-decadal climate variability and global warming slowdown

(7) Mechanisms of multi-scale ocean-atmosphere interactions

(8) Detection and attribution of the regional climate change

(9) Global change and multi-scale climate variabilities in the Asian monsoon and westerly belt

About 6 to 8 projects will be funded.

12. Impacts of human activity on environment and disaster

Scientific objectives: Following the scientific development concept, and maintaining harmonious relationship between human and nature, this field will focus on the development phase and needs of economy and society in China, and consider the actual condition and advantage of resources and environment and its change, and continue to support multidisciplinary and interdisciplinary researches between natural science, engineering technology, and social science, to reveal interaction effects, mechanism and process during the industrial and agricultural production activities, engineering construction of major infrastructures, exploitation of resources and energy, urbanization and other human activities, and investigate threatening impact of human activities on the earth's environment and disaster mechanism, and understand the mechanism of action due to the human activities and its possibly negative effects and disastrous consequences of the human activities on the earth system during the earth's environment and regional environmental evolution. This will be helpful to provide scientific basis to protect regional environment, reduce disaster risk, adjust and control the adverse environmental evolution, realize harmony between human and nature, and promote sustainable economic and social development.

Key scientific issues include: characteristics, interaction and security disposal of industrial and urban solid waste; impact of large-scale human engineering activities on environment and its hazard mechanism; ecological and environment effects caused by mineral resources utilization; evolution process, influencing factor and mechanism of

geological disasters (such as landslide and debris flow); impact of human activities on forming process of combined atmospheric pollutions; impact of human activities on regional and global environment; regional environmental process and control; regional sustainable development; multi-medium interface process, effect and control of environmental pollutants; coupling interaction between regional human activity and resources & environment; effects of urbanization and environment & resources.

Research orientations in 2017:

(1) Security disposal of radioactive waste and unhandy industrial waste

(2) Mine environment and tailing disposal

(3) Pollution treatment of e-waste

(4) Pollution process and environmental restoration of groundwater

(5) Multi-medium interface process of environmental pollutants

(6) Regional development and spatial restructure

(7) Effects of urbanization and resources & environment

(8) Early identification and warning of geological hazard

(9) Impact of large-scale human engineering activities on environment and its disaster mechanism

(10) Prediction and prevention of geological disasters involved in significant engineering

(11) Impact of human activities on forming process of combined atmospheric pollutions

About 6 to 8 projects will be funded.

Department of Engineering and Materials Sciences

In 2016, the Department of Engineering and Materials Sciences received 441 proposals for the Key Program, and among them, 90 proposals were funded in 82 fields with a success rate of 20.41%. The total direct cost was 259.70 million yuan and the average direct cost was 2.89 million yuan per project.

In 2017 about 90 projects will be supported in 84 fields with an average direct cost of 3 million yuan per project for 5 years. The 84 fields are as follows:

1. Key problems in the design, manufacture, processing and application of ferrous metals (E0101, E0109)

2. Key problems in the design, manufacture, processing and application of non-ferrous metals (E0101, E0109)

3. High temperature alloys, intermetallic compounds and metal matrix composite materials (E0101, E0102)

4. Metastable and nano-structured metallic materials (E0103, E0104, E0105)

5. Energy and catalytic metallic materials (E0105)

6. Biomedical, intelligent and biomimetic metallic materials (E0105)

7. Magnetic and information metallic materials (E0105)

8. New phases, new functions in metals and new materials with metallic properties (E0104, E0105, E0106)

9. Characterization of structure, surface and interface of metallic materials (E0107, E0110)

10. Mechanical properties and service behavior of metallic materials (E0108, E0111, E0112)

11. High efficient energy storage materials and devices (E0210)

12. New technologies and mechanisms for flash sintering of ceramic materials (E0203)

13. Salt damage mechanisms and predictions of cultural relics composed of vulnerable silicates (E0212)

14. Memristive materials and devices (E0204)

15. Any research topics in the field of inorganic non-metallic materials (E02)

16. Structure/property directed chemistry of polymeric materials (E03)

17. Manipulation of the aggregation structure of polymeric materials and its influence on properties (E0314)

18. New theories and methods for the processing (including micro-nano processing and additive manufacturing) of polymeric materials (E0315)

19. Basic issues on biomedical polymeric materials (E0310)

20. Basic issues on optoelectronic organic polymeric materials and devices with high performance (E0309)

21. Basic research on polymeric materials related to energy, ecological environment and resources (E0313)

22. Basic research on structure/function design, preparation and properties of polymer composites (E0307)

23. Key scientific issues of oil and gas exploration in deep layer and deep water (E0403)

24. Information theory of mining and strata control (E0401, E0402)

25. Disaster prevention and control of flammable and explosive hazardous chemicals (E0410)

26. In-situ dissolution kinetics and mass transfer enhancement (E0401, E041202)

27. Refractory ore pre-treatment theory and methods (E0411)

28. Phenomenological theory of metallurgical physical chemistry (E041204)

29. Law and model of material energy conversion in metallurgical process (E0413)

30. Theory for electric arc furnace (EAF) process with scrap (E0414)

31. Foundation of high-purity metallurgy and material preparation (E0418)

32. Physical and mechanical metallurgical control of metal solidification process (E0416)

33. Process metallurgy monitoring, integrated control and intelligence (E042204)

34. Metallurgical information and big data mining processing (E042205)

35. Mechanisms/machines innovative principles and design methodologies for functionality and performance (E0501)

36. New principles and methodologies for precise motion actuation and

transmission systems (E0502)

37. New theories and methodologies for mechanical system dynamics and vibration control in servo safety (E0503)

38. Failure mechanisms and strength design of components/structures/mechanisms for mechanical equipment (E0504)

39. Function design and performance regulation of mechanical surfaces and interfaces (E0505)

40. Design theories and methodologies for complex electromechanical systems (E0506)

41. New principles and methods for bio- and bionic design and manufacturing (E0507)

42. Novel principles and methods for integrated manufacturing with precise forming and high-performance of complex components (E0508)

43. Theories, technologies, and methods for high efficiency and ultra-precision machining (E0509)

44. Novel principles and methods for high energy-density beam and non-traditional energy-field-based manufacturing (E0508, E0509)

45. New principles, operation modes, systems, and equipment for intelligent manufacturing (E0510)

46. Measurement and testing theories, methods, and technologies for mechanical dynamic parameters (E0511)

47. New principles and methods for the design and manufacturing of MEMS/NEMS (E0512)

48. Thermodynamic system analysis, control and optimization for energy conservation (E0601)

49. Turbulent flow mechanism and flow control in fluid machinery (E0602)

50. Fundamentals on multi-phase flow, mass and heat transfer in power systems (E0603, E0605)

51. Mechanism of combustion, pollution and emission reduction of solid fuel (E0604)

52. New principles and methods of measurement for complex thermo-physical quantity and field (E0605)

53. Key thermo-physical issues on the utilization of renewable energy (E0607)

54. Interdisciplinary research of thermo-physical area with mechanics, materials, environment and life science, etc. (E0608)

55. Fundamental research on the high efficiency high quality electric machine system and its control (E0707)

56. Key issues on the new energy system based on electric power (E0704, E0706)

57. Key issues on the advanced power equipment with reliability and security (E0705, E0702, E0703)

58. Key issues on the overall optimization and reliability of power electronic devices and its system (E0706)

59. Key issues on the pulse power and discharge plasma (generation and application) (E0708, E0709)

60. Fundamental research on electromagnetic-biological effects and their medical application (E0712)

61. Fundamental research on high efficiency low cost conversion and large scale storage of electric power (E0713, E0702)

62. Key issues on the advanced electric-magnetic energy conversion theory and technology (E0701, E0706)

63. Design and planning theory, method of high quality elementary education architectural space and environment (E0801)

64. Design theories and methods of public buildings with a large space (E0801, E0803)

65. Inheritance and regeneration development of regional construction pedigree and vernacular architectures in urban and rural areas (E0801, E0803)

66. Mechanisms for high-efficiency removal of pollutants in waste water biological treatment processes (E0804)

67. Coupling principle of chemical-physical process for water treatment (E0804)

68. Theory and technology for microbiological risk control of reclaimed water (E0804)

69. Sustainable, high performance building materials and innovative structural systems (E0805)

70. New theory and methods for civil engineering structure design and construction (E0805)

71. Performance of concrete structures under complex loading conditions /environmental effects (E0805)

72. New structural systems, technologies and methods for disaster prevention and reduction of civil engineering (E0805, E0808)

73. Development and safety risk control of urban underground spaces (E0806, E0807)

74. Theory and method of risk analysis for disaster prevention and reduction of major structures (E0808)

75. Mechanism, prevention and control of flooding and water logging (E0901)

76. Agricultural water-saving theory and equipment (E0902)

77. Water ecological environment protection and remediation (E0903)

78. Hydrodynamics of urban flooding and water logging (E0905, E0904, E0901)

79. Theory and technology of real-time monitoring of geological defects in heavily mechanized tunneling (E0907)

80. Disaster early warning and quick rescue of geotechnical and/or hydro projects (E0907, E0908, E0909, E0910)

81. Mechanisms and control of abnormal deformation of dam foundations and their influences on super-high dams (E0908, E0907)

82. Key sediment transport processes and channel bed evolutions in estuaries or rivers (E0909, E0904)

83. Fundamental theories and design methods for new types of coastal structures (E0909)

84. Dynamic characteristics of offshore wind power platform system (or structural system) (E0910, E0909)

Department of Information Sciences

In 2016, the Department of Information Sciences announced 82 areas and 3 priority funding areas for the application of Key Programs, and received 253 applications, of which, 85 projects were funded with direct cost funding total of 225 million yuan (13 million yuan moved in from Major Program), and average direct cost funding intensity of 2.6471 million yuan per project. The success rate is 33.60%. Most of the Key Program projects in areas related to big data received larger funding.

In 2017, the Department will fund 85 Key Program projects with average direct cost funding of about 3 million yuan per project for 5 years. Applicant should follow the guidelines for research directions in relevant areas, in accordance with 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. Projects receiving priority funding will be managed according to the management of Major Program projects.

Please provide proper application code in the application form, and visit NSFC's website (http://www.nsfc.gov.cn/) for details.

The deadline for proposing areas of Key Program for 2018 is April 30, 2017. Please visit the department website (http://www.nsfc.gov.cn/cen/oo/kxb/xx/tztg.htm).

Key priority funding areas of the Department:

1. Theory and method of millimeter wave and tetra hertz imaging (F0120)

To meet the need of new technologies for anti-terrorism in airport and railway stations, this project aims at studying new method of dangerous materials detection using millimeter or tetra hertz waves, explore theory and method of fast high-resolution imaging for security check. Applicant must have good research background and research results are required to be verified in typical application environment.

Main research directions include:

(1) New mechanism and method of millimeter or tetra hertz imaging for security checks;

(2) Fast high-resolution imaging using millimeter or tetra hertz waves in cooperative security checks;

(3) Fast high-resolution imaging using millimeter or tetra hertz waves in non-cooperative security checks.

2. Analysis of performance of complex system and design of controllers (F0301)

There are two research directions, and one or two key program projects will be funded. Applicant should address key problems related to analysis of complex performance and design of good controllers in nonlinear or random system to determine topic of study, and make deep research on basic theory and creative methods, and try to make breakthrough in some basic problems and new methods that have important impact internationally.

(1) Performance analysis and controller design of nonlinear systems;

(2) Performance analysis and controller design of random system.

3. Basic research on key technology of optical fiber sensing (F0503)

Optical fiber sensors have big problems in extreme conditions, such as high temperature and high pressure, and long service time. For this project group, we have four research directions, and plan to fund three or four key projects. Applicant must have good research background and research results are required to be verified in related areas.

Main research directions are:

(1) Basic research on optical fiber sensing for underground energy industry;

(2) Basic research on optical fiber sensing for safety monitors in smart rail transportation;

(3) Basic research on special optical fiber for sensors;

(4) Basic research on optical fiber sensing for underwater environment.

Key areas funded by the Department are as follows:

1. Imaging genome studies for precise therapy of cancer (F0125)

2. Studies on 3D visual comfortable nerve system based on neural imaging (F0125)

3. Basic theory and key technology of plane antenna arrays with wide angle scanning capability (F0120)

4. Warning sensor for air drilling safety checks (F0123)

5. Digital super materials and its regulation to tetra hertz waves (F0119)

6. Basic theory and experimental verifications of non-equilibrium interactions between microwave and chemical reactions (F0119)

7. Fast magnetic resonance imaging for high dimensional big data of multi sources (F0125)

8. Basic theory and technology of the internet of vehicles for 5G applications (F0104)

(1) Theory of complex moving environment sensing and modeling

(2) Connection theory of high speed moving environment and reliable transmission technology

(3) Optimal dispatching of resources and method for optimization of vehicle movement

9. Theory and technology for high speed chaotic optical fiber communication system (F0109)

10. Theory and technology of 3D mobile wireless sensor network for space monitoring (F0104)

11. Modeling and optimization of navigation system for new generation satellite (F0106)

12. Theory and technology repeatable high frequency applications (F0101)

13. Theory and technology of utilizing wireless edge network resources based on client behaviors (F0104)

14. Repeatable circuit for all digital DBF array for marine applications (F0118)

15. Theory and method of radar tracking of high maneuvering target in near space (F0112)

16. Theory and method of real time service for downloading remote sensing satellite data (F0113)

17. Theory and method of media broadcasting in software defined network (F0117)

18. Digital restoration of damaged historical relics (F0115)

19. Distributive non convex statistical analysis of big data (F0111)

20. Graph computation for big data application (F0201)

21. Theory and method of automatic theorem proving (F020107)

22. Reliability of key security systems (F0202)

23. Dynamic uncertainty and smart configuration of software engineering demand (F020202)

24. Theory and key technology of management of big graph data (F020204)

25. Data management of new hardware (F020204)

26. Contractible virtualization driven by extreme needs (F020205)

27. New type of high efficiency computation architecture (F0203)

28. New type of high performance processor architecture for deep learning (F0203)

29. Brain-like computation architecture for large neural network (F020306)

30. Key technology for coordinated brain-like learning and visual cognition (F0205)

31. High flux visual computation for big data environment (F020502)

32. Automatic construction of multi-channel virtual environment for big data learning (F020503)

33. Basic theory and algorithm of genome data analysis (F020504)

34. Modeling and experience of real feeling of personalized goods for e-commerce (F020507)

35. Uncertain modeling of machine learning of big data (F020508)

36. Theory and application of machine gaming in complex environment (F020509)

37. Basic theory and technology of security searching in ubiquitous network (F020511)

38. Theory and method of hetero media searching for complex inquiries (F020511)

39. Machine translation of rare resource language (F020605)

40. Light coding and security protocol of quantum security (F0207)

41. Theory and technology of network coordination for unmanned systems (F020806)

42. Smart control system of typical industrial process (F0301)

(1) Control of drilling process

(2) Control of are earth extraction process

43. Modeling, optimization and control of typical moving targets (F0301)

(1) Modeling and control of dynamics of underwater vessels

(2) Integrated optimization and control of reusable and long flying time airships in stratosphere

44. Design and optimal control of new energy systems with multi-complimentary power supply mode (F0301)

45. Diagnosis and error tolerant control of complex engineering systems (F0301)

(1) Error control of vehicle born large power electric electronic switching devices

(2) Error tolerant control and self-saving system of deep sea manned vessel

(3) Diagnosis and regulation of industrial process driven by big data

46. Analysis and decision making of complex behaviors of group ecosystem for sensing network (F0302)

47. Theory and application of high trust emulation of complex system (F0302)

48. Wide frequency inertia baseline based on magneto fluid dynamics (F0303)

49. Theory and method of syntax understanding for text in video footage for network security application (F0304)

50. Method and application of new types of smart information processing (F0305)

(1) Computation model and application of multi state sensing interactive brain mechanisms

(2) Visual computation model and application based on brain mechanism

51. Smart robot system for tasks (F0306)

(1) Visual sensing and maneuver control of robots for smart manufacture

(2) Theory and method of robot simulating astronaut operations

(3) Environmental sensing and autonomous operation of serve robot

(4) Flexible operation of robot based on visions

52. Performance evaluation system and platform for capturing capability of underwater robots (F0306)

53. Studies on front module of silicon based MEMS radio (F0402)

54. Studies on integrated inferred detector chips on pixel level (F0504)

55. Complex 3D optical precision measurement for smart manufactures (F0508)

56. Growth technology of low defect III group nitrate on 2D crystals (F0403)

57. New materials and devices for tetra hertz regulation (F0504)

58. Mechanism and method of solving instability for large power optical fiber laser (F0506)

59. Silicon based night vision imaging integrated chips (F0403)

60. Studies on optical fiber and lasers doped with main group elements (F0502)

61. Basic problems and key technologies of multi light beam interference in super short pulse optical fiber laser (F0506)

62. Super low power consumption self-spinning electronic devices and integrated technology (F0408)

63. Studies on cadmium free semiconductor quantum point LED (F0509)

64. Precision control of photo genetics at sub cell level (F0512)

65. Silicon dioxide photo quantum integrated chips based on plane silicon technology (F0408)

66. Self adaptive optical correction technology by vortex light beam (F0508)

67. Single chip integration of tetra hertz quantum level devices (F0403)

68. Principles and technology of non-marker wide field optical high-resolution imaging (F0512)

69. Integration of 2D semiconductor and hetero joint logic devices (F0408)

70. Method and application of effective control of visible light propagation based on micro nano structures (F0509)

71. Basic research on large flexible electronic system based on integration of oxide semiconductor and silicon IC (F0402)

72. Research on technology and key devices of fast high-resolution spectrum analysis based on re-construction of time wave length sequence (F0507)

Department of Management Sciences

In 2016, the Department of Management Sciences received a total of 87 Key Program applications, and funded 22 projects. The average funding for direct expenses was 2.3 million yuan per project.

During the 13th Five-Year Plan period, the Department of Management Sciences will release funding fields of key programs annually, and release funding fields of key program clusters and database construction timely. The Key Programs should be focused on (1) scientific frontier issues that can promote discipline development, obtain great innovative achievement, and generate international impacts; (2) important theoretical and application issues regarding economy construction, society development, reform and opening-up, and the improvement of China's comprehensive competitiveness, which need to be addressed immediately, are possible to be addressed; (3) systematic and in-depth innovative research, which explores management theories and laws for China and has sound research background or good potential for discipline development.

The funding priority areas listed below outline the main contents, scopes and basic requirement of research work. Applicants are required to possess solid research experiences and abilities in the areas that they are applying for. Applicants are encouraged to exploit their full advantages, present deep academic thoughts in their applications, make the research goals clear and concrete, focus on one or several key points of the research and actually address them (it is not required to include all aspects of the research content in the Guideline), and have theoretical breakthroughs. In addition, applications are required to apply theories to practice, discover key scientific issues from important practical management issues from a perspective of China's situations and conduct in-depth research, and try to provide new approaches to address practical management issues. Applicants should focus on scientific methodologies, emphasize on the application of scientific approaches, take real data and actual cases as the fundamental information of their research, and make sure not to be subjective. Please note that the title of application is not required to be exactly the same as the area titles of the following listed Key Programs.

Note that the requirements given in the general description section of the General Program of the Department of Management Sciences in this Guideline are also applicable to the Key Programs, please read these items carefully.

Key priority areas of Key Programs

In 2017, the Department of Management Sciences proposes 23 priority areas for Key Programs (including one Key Program Cluster), and plans to fund approximate 24 projects, with approximate 8 projects (including one Key Program Cluster) for each of the three divisions. The average funding for direct expenses will be 2.2-2.8 million yuan per project, and the implementation period of the Key Program projects will be 5 years.

1. Research on the impact of the massive internet information environment on decision behavior (G0108)

Key scientific issues: (1) Adaptability and coping strategies of different cognitive systems (e.g., a dual system of heuristic method and analytical method) under the internet information environment; (2) Method of human beings using "ecological rationality" to

adapt the variations in the information environment and deal with "garbage information", and; (3) How to use limited cognitive resources to make simple and effective decisions in the fields of risk, uncertainty, and intertemporal choices.

2. Micro credit evaluation theory and method under the big data environment (G0105, G0117)

Key scientific issues: (1) Establishment of micro credit evaluation system under the big data environment; (2) Unstructured credit information mining and extraction: (3) Default risk distinguishing methods under multi-dimensional data flow, and dynamic multi-criterion credit evaluation method; and (4) Credit evaluation modes and mechanism of prevention strategy behavior.

3. Optimization and management of aviation network operation security (G0102, G0119)

Key scientific issues: (1) Risk evaluation theory and methods of aviation network operation security, including collision risk models of airspace, network risk evaluation indicator system, security operation ability calculation, etc.; (2) Optimal allocation theory and methods of aviation network operation, including network risk transmission mechanism, risk dynamic regulation method, flight flow emergency optimization; and (3) Comprehensive simulation validation platform for aviation network operation security, including comprehensive evaluation system of airspace security operation, dynamic airspace emergency optimal allocation system, massive flight collaborative optimization and management system.

4. Medical resource optimization and service operation management in China under the hierarchical medical system (G0102, G0104)

Key scientific issues: (1) Distribution and characteristics of medical resources in typical areas of China; (2) Classification and grading methods for medical resources towards key illness and groups; (3) Patient selective induction mechanism design that can balance medical resources loads of each medical grade; (4) Optimal allocation mechanism of medial resources of each medical grade; and (5) Hospital appointment and overbooking strategy, patient queuing management and arrival time optimal regulation towards "internet+".

5. High availability implementation strategy of high-speed railways (G0113, G0102)

Taking locomotive power systems of China's high-speed railway as case study, conducting research on quality-and-reliability-oriented high availability implementation strategy of high-speed railways on the basis of collection and analysis of real data and cases during the design manufacturing, operation, and maintenance stages, including high-speed railway system optimization design methods towards reliability, maintainability, safety, and elasticity; modeling and analysis methods of high-speed railway component-level and system-level reliability and associated variation processes; high-speed railway operation monitoring, failure warning and root and cause analysis methods driven by real-world complex data; system-level maintenance strategy optimization and elasticity promotion methods.

6. Theory, methods, and application of social operation management (G0102)

Key scientific issues: (1) Mechanism of information interaction and society interaction behaviors of operation management participants under the internet and social network circumstance; (2) Optimization modeling and rapid calculation methods of

operation management issues with social interaction behaviors included, and their application in new business modes such as group purchase, crowdfunding, crowdsourcing, and two-sided market; and (3) Social operation management in the context of China.

7. Emergence mechanism and evolution rules of social system group behaviors (G0109)

Taking social group incidences as the main research background, conduct research on the following key issues: (1) Individual behavior characteristic and its interaction modes in the social system; (2) Spatial and temporal variation characteristics of each stage of incidences including brewing, rising, and bursting; group incidence evolution mechanism of virtual-reality social interaction effect based on coupling interaction; (3) Emergence mechanism of social system group behavior based on scenario-embedded and near-neighbor interaction effects; and (4) Group incident forecast, warning, and regulation based on interaction structure and information transmission.

8. Sustainable pension system design and multi-level pension system establishment (G0112)

Key scientific issues: (1) Optimization and design of public contributory pension insurance system, including solvency calculation and risk control strategy of pension funds under different payment and population conditions; (2) Design and optimization of welfare economy security system for aging people; and (3) Strategy simulation and system design of a multi-pattern and complementary pension system, including family insurance and social pension.

9. Project management theories and patterns under the circumstance of big data (G0212)

Under the circumstance of big data, project management theories and patterns are expecting new breakthrough. In this area, research focusing on project management theories and new standards and new patterns of project management by using big data and digital information technology will be given priority, and one or two key programs will be supported.

10. Enterprise theory study based on China's practices (G0202)

There are many successful experiences and issues in the growth of China's state-owned and private enterprises, but the theory studies are relatively insufficient. In this area, those studies taking state-owned enterprises, small/medium-size family enterprises, listed companies, and multinational companies as research targets and focusing on corporate governance theory, enterprise property rights theory, and enterprise growth theory based on China's practices will be given priority. One or two key programs will be supported

11. New methods and theory innovation of experimental research for economic policy evaluation (G0302)

By conducting economic experimental case study, refine experimental methods of economic policy evaluation, study the influences of individual features of experimenters on the experiment, scientific analysis methods of experimental data, as well as the differences between experiment results and the growth paths in reality, and generate new theories and methods of experimental research for China's economy.

12. Global value chain and new rules of international trade (G0304)

Key scientific issues: (1) The effects of the new rules of international trade on promoting global value chain specialization and new international production network establishment; (2) Promotion pathway and key areas of the reform and new rules of

international trade; (3) Quantitative research on political barriers and obstacles of China's deep involving and promoting global value chain; (4) Research on practicing new rules of international trade and conducing effective risk and pressure tests; and (5) research on pathways of how to raise the benefits from the global value chain and promote the discourse power for China under the new rules of international trade.

13. Domestic production network and market integration on the global value chain (G0304)

Key scientific issues: (1) Theoretical models and measurement methods of domestic value chain on the basis of global value chain theories; (2) Methods of embedding domestic regional input-output database into global input-output database; (3) Historical variation pathway and associated influencing factors of domestic regional specialization and production network from a domestic value chain perspective; (4) Influences of domestic market segmentation on domestic economy from a value chain perspective; (5) Interactions between domestic and global value chains, and the ways to integrate them and promote regional development; and (6) Establishment of China's multi-regional CGE model from a domestic value chain perspective and associated policy simulation.

14. Global value chain and China's industrial upgrading (G0304)

Key scientific issues: (1) Quantification methods and evolution rules of global value chain, including measurement research on quantitative indexes of industrial characteristics, such as the global value chain's length, locations, participation level, times of cross-border, trade case and profit allocation; (2) Characteristics of industries from major countries participating in the global value chain, and variation trend in the global value chain under the future international trade pattern and rules; (3) Measurement of the manner, degree, and position of China's participation in the global value chain from multiple aspects of trade structure, industrial competitiveness, and resource utilization efficiencies; (4) Approaches to promote the effects of the "One Belt and One Road" strategy on upgrading value chain of China's industry; and (5) Relations between integrating manufacturing and service industries, service-oriented manufacturing industry, service industry development, and manufacturing industry upgrading.

15. Evolution rules and change management of China's financial system (G0306)

Key scientific issues: (1) Characteristics, innovation, and risks of main constituent elements of Chinas' financial system, as well as evolution rules for China's financial industry and financial institutions; (2) Transition of business forms and operation modes of financial institutions; (3) Characteristics, innovation, and risk management of new-type financial tools; operation mechanism and interactions between China's currency market and capital market; and (4) Macro evolution rules and change management measures of China's financial system.

16. Evolution of China's industrial clusters and cultivation of new drivers for development (G0309)

Key scientific issues: (1) Evolution of China's industrial clusters formation accompanied by economic growth, and the interaction mechanism of industrial clusters on industrial innovation; (2) Integration and coordination mechanism of innovation chains, industrial chains, and capital chains of manufacturing industry clusters, and the formation mechanism of cooperative clusters of the producer service industry and manufacturing industry; (3) Interactions between industrial clusters and urbanization, and the industry

cluster effects in the period of China's urbanization; (4) Description of new industrial clusters patterns, transition of enterprise organization mode, and new driving cultivation based on enterprise' common demand; (5) Effects of industrial clusters on the strategy of "Chinese enterprises go global"; and (6) Policy recommendation regarding new driver cultivation for China's economic development.

17. University and regional innovation mechanism (G0405)

Key scientific issues: (1) Definition of core connotation and characteristics of regional innovation system according to the innovation theories; (2) Regular patterns of university and regional innovation system, and the basic operation mechanism of their intergrowth; (3) Coordination evolution mechanism and pathways of university and regional innovation eco-system, and the development characteristics of university and regional innovation system in new emerging economies, especially the evolution pathways to realize inclusive innovation and development in new emerging economics; (4) Policy simulation of innovation policy systems of university and regional innovation system, institutional environment design for promoting university and regional innovation system, and policy recommendation.

18. Ability promotion of primary medical services (G0406)

Key scientific issues: (1) Reasonable function orientation of primary medical care institution in the tiered medical service and the entire medical service system; (2) Scientific definition and theoretical explanation of primary medical service ability from a theoretical perspective, and establishment of an indicator system to scientifically evaluate primary medical service ability; (3) Influencing factors and mechanism of primary service ability and functional target differences; and (4) Summarizing and refining local practical experiences that are typical for promoting primary medical service ability, and further proposing generally applicable, operable, and concrete policy recommendations from the aspects of institution system, policy regulations, and reform and innovation to promote primary medical care service.

19. Non-traditional security issue identification and prevention mechanism (G0409)

Key scientific issues: (1) Combined with concrete cases in the non-traditional security field, identification of the causes of non-traditional security issues and their generation mechanism; (2) Dynamic evolution pathway and emergence mechanism of non-traditional security issues from micro to macro, and the complexity rules of non-traditional security issues formation; (3) Non-traditional security identification and warning mechanism, composition of risk factors and associated relations, and identification methods of risk characteristic indicators, security evaluation and measurement methods based on risk characteristic indicators, classification and gradation standards for warning; and (4) Impact mechanism of non-traditional security prevention and response mechanism, policy and plan making mechanism design methods, coordination mechanism during policy implementation, etc.

20. Evaluation method and management of ecological assets (G0411)

Key scientific issues: (1) Concepts and scientific connotation of ecological assets; (2) Design of ecological assets investigations and evaluation indicator systems; (3) Approaches to ecological assets calculation and pricing; and (4) Management methods and public policies of ecological assets.

21. Program management in new-type urbanization development (G0413)

Key scientific issues: (1) Identification of stakeholders in new-type urbanization progresses, and establishment of multi-agent linkage game models within the sustainable development progress; (2) Using program orientation to replace the development situation of each element, and analyzing development progresses of each program during the sustainable development and the relations between them; (3) By establishing system dynamics models that have all stakeholders and programs included, revealing the rules of stakeholders and each program in urbanization progresses and the driving mechanism to promote urbanization sustainability; and (4) Conducting research on program management-based sustainable development strategy to reasonably and Normatively guide and restrict new-type urbanization progresses.

22. Modernization theory on urban transportation management (G0413)

Key scientific issues: (1) Fundamental theory on urban transportation management, urban transportation management target under the resource and environment constrain, optimization of public transportation network, evaluation of the trend in mobile internet and private cars; (2) Conducting research on inclusive management policies and proposing policy recommendations on institutional innovation and associated technical supporting, which are compatible with China's economy and society development level.

23. Driving mechanism of enterprise innovation and system research (Key Program Cluster)

The Key Program Cluster of Business Administration aims at domestic enterprise innovation driving mechanism and system, focuses on the enterprise innovation and entrepreneurship issues that serve national innovation-driven development strategy, and lists enterprise collaborative innovation ecological system, enterprise green development pattern and value chain restructure, enterprise innovation chain construction, and breakthrough technology innovation mechanism as key scientific issues.

To achieve the overall scientific goals and inter-disciplinary integration, the PIs of funded projects need to make commitment to complying with the regulations of related data, cases, and information management and sharing. The applicants should make the following notation in the Appendix of the application: "Enterprise Innovation Driven Mechanism and System Research Key Program Cluster".

In 2017, the Key Program Cluster of Business Administration plans to fund 4-6 key programs from the following six research topics:

(1) "Internet+" enterprise collaborative innovation ecological system research (G0203);

(2) Enterprise green development pattern and value chain restructure research (G0210);

(3) Business pattern formation and growth pathways of new ventures (G0214);

(4) Organization structure and coordination management of innovation chains of leading enterprises (G0202);

(5) Enterprise transition and upgrading mode innovation (G0203);

(6) Formation mechanism and evolution pathways of breakthrough technology innovation (G0203).

Department of Health Sciences

Applications for Key Program in the Department of Health Sciences are accepted only if they are in response to the solicited thematic areas listed in the *Guide*. Applicants are expected to give their own specific project titles, research contents and research plans according to the listed areas.

In 2016, 592 applications for the Key Program in responsive to 39 thematic areas were accepted, 107 of them were finally funded, with a total funding of 294.02 million yuan (direct cost) and an average funding intensity of 2.75 million yuan (direct cost as well) per project.

In 2017, approximately 105 applications for the Key Program will be awarded by the Department; the funding intensity of direct cost is expected to be 3 million yuan per project, and the duration is 5 years.

Detailed requirements for applications for the Key Program are described in the general requirement for the Key Program of NSFC in this *Guide*. Special attention should be given to the following requirements:

(1) Applicants are expected to refer to the requirement for General Program in the Department of Health Sciences in this *Guide*, and to pay special attention to the following contents: the Department in 2017 will generally not give further funding to applicants who either have got high funding intensity in 2016 from NSFC (such as Key Program, Major Program, Major International and Regional Joint Research Program, etc.), or are applying for repetitive or similar research to their ongoing national scientific projects funded by other governmental agencies.

(2) Applicants are expected to choose the relevant application code corresponding to the given thematic area and to fill in the application form. Besides, the title of the selected thematic area should be written in the "annotated column" of the application form.

(3) Applicants are expected to attach PDF copies of 5 relevant representative papers of the principal investigator to the electronic proposals.

(4) Applicants are expected to fill in the budget form with detailed justification.

It will be unacceptable if applicants fail to follow the above requirements.

The thematic areas for solicited Key Program in the Department of Health Sciences in 2017 are listed as follows:

1. Immunoregulatory mechanisms of lung injury and repair (H01)

The main studies are about the host-pathogen interaction, alveolar epithelial cells, macrophages and lymphocytes of the natural or acquired immune response after lung infection or injury, the interaction between immune cells and pulmonary epithelial cell, the signaling pathways involved in lung injury and repair, cytokines and their regulation of inflammation, and neuro-immunoregulatory mechanisms.

2. The pathogenesis and intervention of macro-vascular disease (H02)

The priority research areas will focus on the role of inflammation and immunity, genetic and epigenetic, biomechanics and vascular calcification etc. in the pathogenesis and intervention of macro-vascular disease.

3. The pathogenesis and intervention of myocardial dysfunction induced by metabolic disorder (H02)

The priority research areas will focus on the mechanism of cardiomyocyte in sensing and regulating metabolic balance, the molecular mechanism and key points of the dysfunction of important organelles (such as mitochondria) in cardiomyocyte induced by abnormal metabolic condition, the new early metabolic diagnostic and therapeutic targets for myocardial diseases induced by metabolic disorder .

4. Mechanisms of inflammatory changes and metabolic disorders in liver diseases (H03)

The key scientific issues include the impacts of inflammatory changes on metabolism of liver cells in liver diseases, the crucial molecular regulatory mechanisms in abnormalities of hepatic metabolism remodeling and metabolites sensing aggravating inflammatory changes in liver and its restoration.

5. Mechanism underlying adverse effects of advanced reproductive ages on pregnancy outcomes and offspring health (H04)

The area encourages applications focused on the mechanism underlying adverse effects of advanced reproductive ages on pregnancy outcomes and offspring health, including the effects of advanced reproductive ages on the quantity and quality of germ cells, on early embryo development, on the occurrence of fetal chromosomal abnormalities, and on the maternal-fetal interface by reciprocal genetic and environmental interaction upon cumulative exposures, etc.

6. Mechanism underlying reproductive diseases caused by dysfunctional endocrine network (H04)

The area encourages applications focused on: (1) research addressing the molecular basis of “hypothalamus-pituitary-targeting organs” axis on normal reproductive performances and related diseases, and potential interactions of this endocrine-regulatory axis with neuroimmune systems and its pathophysiological significance on reproductive system. (2) research elucidating the complexity of interactions of “hypothalamus-pituitary-targeting organs” axis with multiple factors, such as genetic, environmental, nutritional, psychological and psychical factors, etc., during the occurrence of various reproductive diseases.

7. Mechanisms of metabolic homeostasis imbalance caused by chronic kidney diseases (H05)

The key scientific issues include the effects and molecular mechanisms of metabolic disturbance of amino acids, lipids, minerals (calcium and phosphate) caused by chronic kidney diseases (CKD) in the disease progression and related complications, so as to find potential diagnostic and therapeutic targets in postpone CKD progression.

8. Degeneration, injury and repair of locomotor system (H06)

Focus on investigating the molecular mechanism of degenerative diseases in the locomotor system during its occurrence and development; seeking the key regulator for delaying or reversing the degeneration progress in the locomotor system and elucidating its associated regulatory mechanism; studying the degeneration and injury mechanism of the locomotor system and exploring preventive and therapeutic method.

9. Regulation and function of beige fat development in energy homeostasis (H07)

The key scientific issues is to investigate the differentiation program, metabolic characteristics, key regulatory signaling pathways, as well as epigenetic regulation during beige fat development and their roles in glucose/lipid metabolism and energy homeostasis,

aiming at providing important scientific knowledge for developing novel drugs to prevent and treat obesity and its related metabolic disorders.

10. Regulation of microenvironment and its relation to the development of hematological diseases and the mechanism (H08)

The grant calls for the applications to investigate the mechanisms of microenvironment changes in relation to the microenvironment of hematological diseases. Particularly, how the composition of cells and cytokines in the microenvironment (such as bone marrow/lymph nodes) regulates the function and the fate of HSCs/HPCs, their role(s) in the initiation and development of hematological diseases, and the mechanism for normal hematopoiesis inhibition under such disease environment.

11. Cell immunotherapy for hematological diseases and its mechanism (H08)

By resolving the key bottle-neck issues in cell immunotherapy at present, such as the specific target for cell therapy and the relapse of the treatment, the grant calls for the applications to study the molecular mechanisms of such problems to lead the basic and clinical research in this fiercely competing field.

12. Mechanism and intervention of periprocedural anesthesia related neurological damage (H09)

Periprocedural anesthesia related neurological injury and dysfunction can seriously affect clinical outcomes for surgical. This project highlights the need for research in this area and invites specific research applications in the following areas: neuroprotection throughout the perioperative period, post-operative delirium and cognitive impairment, neurotoxicity and the impact of narcotics on neural development, sleep disorders during perioperative period, chronic pain post-surgery, etc.

13. Mechanisms of neurodevelopmental disorders (H09)

This project will identify and fund research applications that specifically focus on early-stage neurodevelopmental disorders that occur in childhood such as developmental delay, pervasive development disorder, intellectual disability, autism spectrum disorders (ASD), epilepsy, etc. The priority of proposed studies should be to explore the pathogenesis of factors such as gestational age, environment, medicine, disease, etc. on immature neurons, with particular emphasis on synapse formation, ion channel function, and myelinization.

14. Mechanisms and immunotherapies of diseases caused by abnormal immunoregulation (H10)

The area encourages applications focused on: (1) the cellular and molecular basis of diseases caused by abnormal immunoregulation, such as dysfunctional immune tolerance or immune escape; (2) the cellular and molecular basis of autoimmune and allergic diseases caused by excessive immune response, and (3) immunotherapies of immune cells, antibodies, cytokines and vaccines for these relevant diseases.

15. Mechanisms underlying differentiation of immune cell subsets and diseases caused by abnormal differentiation (H10)

The area encourages applications focused on: (1) the cellular and molecular basis involved in differentiation of immune cell subsets, (2) the regulatory roles and mechanisms of the microenvironments and metabolic processes on the differentiation and function of immune cell subsets, and (3) the pathogenesis caused by abnormal differentiation of immune cell subsets.

16. Study on genetic/epigenetic mechanisms of skin diseases (H11)

Studies should focus on the genetic and variation mechanisms on skin development,

skin aging and skin diseases, as well as the epigenetic mechanisms, such as DNA methylation, histone modification, miRNA, lncRNA, etc.

17 Retina injury and mechanisms of retina injury repair (H12)

The key scientific issues are to investigate retina injury, including neural circuit involving photoreceptor, ganglion cell, optic nerve, etc. Etiology of retina injuries includes retinal vasculopathy, immune and inflammatory factors, metabolism and microenvironment changes. Mechanism of retina repair includes antioxidant therapy, physiotherapy, gene therapy, as well as stem cell transplantation.

18. Mechanisms and interventions of auditory vestibular dysfunction (H13)

The key scientific issues include the pathogenesis and regulatory mechanisms of auditory vestibular dysfunction (vertigo, tinnitus, hearing sensitivity, etc.), mechanisms of inner hair cell regeneration, gene therapy and small molecule agents in treating auditory vestibular dysfunction (vertigo, tinnitus, and hearing sensitivity, etc.).

19. Basic research on the mechanisms of initiation, progression and interventions of common non-malignant diseases on oral mucosa (H14)

The key scientific issues include the mechanisms of initiation, progression and interventions of common non-malignant disorders on oral mucosa such as recurrent aphthous stomatitis, oral lichen planus, oral leukoplakia, oral candidiasis and so on, with emphasis on the key factors that are involved in the immuno-regulation, genetics, microecology, and inflammation, in order to lay a due basis to develop novel strategies for the diagnosis and treatments for those entities.

20．Study on key scientific issues of multiple organ dysfunction and protection (H15)

To focus on the early identification, rapid diagnosis and treatment, and mechanisms of multiple organ dysfunctions due to trauma, burns, sepsis, intoxication, and other critical illnesses; the protection measures and the prevention strategies against the functional damages of vital organs (heart, brain, kidney and so on) emerging after cardiopulmonary resuscitation.

21. Remodeling of cell metabolism and tumor immune microenvironment (H16)

To focus on the metabolic reprograming of immune or inflammatory cells and the influence of tumor cell metabolism on tumor microenvironment, as well as their biological effects and impact on tumor formation and progression.

22. Cancer chemoprevention for precancerous lesions (H16)

Based on precancerous lesions and related tumorigenesis, to discover new targets and chemicals for chemoprevention and to elucidate their molecular mechanisms. Also, to investigate the mechanisms of chemopreventive chemicals and conventional drugs in new use that can effectively intervene the inflammation cancer transform and abnormal cellular metabolisms.

23. Mesenchymal-epithelial transition (MET) and cancer metastasis (H16)

To investigate the mechanisms of mesenchymal-epithelial transition as a form of tumor cell plasticity and its impact on cancer growth and metastasis, including cytokines, signaling pathways, epigenetics, alteration of gene expression and reconstruction of cell skeletons of cancer cells related to the process.

24. Basic research on targeted therapies against chromatin remodeling (H16)

To study the aberrant modification and configuration alteration of chromatin nuclear acids or histone in the process of tumor formation and progression and to investigate their

intervening and reversing strategies to correct aberrant cancer gene expression, to inhibit tumor growth and metastasis and to reverse treatment resistance.

25. Basic research on multi-modal imaging of ischemic brain disease (H18)

The funding field will mainly focus on the studies of multi-modal representation of ischemic brain disease, especially on imaging characterization of the different modalities in the development and progress of ischemic brain disease, imaging characterization of the collateral circulation establishment and its dynamic evolution, qualitative and quantitative analysis of ischemic penumbra, as well as early diagnosis and therapeutic effect evaluation of ischemic brain disease based on multi-modal imaging.

26. Research on mechanism of vascularization and neurotization in tissue-engineered tissue/organ regeneration (H18)

The funding field will mainly focus on the studies of blood circulation or innervation reconstruction mechanism and its influence factors during the progress of tissue-engineered tissue/organ regeneration, involving blood supply reconstruction method of tissue/organ and its influence factors, innervation reconstruction, function and its influence factors of tissue/organ, as well as the influence of physics and chemical characteristics of biomedical material to blood circulation/nerve reconstruction of tissue/organ.

27. Human virus infection and pathogenesis (H19)

Focus on the interaction between human viral infection and the host, including the mechanism of viral tropism, pathological injury of cells and tissues caused by virus, the effect of viral infection on the function of the immune system, the relationship between the genotype or variation of virus and the spectrum of disease, the mechanism in the chronic or latent viral infection, and so on.

28. Research on mechanism and intervention of the cardiac and cerebral diseases induced by the special environments (temperature, pressure, gravity, space and so on) (H21)

The funding field will mainly focus on the research of cardiac and cerebral diseases pathogeneses and the basis of its intervention and prevention under the conditions of aeronautical, astronautic, nautical, submarine, plateau, polar region and other special or extreme environments, involving heart and brain injury under the conditions of plateau/hypoxia/high temperature/low temperature/high pressure or hypobaric environment, or under the conditions of space/microgravity/weightlessness and the influence on the dynamic regulation of cerebral blood flow, brain function, learning memory and so on.

29. Basic research on acute nuclear radiation injury and relevant detection technology (H22)

With laboratory methods, we should pay primary attention on researches regarding the mechanism of acute nuclear radiation injury after nuclear leak incidents with big scale of exposure and the detection of biomarkers to rapidly differentiate different sensitive organs and different degrees of radiation injury and its related detection technology.

30. Basic research on the estimation of postmortem interval and wound age in forensic medicine (H23)

The funding field will mainly focus on the studies of body injury/death cause and mode, the influences, functions and the changing regularities of internal and external environment and other factors to tissue/organ, develop innovative theories and technologies for the estimation of postmortem interval and wound age by using new multi-interdisciplinary technologies such as imaging, molecular biology, analytical chemical

and sensing technology and mathematical modeling and so on.

31. The early health risk and risk assessment of environmental and occupational hazards (H26)

The researches should focus on the early health damage caused by important environmental and occupational hazards. Also, the screening and verification on early health effect indexes and their application in health risk assessment are supported to realize the early warning and precision prevention towards diseases caused by environmental factors.

32. Research on the intake and health effects of nutrients and non-nutrients active substances (H26)

Combining field investigation with laboratory methods, the research should focus on the effects of nutrients and food active substances intake which derive from dietary and nutritional supplements on the population health, especially the exact relationship between the total intake of nutrients or food active substances and health effects or health risks.

33. Basic biological research on progress and treatment of febrile diseases (H27)

The research will aim to investigate the biological basis of dynamic progress of febrile diseases, and mechanisms underlying rules of treatment and effects of herbal decoction in different phases.

34. Basic biological research on preventive treatment of diseases with high susceptibility in Chinese medicine (H27)

The research will focus on the biological basis of disease susceptibility enhanced by emotion and/or physique. In addition, it will also investigate mechanisms by which preventive treatments are implemented in dominant diseases in Chinese medicine, through reducing susceptibility to the disease by preventing disease before onset and/or by preventing disease from exacerbating.

35. Compositional basis for resuscitation induced or dampness eliminated by aromatic herbs and their underlying mechanisms (H28)

The research will aim to investigate compositional basis for resuscitation induced or dampness eliminated by aromatic herbs and the underlying mechanisms.

36. Mechanisms underlying the prevention of dominant diseases in Chinese medicine supported by evidence-based medicine (H29)

Research will focus on mechanisms responsible for prevention and treatment of chronic non-communicable diseases and viral infectious diseases, which have been identified as dominant diseases in Chinese medicine through multicenter and randomized controlled trials.

37. Discovery, action mechanism and new targets of natural active compounds with potential clinical application value (H30)

The depth and breadth of cross-research between natural medicinal chemistry and pharmacology, molecular biology or medicine are strengthened in these projects, especially focus on the new mechanism, new targets and new drugs of natural active compounds with a confirmed therapeutic efficacy (subject to clinical or preclinical validation or in vivo pharmacodynamic evaluation), also the high correlation between in vivo therapeutic efficacy and new mechanism or new targets should be further emphasized.

38. Discovery and systematic pharmacological validation of new drug targets (H31)

To develop new screening model of pharmacological activity and find lead

compounds with novel structure according to the new drug targets with strong research basis, and to study pharmacological activity of lead compounds and their mechanisms at molecular, cellular and whole animal level, especially systematically verify the correlation between pharmacological activity and drug targets.

39. Discovery of specific sensitive biomarkers and basic research of personalized drug therapy (H31)

Focus on the mechanism study of clinical drug therapy efficacy and toxicity significantly influenced by the changes of drug metabolizing enzymes, transporters, receptors or targets based on individual differences. To find the specific, sensitive and clinic detectable biomarkers, and to verify the in vitro and in vivo functions of resulted biomarkers and their potential clinical application values through various modern technologies, including genomics, epigenetics, metabolomics.

Major Program

Major Program serves the major needs of the scientific frontiers, national economic, social and S&T development and national security, deploys in advance, conducts multidisciplinary research, and plays the supporting and guiding role of improving the capability of indigenous innovation in China's basic research.

Major Program projects will be implemented by unified planning and research projects will be supported in batches. Research areas and guidance for Major Program will be determined on the basis of the development plan, priority areas, evaluation reports on funding and opinions from the expert consulting committees from the scientific departments.

NSFC only accepts integrated applications for each Major Program, which should include both the overall application for the Program and proposals for research projects. Proposals involving only part of the research areas or one of the research projects indicated in the Guide of Major Program will not be accepted.

Each Major Program application can contain no more than 5 projects. The applicant for the program must also be the PI for one of the projects. Each project application should have no more than 2 collaborative research units. The total number of Host Institutions and Collaborative units may not exceed 5 for one overall application. (For those programs with special research design and number on Collaborative unites, please refer to the Guidance on Major Programs.)

Applicants should have the following qualifications:

(1) Have experience of undertaking basic research projects;

(2) Have senior academic position (title).

Post-docs, graduate students and those without home institutions are not qualified to apply.

Applicants should have excellent academic accomplishments, with considerable influence and team ability.

The duration for Major Program is 5 years. When writing the proposal, the applicant should write: from Jan. 1, 2018 to Dec. 31, 2022.

The Major Program applicant should first write the overall application in the submission system and authorize all the project applicants. Unauthorized

applicants cannot submit in the system.

Applicants should compose the application based on the Major Program Composition Outline, select "Major Program" in funding category, "Overall application" or "Project application" in the subclass introduction, select the relevant major program title in "annotation" and select the correct application code according to research content (for those with specific requirements on application codes, please do as required by the guidance). Applications with incorrect selection or without selection will not be accepted.

Overall application and project application should be submitted through the host institutions. The project application must be submitted prior to the overall application, which should be submitted after all project applications are successfully submitted and the then produced overall budget forms are confirmed.

In 2017, the first 3 Major Program Guidances of the 13th Five-Year Plan are released. Applicants should follow the guidelines when writing proposals, focus on key scientific issues with strategic and fundamental significance, put forward clear, concentrated and interdisciplinary scientific targets, and pay attention to coordination and links with other national S&T programs. The research team should have good accumulation of research work, sufficient research conditions, the ability to do innovative work and a number of high level academic leaders.

Controllable Preparation and Properties of Two-Dimensional Carbon-Graphdiyne

The synthesis and separation of new carbon allotrope in different dimensions is the focus of the past three decades of research. Scientists have discovered new carbon allotropes, such as three-dimensional fullerenes, one-dimensional carbon nanotubes and two-dimensional graphene. These materials have become the international academic research frontiers and hot topics. As a new type of materials with Chinese independent intellectual property rights, the graphdiyne has attracted increasing interests and evolved into a new research focus and fields. Through the development of methodologies for controlled growth of large-area high-quality monolayer and few-layer of graphdiyne, the new characterization methods of graphdiyne, and the new physical and chemical features of graphdiyne, this major project will make a series of important outcome of independent intellectual property rights, form a characteristic research system, and continue to lead the research internationally.

1. Scientific Objective

In this project, some new methods will be developed for characterization technologies and computer simulation to guide the research on properties and functions of graphdiyne. The intrinsic properties of graphdiyne will be understood well by growth of the high-quality few layers and single-layer of graphdiyne film for fundamental and applicable research. The chemical modification and doping studies of graphdiyne will also be carried out and extended. The scientific objectives are: to establish the methodology for controlled preparation of high-quality two-dimensional carbon graphdiyne with large area and highly oriented films; controllable synthesis of two-dimensional carbon graphdiyne monolayer films and detection of atomic-resolved structure; to study energy band and mechanism of controlling structure, property and application of two-dimensional carbon graphdiyne; to develop methods of simulation, characterization and theory calculation of two-dimensional carbon graphdiyne. The rapid development of graphdiyne research will be significantly promoted through the above research.

2. Research Content

(1) New chemical synthesis methods for graphdiyne

Develop high efficiency, low cost and repeatable methods for the preparation of the highly ordered graphdiyne films with large area; discover the controllable growth and self-assembly techniques for the macro-preparation of graphdiyne bulky material and large area as well as high quality graphdiyne films with controllable thickness and layers; explore new methods and techniques for the controllable growth of monolayer graphdiyne.

(2) Simulation, characterization and theoretical calculation of two dimensional carbon graphdiyne

The first principles and molecular dynamics simulation methods are developed and utilized to reveal the formation, growth mechanism of graphdiyne and its regulation principle, to guide the design and optimization of the synthetic reaction of graphdiyne, to predict the new properties and functionalization of graphdiyne, to realize the simulation calculation and characterization of the molecular structure, electronic structure and

micro-structure of monolayer and few layers graphdiyne films, and the intrinsic physical and chemical properties of the monolayer graphdiyne.

(3) Investigation of the dynamic process of two dimensional carbon graphdiyne

Study the transfer and transmission processes of carrier, energy and photon in the two dimensional ordered structure of graphdiyne; explore the processes and regulation of the material evolution in complex and extreme chemical reaction conditions (including crystallization, ordering, etc.); elucidate the influence of chemical structure, electronic structure and aggregation structure of graphdiyne on its properties; reveal the formation mechanism, growth mechanism and kinetic process of two-dimensional carbon graphdiyne and its aggregation structure.

(4) Functionalization of graphdiyne

Develop new technologies and new methods for the assembly of large area, highly ordered and oriented graphdiyne films and aggregation structures with good repeatability; study the small size effect and dimension effect of two-dimensional carbon graphdiyne; explore the new application of graphdiyne; develop graphdiyne composite materials and investigate their surface and interface microstructure and realize the regulation of their structure and function.

3. Notices of Application

(1) The illustration of annotations about the application is "Controllable preparation and properties of two-dimensional carbon-graphdiyne" (**Any other inaccurate or unselected project application is inadmissible**).

(2) The direct funding budget of application from applicants should not exceed 17 million yuan/project (including 17 million yuan/project).

(3) This project will be accepted by the Department of Chemical Sciences.

Material-Structure Integrated Design and Manufacturing for High-Performance Components

High-performance components are mainly used in some harsh environment characterized by extreme load-carrying, thermal resistance, manufacturing precision, light-weight and reliability. They are key parts of major equipment such as high-speed flight vehicle, launch vehicle, space craft and nuclear fusion device, etc. Due to the coupling influence of multiple factors such as material, structure and process, three difficulties commonly exist in design and manufacturing. First, the complicated and coupled influence of material distribution and multi-scale structural features results in the difficulty in the material-structure matching performance design. Second, their integrated manufacturing is restricted by the traditional design methods and manufacturing processes. Third, the lack of precise forming control methods causes the difficulty in monitoring the high-performance objectives in a trial and error process.

Material-structure integrated design and manufacturing is an effective way to solve

the above problems. By means of material and structure matching optimization design, their potentiality will be explored in both macro and micro scales so as to break through the limit of current design methods. By employing the additive-subtractive-equivalent material manufacturing, new integrated manufacturing schemes will also be explored. The geometry-performance coordination of gradient materials microstructures and multi-scale structures will be strengthened as that the precise control of component performance can be carried out.

1. Scientific Objective

This major program will study the mapping rules between multi-scale structures and component performance, and clarify the interaction mechanism between material microstructure evolution and structural deformation. It will also explore the material-structure integrated design and manufacturing principles and put forward relevant fundamental theories, in order to achieve the integrated manufacturing of complex high-performance structures.

2. Research Content

(1) Material-structure multi-scale modelling and integrated design;

(2) Point-by-point and domain-by-domain controlled additive manufacturing for multi material-structures;

(3) Interface behavior and structure precise manufacturing of heterogeneous components;

(4) Precise control for material microstructure evolution and structural deformation;

(5) New principles and equipment for integrated manufacturing of high-performance components.

3. Notices of Application

(1) “Material-Structure Integrated Design and Manufacturing for High-performance Components” should be selected in the “Explanatory Note” column of the Project Application Form. “E0508” should be selected in the “Application Code 1” column. (Any applications with incorrect or no selection will not be considered.)

(2) The budget of the direct cost should not exceed 15 million yuan per project (including 15 million yuan per project).

(3) The Department of Engineering and Materials Sciences is responsible to accept the applications.

Abnormalities of metabolites and metabolite sensing in tumorigenesis and cancer progression

Metabolic aberration is an important hallmark of cancer. Increasing evidence has demonstrated that cancer cells undergo metabolic reprogramming not only in glycolysis and tricarboxylic acid (TCA) cycle, but also in metabolism of fatty acids, cholesterols, glutamines, serines, one-carbon units and cholines, etc. In light of recent understanding in cancer biology, metabolic abnormalities during tumor formation and development have emerged as an active new frontier in cancer research. It is now believed that metabolic

abnormality precedes tumorigenesis. Recent studies have suggested that glucose deprivation promotes normal cells to develop mutations in KRAS and related proteins in its signaling pathway, which for the first time demonstrates that metabolic abnormality results in oncogenic mutations. Additionally, 2-hydroxglutarate competitively inhibits multiple α-KG-dependent dioxygenases, for example, TET dioxygenase mediating DNA demethylation, histone demethylase and other epigenetic modifying enzymes to exert epigenetic regulation and thus promotes cancer development. These findings suggest that metabolic dysfunction is capable of promoting tumorigenesis. Notably, these regulatory processes underlie novel potential targets for cancer diagnosis and treatment. The study of metabolic abnormalities will provide invaluable guidance for molecular diagnosis, precise subtyping, prognostic analysis, targeted therapy and prediction of therapeutic response for cancer.

Intricate biological processes and diverse molecular mechanisms are implicated in the interaction between metabolic reorganization and cancer development, among which the abnormalities of metabolites and metabolite sensing is attracting intensive interest. For example, lactate promotes the stability of certain proteins to enhance cell proliferation and cancer vascularization; tumor cells sense metabolic fluctuations and increase the synthesis of invasion/migration-related proteins; cancer cells reorganize its energy-sensing pathway to acquire fitness under metabolic stress and increase cell viability in a harsh microenvironment, which is a contributing factor of chemoresistance. Moreover, tumor cells compete with immune cells for nutrients to induce immunosuppression. High glycolytic cancer cells induce malnutrition of T cells and suppress T cell-mediated cancer immunity. Besides, modulating cholesterol metabolism activates cytotoxic T cell to exaggerate cancer immunity studies in cancer metabolism have further extended to tumor microenvironment and cancer immunity. Therefore, identifying aberrant metabolites and the dysfunction of metabolite sensing, revealing the impact of aberrant metabolism on malignant transformation and reorganization of immune microenvironment are key pioneering questions in this field. Elucidation of the underlying molecular mechanism will provide new strategies to cancer prevention, early diagnosis and therapeutic interventions.

This program is aimed towards discovering tumor-associated metabolites, investigating the function and molecular mechanism of aberrant metabolites in regulating malignant transformation, defining the mechanics of metabolite sensing dysregulation in tumorigenesis and cancer development, and exploring the remodeling of tumor microenvironment by metabolic dysregulation. Furthermore, elucidating gene regulation and signal transduction by aberrant metabolism in cancer cells and microenvironment will help to achieve a comprehensive understanding on abnormalities in metabolites (and related metabolic enzymes) and metabolite sensing in tumorigenesis, and provide new targets for cancer diagnosis and treatment in translational studies. This program is of particular significance in advancing the cross-discipline cooperation of metabolism biology, chemistry, immunology and cancer biology from basic and clinical research.

1. Scientific Objective

To focus on one or two most prevalent cancer types in China as a model, to identify a group of key metabolites with significant regulatory roles in cancer development, to investigate the regulatory mechanism of these metabolites during malignant transformation, to validate the function of the interplay between dysregulated metabolites and cancer cell in tumorigenesis, to interpret the regulatory role of metabolites in cell signaling and gene

expression, to elucidate the biological effects of aberrant metabolism on remodeling of tumor microenvironment, to establish a platform suitable for in vitro and in vivo translational research on metabolites, to discover potential molecular markers for clinical diagnosis of cancer, and to identify metabolite targets for further therapeutic interventions.

2. Research Content

To focus on one or two most prevalent cancer types in China, studies should be conducted on the following four directions:

(1) Discovery of cancer-associated metabolites

Based on high-throughput metabolomic, proteomic and bioinformatic approaches, to discover, screen, and identify metabolites that closely related to tumor phenotypic characteristics. Using cell lines, xenograft or transgenic mouse models to validate the effects on transformation in vitro and in vivo.

(2) Mechanism of metabolite-induced malignant transformation

To establish a platform suitable for in vitro and in vivo translational research on metabolites; to investigate the mechanism of malignant transformation induced by pre-identified tumor-associated metabolites, including regulatory function at the levels of epigenetics, gene transcription, post-translational modification, signaling transduction, etc.

(3) Regulation of metabolite sensing by cancer cell

To integrate techniques from biochemistry, cell biology and molecular biology; to identify the receptors of specific tumor-associated metabolites; to elucidate changes in metabolite-sensing pathway and the consequent impacts on metabolic activities; to investigate the regulatory mechanism of metabolite-sensing pathway in different nutritional status.

(4) Remodeling of tumor microenvironment by metabolic dysregulation and its biological effects

To investigate the influence of aberrant metabolism (metabolites or related metabolic enzymes) on tumor microenvironment, particularly the recruitment, activation, functional regulation of inflammatory and immune cells in the microenvironment; to elucidate the reorganization of tumor microenvironment by metabolic dysfunction and its biological effects in tumor development.

3. Notices of Application

(1) Applications need to set up four research projects according to research scopes as listed above in this program.

(2) Select “Abnormalities of metabolites and metabolite sensing in tumorigenesis and cancer progression” in the proposal annotation (inaccurate selection or unannotated application will not be accepted).

(3) Direct cost limited to 15.3 million yuan over entire project period (including 15.3 million yuan).

(4) This program is jointly put forward by Departments of Health Sciences, Life Sciences and Chemical Sciences. The Department of Health Sciences is in charge of grant applications and review processes.

Major Research Plan

The Major Research Plan focuses on key basic scientific issues with strategic importance to the nation and major frontier areas and gives high priority identified on the basis of the capability and advantages of the country. Rather than individual project, the Major Research Plan is designed to be a program cluster which contains a number of projects with relatively identical objectives for innovative research resources integrity in order to explore the possible breakthroughs in the identified areas.

The Major Research Plan follows the principle of "definite objective, stable support, integration and refinement and leap-forward development". The funding period for Major Research Plan projects is 8 years in general.

Applicants should meet the following eligibilities:

(1) Having experience of undertaking basic research projects;

(2) Bearing a senior academic position (title).

Post-doctors in station and graduate students are not eligible to apply. Researchers without affiliation to a research institution or whose home institutions have not been registered at NSFC cannot apply as the Principle Investigator.

One applicant may submit no more than one application in the same year (excluding Integrated Program and Strategic Research Program); and grantees of the Major Research Plan program are not allowed to apply for the same program in the following year.

The Major Research Plan is framed with three types of programs, namely, the Fostering Program, Key Program and Integrated Program, of which each one is open to application. Proposals shall be prepared in accordance with the requirement for the Major Research Plan and outlines for proposal preparation, featuring interdisciplinary research, emphasizing on the contributions to solving key scientific issues and fulfilling the overall goals of the Major Research Plan. Applicants should select "Major Research Plan" for the column of the funding type in the application form of proposal, and Fostering Program, Key Program, or Integrated Program for the column of sub-type, and give the titles of the Major Research Plan in the annotation. Proposal is not accepted in case of incorrect selections or without any selections.

Generally, duration for Fostering Program project is 3 years, for Key Program project is 4 years, and that for Integrated Program project is determined by the Steering Committee of each Major Research Plan according to the actual need. For Fostering Program project and Key Program project, the collaborative organizations involved may not exceed 2 in number. The number of collaborative organizations involved in one Integrated Program project may not exceed 4. The main participants must be the actual contributor to the Integrated Program project, and total number of main participants may not exceed 9.

Regulations on sharing of data and information should be observed in order to achieve the overall scientific objectives and multi-disciplinary integration of the Major Research Plan.

Each Major Research Plan should hold an academic workshop or seminar on related areas so as to strengthen academic exchange and achieve the overall scientific objectives and integration of disciplines. The principal investigator of the granted projects is required to participate in these activities.

For details of each Major Research Plan, please refer to the relevant sections of introductions on Major Research Plan in this *Guide*.

Precision Measurement Physics

Precision measurement physics is the basis and frontier areas of modern physics development, and the result of integrating scientific exploration and precision measurement techniques, and the basis of national needs on relevant precision measurement. This major research plan aims at special target of precision measurement physics, along the line of atomic, molecular and photonic research, construct new system of highly stable precision measurement, explore new concept and new principles of precision measurement physics, develop higher precision measurement method and technology, improve precision of measuring basic physical parameters and test the range of application of basic physical principles at higher precision level.

I. Scientific targets

Overall scientific target

To further improve research capability of China in precision measurement area, promote development of precision measurement physics, increase international impact of disciplines in precision measurement physics, and reach leading level in some areas, and strengthen the right of speech of the Chinese scientists in the world in basic physical constant measurement and basic physical quantities. Provide key concept, method and technology basis for national needs such as navigation and positioning, time keeping, resources exploration, national defense, etc. Build a high standard research team for China.

Specific scientific target

Improve existing experimental system, increase measurement precision; construct new system of atomic and molecular cooling, propose new principles and new method for atomic and molecular cooling for precision measurement; break the standard quantum limit in measurement, reach the international leading level in noise compression; make the uncertainty in time frequency measurement reach to the level of 10^{-18}, time frequency comparison and transfer precision higher than 10^{-19}; make measurement value of more physical constants enter CODATA; and achieve international leading results in testing of physical laws such as equivalent principle and Newton's reverse square law, etc. On the basis of experimental measurements, achieve new discoveries, new understanding, new mechanism, and propose new concepts and new views.

II. Key scientific problems

1. Principles, method and technologies of measurement breaking the standard quantum limit
2. New principles and method breaking the existing atomic frequency standard precision
3. New mechanism and technology breaking the atomic precision control and molecular cooling

III. Application and funding in 2016

In 2016, we received 51 applications, among them, 21 were for Key Program project, 30 for Fostering Program project. After expert review, we funded 9 Key Program projects, 12 Fostering Program projects. Total direct cost funding was 42 million yuan.

IV. Key funding research areas in 2017

This Major Research Plan will focus on core scientific problems and support projects mainly in the form of "Integrated Programs", and some "Fostering Program" and "Key Program". In 2017, we shall fund the applications having explorative and new ideas in the form of "Fostering Program" and the applications having original ideas, good research accumulation and prospects of making breakthroughs in the form of "Key Program", and those having achieved important progress in the form of "integrated Program". This Major Research Plan will last for 8 years, and the project selection and funding will be done in the first 5 years. In 2017 we plan to allocate 35 million yuan in total, and direct cost funding of 3-4 million yuan per project for 4 years for Key Program, and 0.8-1 million yuan per project for 3 years for Fostering Program. The research directions are listed below.

Integrated Programs

1. Measurement of quantum correlation beyond standard quantum limit

Scientific goals: develop new principles and methods for preparation of correlated control of multi particle entanglement, and make quantum measurement beyond classic limit using multi particle entanglement, conduct research on effective criteria of describing and calibration of measurement capability, and generation and verification of practical quantum entanglement.

Research contents: new mechanism of quantum entanglement and correlation based on single photon, photon and atom, entanglement between super cold atoms, compare methods of preparation, control and detection of photon-photon, photon-atom, atom-atom quantum entanglement and quantum correlation in different systems and using different methods (such as linear optical system based on single photon, etc.).

2. Comparison and measurement of optical clock frequencies

Scientific goals: study frequencies among different optical clocks in different labs, check against basic theory of physics, and explore theory and technology of developing optical clock of uncertainty level reaching E^{-19}.

Research contents: use high precision optical fiber frequency transfer technology and super low phase noise optical frequency to achieve high precision frequency comparison of optical clocks. From frequency comparison measurement, explore variations in fine structural constant, and check against generalized theory of relativity. Using existing optical clock system, study theory and technology of solving problems affecting stability of optical clock frequencies, and explore new principles and technologies of reducing various frequency changes, thus improving uncertainty of optical clock frequencies.

3. Checking basic laws of physics

Scientific goals: improve measurement precision, check basic laws of physics at higher precision, search for possible cases of violation of laws, and discover new physics. Achieve international level in checking basic laws such as equivalent principle, inverse square laws of Newton, and Lorentz invariance, providing experimental data for searching

new types of interactions.

Research contents: use different methods (micro atomic interference, macro object distortion, etc.) to test equivalent principle in macro and micro systems. Check validity of inverse square law of Newton and make quantum electro dynamic computations, and check validity of QED in different systems. Use optical interference method to test Lorentz invariance.

4. Measurement of basic constants

Scientific goals: develop precision measurement method, find possible system error using different method of measurement, and improve accuracy of measurement of basic physical constants and parameters.

Research contents: use different method to measure universal gravitation constant, use spectrum method to measure Boltzmann constant, and use energy balance method to measure Planck constant. Use high precision molecular spectrum combined with precision theory to obtain mass ratio of proton and electron, and use cold atomic interference method to measure gravitation, and study baseline of gravitation measurement.

Key Programs

1. Studies on principles and methods of precision measurement based on super cold atom and molecules

Main research contents:

(1) Preparation of super cold molecules (including ions) system and new principles and experimental method for use in precision measurement, including new ideas and experiments in applications of special energy level properties of cold atoms and mixtures in precision measurement physics;

(2) Develop microscopic technology of high spatial resolution atoms and molecular quantum gas and new generation of frequency stable lasers, with spatial resolution reaching 1-2 micrometer;

(3) Using Feshbach resonance of strong interference quantum gas energy spectrum to measure physical constant, such as time variation of mass ratio of proton and electron.

2. Principle and method of precision measurement based on optical force system

Main research contents:

(1) New type of optical force system and new method of base state cooling. Construct new optical force system, study coupling of mechanical vibrator and cold atom system, explore new method of base state cooling by mechanical vibrator, and demonstrate zero point vibration in experiment;

(2) Use optical force system to prepare non classic state, to study compressed state, Fock state, overlapping state, entanglement state, etc.;

(3) Develop new principles of optical force system for precision measurement, new method to measure mass, displacement, and weak signals using non classical state and quantum interference principles.

3. Research on atomic light clock based on non-classic atomic state to exceed quantum limit

Main research contents:

(1) Principles and method of preparation of non-classic atomic state systems, and experimental method and technology of controlling quantum projection noise by non-classic

atomic state.

(2) Theory and technology of detecting non-classic atomic state using classic and non-classic optical field

(3) Atomic light clock using non-classic atomic state to exceed quantum limit.

4. High precision measurement of world time using super large optical gyros

Main research contents:

(1) New principles and methods of super large optical gyros, and related new types of optical systems;

(2) Main factors restricting the precision of super large Sagnac interferometer, and related laws of influence;

(3) Online monitoring of main physical parameters of super large Sagnac interferometer and method of control 1/f noise;

(4) Precision computation of world time UT1.

Fostering Programs

Addressing issues in precision measurement physics, conduct studies in frontier areas of new physical system, new principles, new methods and new technologies for special problems in precision measurement physics, and foster talents in precision measurement physics. Applications should have clear scientific problems, new physical ideas and specific ways of solving the problem.

Main research directions are:

1. Noise mechanism and method of reduction in precision measurement physics

2. New principles of high precision atomic frequency marker

3. High precision transport and comparison of time frequency

4. Studies on atomic molecular structures and precision spectrum line

5. New principles and new method of quantum measurement

6. Principle and method of ultra-cold atomic molecular precision measurement

7. New method of high precision testing of basic physical laws

8. New method of high precision measurement of physical constants and physical parameters

9. Studies on key unit technology of precision measurement physics

10. New scheme and new technology of detecting gravitational wave

V. Basic selection criteria

1. Research contents should meet the requirement of this guide, and research and experiments should be creative, and focusing on scientific problems in precision measurement physics based on atomic, molecular and photonic techniques.

2. We encourage exploratory studies in frontier areas, and give preferential support to original research on new ideas, new systems, new methods and new technologies in precision measurement physics.

3. Studies are mainly of the experimental type, but please pay attention to combining theory and experiments, and research targets should be higher measurement precision.

VI. Notes to Applications

1. Please read this guide carefully before writing the application. This research plan

aims at forming a research project group. Applications should have clear key scientific problems, and close relations with the problems given in this guide, and emphasize on contributions to the overall objectives and the key scientific issues of this research plan.

2. Please select the proper application code.

3. The applications are accepted by the Department of Mathematical and Physical Sciences.

The Change of the Tibetan Plateau's Land-Atmosphere Coupled System and its Effects on Global Climate

The Tibetan Plateau (TP), as an important factor controlling atmospheric circulation and its change, have profound impacts on regional and global climate change through energy and water cycles. In accompany with the deepening research of global climate change, the TP's land-atmosphere coupled system with the increasing significance of its impacts on global climate has become a research frontier in the international community of climate and the earth system science. More research on the TP's influences upon disastrous weather and climate change in China will improve the ability of disastrous weather forecast and climate prediction.

I. Scientific goal

This Major Research Plan (MRP) is designed to explore the mechanism of the TP's impacts on the global climate and climate change, improve the regional and global weather/climate prediction capability, move the atmospheric research in China on the Tibetan Plateau into the world arena with a group of leading scientists in the advanced research teams making greater contribution to the sustainable socio-economic development.

The overall target of this MRP is to understand the TP's land-atmosphere coupled process, the cloud precipitation and water cycle processes and the troposphere-stratosphere exchange process over the TP, develop the TP's database and assimilation system, improve the numerical models of regional and global climate systems, and to reveal the mechanism of TP's impacts on regional and global energy/water cycles.

II. Key scientific issues

The key scientific issues to be addressed in this MRP are how the TP's land-atmosphere coupled system influences the Asian and global climate system. This plan will be focused on the following three critical scientific issues.

1. The regulation of the TP topography in the global atmospheric circulation

It is to investigate the land surface process and land-atmosphere interactions over the TP; dynamic effects of multi-scale topography of the plateau and their impacts; and topographic effects of the plateau on the general circulation.

2. Impacts of the changing TP's land-atmosphere coupled system on the global

energy/water cycles

It is to explore cloud precipitation physics and atmospheric water cycle over the TP; linkage of energy to water cycle over the TP and its impacts; mechanism of impacts of the plateau's land-atmosphere coupled processes on monsoons, energy/water cycles; collaborative influences of the TP and oceans on the regional and global climate changes; and interactions of troposphere and stratosphere over the TP.

3. Mechanism of influences of the TP's land-atmosphere coupled system on disastrous weather and climate in China

The research will be focused on the mechanism of the influences of the TP's land-atmosphere processes on disastrous weather in China; impacts of multi-sphere interactions on Asian monsoons and droughts/floods in China; impacts of the TP on global monsoons and climate anomalies; and the key techniques for weather and climate system models, physical processes, data reanalysis and data assimilation.

III. Key research priorities and directions in 2017

The year 2017 is the fifth year for the MRP-application. According to the arrangement of previous funding and the overall MRP progress, the MRP 2017 will step on the stage of integrating and sublimating research projects. Therefore, the body of guiding experts decided that the MRP 2017 will support more projects of the "Integrated Program" and "Key Program" and less projects of the "Fostering Program". The total direct fund for the MRP in 2017 is approximately 30 million yuan. The projects of "Key Program" will be funded with duration of 4 years and the average direct funding of approximately 3 million yuan per project. The projects of the "Integrated Program" and the "Fostering Program" will both last 3 years but respectively with the average direct funding of approximately 3 and 1 million yuan per project.

Key research directions in 2017 include:

1. The physical processes of cloud-precipitation on the TP and their effect on the energy and water cycles.

2. The key physical processes in the TP's land-atmosphere coupled numerical models system (especially with respect to the TP's gravity wave drag, boundary layer, radiation and stratospheric physical and chemical processes).

3. The TP's land-atmosphere coupled processes and the effects of the heat source on the severe weather in its downstream areas.

4. The properties of multi-scale variations of water cycles associated with the complicated terrain over the TP and its surroundings and their effect on weather and climate system.

5. Effects of the TP's land-atmosphere coupled processes on the energy and water cycles both at global and regional scales.

6. Troposphere and stratosphere air mass exchange (vapor, aerosols and ozone, etc.) and its impact mechanism on global climate change.

7. The relevance of the regional weather and climate changes over TP to the global climatic events.

8. Influences of the interactions between lower and mid-latitude systems on the TP's dynamical and thermodynamic structures and their effects on weather and climate system.

Key directions for the integrated research in 2017 will focus on the following

two directions:

1. Regional multi-scale energy and water cycles of the TP's land-atmosphere coupled processes and their influences on the severe weather

The integrated research will combine the previous MRP-projects to further explore following issues: (1) the spatial-temporal variations of regional heating source structures and its connection to severe weather; (2) the mechanism of the multi-scale water cycles in the TP's land-air interaction and its effect on severe weather; and (3) the energy and water cycles of the TP's land-air coupling system and their role in regional and global weather and climate changes.

2. Fusion of multi-source information on the TP's regional land-air interaction, data assimilation and numerical model development

(1) The TP's regional data assimilation: On the basis of the key and fostering projects that have already been carried out, together with the integrated results of TP's atmospheric and land data assimilations data, the TP's regional data assimilation system will be established to enhance the accuracy and quality of regional analysis data over the TP region, and to demonstrate the application of the developed multi-source information over the TP region; (2) The TP's numerical model development: the parameterizations of the TP's atmospheric physics and land surface processes and the uncertainties of the parameterizations will be integrated based on the key and fostering projects that have already been carried out. Improve high-resolution general circulation models and simulation performance of climate models in the TP area.

IV. Notes to application

1. Before filling in the Project Application Form, applicants should carefully read the guidelines. The theme selected in the Project Application Form should conform to the implementation principles set for this Major Research Plan, and description should be given to the scientific issues that are most relevant to the guidelines, including potential contributions to solve the key scientific issues and achieve the overall objectives of this Major Research Plan. The objectives and contents given in the Project Application Form should target at the key scientific issues of this Major Research Plan, highlight the limited goal and emphasize on specific research on innovative points and frontiers of basic scientific issues. Any applications that do not conform to the guidelines will not be accepted. Those who have been involved in other relevant scientific research project(s) should demonstrate the differences and relations between this proposal and other project(s) in the "Research Foundation" part of the Project Application Form.

2. Targeting at specific scientific issues to be addressed, applicants may freely identify a project title, research contents, a research scheme and the corresponding fund required in support of the research work by clarifying the point for making a new breakthrough and innovative concept(s) based on analyses of research findings that are available nationally and internationally.

3. Be sure that a corresponding application code should be selected according to the specific content of the research project to be applied for. "Major Research Plan" is selected in the "Funding Categories" column of the Project Application Form, "Integrated Program Project" or "Fostering Program Project" or "Key Program Project" in the "Subcategory Description" column, and "the Change of the Tibetan Plateau Land-Atmosphere Coupling

System and its Effects on Global Climate" in the "Explanatory Note" column. **Any applications with incorrect or no selection will not be considered.**

4. Pay attention to the mutual support relationship with other projects in this research plan during the project execution process.

5. The Department of Earth Sciences is responsible to accept applications.

Young Scientists Fund

The Young Scientists Fund supports young scientists to freely choose their research topics within the funding scope of NSFC to conduct basic research, fosters the ability of young scientists to independently undertake research projects and do creative research, stimulates creative thinking of young scientists and trains backup talents for basic research.

Eligibility of applicants:

(1) Have experience of doing basic research;

(2) Have senior professional position (title) or PhD degree, or be recommended by 2 researchers in the same research area with senior professional position (title);

(3) Be less than 35 by Jan. 1 of the year of application (born on or after Jan. 1, 1982). For female applicants, be less than 40 by Jan. 1 of the year of application (born on or after Jan. 1, 1977).

In-service PhD students who satisfy the above criteria may apply through their host institutions with the consent of their supervisors, but full time master degree students cannot apply. Those who are the PIs of ongoing NSFC projects or have undertaken projects of Young Scientists Fund, including one-year small fund for exploratory studies, and terminated or withdrawn projects, cannot apply again.

The Young Scientists Fund adopts the same application, evaluation and management mechanism as the General Program. The creative potential of the applicant is mainly evaluated. Applicants should follow the outlines of proposal for Young Scientists Fund when preparing applications. They may be up to 2 collaborating units within one proposal and the research period is 3 years in general. The funding period for applications submitted by post-doctors is decided in consideration with the letter of commitment from their host institutions.

In 2016, the Young Scientists Fund supported 16,112 projects with a total funding of 3.11670 billion yuan and the average funding for direct costs was 193,400 yuan per project. The average success rate was 22.89%, which is 1.69% lower than that of 2016 (see funding report below).

In 2017, the average funding for direct costs will be increased to around

250,000 yuan per project (200,000 yuan per project for management sciences). Please base the budget on actual requirements for research.

Please refer to sections in each department introduction in this *Guide* for funding scope, funding statistics in recent years and relevant requirements.

Funding for the Young Scientists Fund in 2016

Unit: 10,000 yuan

Department	No. of applications	Awards				Funding rate (%)
		No. of awards	Funding for direct cost	Average funding for direct cost	Share of NSFC total funding for direct cost (%)	
Mathematical and Physical Sciences	5,470	1,630	34,090	20.91	10.94	29.80
Chemical Sciences	5,655	1,450	29,030	20.02	9.31	25.64
Life Sciences	9,916	2,208	44,170	20.00	14.17	22.27
Earth Sciences	5,697	1,622	32,080	19.78	10.29	28.47
Engineering and Materials Sciences	11,889	2,867	57,330	20.00	18.39	24.11
Information Sciences	7,510	1,918	38,380	20.01	12.31	25.54
Management Sciences	3,605	697	11,880	17.04	3.81	19.33
Health Sciences	20,657	3,720	64,710	17.40	20.76	18.01
Total	70,399	16,112	311,670	19.34	100.00	22.89

Department of Mathematical and Physical Sciences

The development of young scientists is particularly important for the development of mathematical and physical sciences. The Department has always been paying attention to fostering and supporting young scientists, and the funding rate of the Young Scientists Fund has always been higher than that of General Program projects. In 2017, the Department will maintain a higher funding rate for the Young Scientists Fund so as to give more young people the opportunity to do independent research, and to foster outstanding talents for basic research.

Funding for Projects of the Young Scientists Fund

in Department of Mathematical and Physical Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Mathematics	Mathematics I	295	5,284	33.64	259	4,793	30.72
	Mathematics II	292	5,236	30.51	284	5,247	29.01
Mechanics	Basic problems and methods in mechanics	2	44	20.00	10	208	30.30
	Dynamics and control	55	1,159	32.16	52	1,128	29.89
	Solid mechanics	119	2,562	31.65	120	2,671	29.63
	Fluid mechanics	76	1,643	31.93	70	1,555	29.54
	Bio-mechanics	19	428	32.20	20	446	29.85
	Explosive and impact dynamics	37	814	31.36	40	887	30.08
Astronomy	Astrophysics	47	1,049	34.81	38	868	29.92
	Astrometry and celestial mechanics	50	1,101	31.25	45	992	29.41
Physics I	Condensed matter physics	228	4,986	31.93	195	4,284.50	29.73
	Atomic and molecular physics	43	919	32.33	48	1,050.50	30.19
	Optics	140	3,060	32.11	125	2,785	29.76
	Acoustics	28	605	34.57	27	610	30.34
Physics II	Fundamental physics and particle physics	68	1,255	33.17	75	1,532	32.05
	Nuclear physics, nuclear technology and its application	85	1,843	32.82	81	1,820	28.62
	Particle physics and nuclear physics experimental facilities	82	1,876	29.71	83	1,924	28.72
	Plasma physics	67	1,486	33.84	58	1,289	30.69
Total		1,733	35,350	32.10	1,630	34,090	29.80
Direct cost funding per project		20.40			20.91		

Department of Chemical Sciences

The Department of Chemical Sciences upholds the principle of people first and fosters innovative talents, brings into full play the maintaining and fostering role of the Young Scientists Fund, and steadily enhances the funding following the idea of properly controlling the funding intensity and further expanding the funding scope. The Young Scientists Fund stresses on the research projects with innovative ideas, discourages the research that simply continue the advisors' topics, and gives less weight to research accumulation and the constitution of the relevant research teams, so as to facilitate the growth of young scientists.

Funding for Projects of the Young Scientists Fund in Department of Chemical Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Inorganic	203	4,263	27.69	213	4,264	26.17
	Analytical	162	3,402	27.74	164	3,283	26.16
Division II	Organic chemistry	242	5,083	27.72	258	5,165	26.17
Division III	Physical chemistry	285	5,986	27.67	280	5,607	26.24
Division IV	Polymers	106	2,226	27.82	95	1,902	26.24
	Environmental chemistry	170	3,570	27.69	178	3,564	26.06
Division V	Chemical engineering	260	5,460	25.05	262	5,245	23.48
Total or average		1,428	29,990	27.18	1,450	29,030	25.64
Direct cost funding per project		21.00			20.02		

Department of Life Sciences

In 2016, the Department of Life Sciences received a total of 9,916 applications for the Young Scientists Fund. 9,648 applications were accepted and 2,208 projects were funded with a funding rate of 22.27%. The average direct cost of funding was 200,000 yuan per project. The Department will continue to follow the principle of "stabilizing research teams, fostering young talents, stimulating innovative thinking and supporting independent research" for the Young Scientists Fund, and provide steady support to researchers in the early stage of their academic career. For application details and special notifications, please refer to the section of General Program of the Department in this guide.

Funding for Projects of the Young Scientists Fund in Department of Life Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Microbiology	157	3,141	25.32	151	3,011	24.08
	Botany	144	2,889	25.44	139	2,775	25.88
Division II	Ecology	164	3,282	29.23	157	3,146	26.61
	Forestry	124	2 485	18.99	143	2,866	20.11
Division III	Biophysics/Biochemistry/ Molecular biology	107	2,139	29	102	2,036	25.00
	Immunology	61	1,222	31.12	58	1,163	29.74
	Biomechanics and tissue engineering	61	1,224	21.18	68	1,368	20.54
Division IV	Neurosciences	50	996	23.15	52	1,036	21.14
	Psychology	57	1,146	21.84	63	1,251	20.45
	Physiology & integrative biology	45	901	23.08	43	869	23.89
Division V	Genetics and bioinformatics	115	2,302	27.12	110	2,211	25.82
	Cell biology	75	1,496	30.36	72	1,445	23.69
	Developmental biology and reproductive biology	51	1,018	24.52	50	995	27.93
Division VI	Agriculture and crop sciences	183	3,653	21.45	180	3,594	19.52
	Food science	192	3,844	18.68	193	3,867	18.38
Division VII	Plant protection	125	2,510	22.4	123	2,453	20.53
	Horticulture and plant nutrition	126	2,513	20.69	133	2,660	19.79
Division VIII	Zoology	76	1,513	31.02	72	1,433	25.99
	Animal husbandry and grassland science	109	2,193	20.76	107	2,143	20.54
	Veterinary medicine	116	2,327	25.95	111	2,231	26
	Aquaculture	76	1,516	19	81	1,617	19.95
Total		2,214	44,310	23.38	2208	44,170	22.27
Direct cost funding per project		20.01			20.00		

Department of Earth Sciences

In 2016, the Department of Earth Sciences received 5,697 applications for the Young Scientists Fund from 847 research institutions. Among them, 3,255 were from universities, accounting for 57.14%, and 2,240 from research institutions, accounting for 39.32%. Totally, 1,622 projects were funded with a fund of 320.8 million yuan (direct cost and hereinafter). The average funding was 197,800 yuan per project and the funding rate was 28.47%. Among the projects funded in 2016, 931 were obtained by universities, accounting for 57.4%, and 647 by research institutions, accounting for 39.9%. One of the most important goals of NSFC is to foster outstanding young scientists continuously and steadily. The Department will further strengthen the funding for young scientists, especially outstanding young scientists. The main function of Young Scientists Fund is "cultivation", and to provide more opportunities for young scholars at the very beginning of their career, especially for the researchers who were just awarded the PhD degrees and started their basic research.

In 2017, a standardized selection of "application code", "research field" and "key words" will be tried out continuously in Division I (Geography). When filling out the application forms, applicants should visit the "special focus" under the item of "application acceptance" on the official home page of the NSFC (http://www.nsfc.gov.cn/), and read carefully the "list of application code, research field and key words (D01 and subordinate codes)" in order to make sure their applications in accordance with the funding areas of Division I.

Funding for Projects of the Young Scientists Fund in Department of Earth Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Geography (including soil science and GIS)	607	12,731	29.21	616	12,197	28.44
Division II	Geology	347	7,285	29.18	374	7,399	28.46
	Geochemistry	124	2,610	29.11	129	2,545	28.54
Division III	Geophysics and space physics	143	3,008	29.12	158	3,120	28.52
Division IV	Marine science	225	4,717	29.22	223	4,409	28.48
Division V	Atmospheric science	136	2,849	29.25	122	2,410	28.50
Total		1,582	33,200	29.19	1,622	32,080	28.47
Direct cost funding per project		20.99			19.78		

Department of Engineering and Materials Sciences

In order to encourage and foster innovative young researchers and to create a good academic ecology, the Department will continue to carry out favorable funding policy for the Young Scientists Fund. In 2016, the Department received 11,889 applications (188 rejected) for the Fund with an increase of 6.21%. 2,867 projects were funded with a total direct cost of 573.30 million yuan. The average funding was 200,000 yuan per project with a success rate of 24.11% (25.91% in 2015).

Please refer to the General Program and other related parts of this *Guide* for general instruction of the department and detailed requirements on application.

Funding for Projects of the Young Scientists Fund

in Department of Engineering and Materials Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Average funding for direct cost	Funding rate (%)	Projects	Average funding for direct cost	Funding rate (%)
Materials sciences I	Metallic materials	231	4,747	25.47	229	4,574	24.26
Materials sciences II	Inorganic and non-metallic materials	353	7,255	25.62	358	7,154	23.72
	Polymer materials	232	4,737	25.66	236	4,714	23.53
Engineering sciences I	Metallurgy and mining science	299	6,141	24.07	311	6,219	23.26
Engineering sciences II	Mechanical engineering	506	10,294	25.84	499	9,986	24.07
Engineering sciences III	Engineering thermo physics and energy utilization	227	4,643	26.12	227	4,545	23.84
Engineering sciences IV	Architecture, environmental and structural engineering	585	11,786	27.03	548	10,971	25.02
Engineering sciences V	Electrical science and engineering	193	3,972	26.47	188	3,752	24.80
	Hydrology and marine engineering	274	5,585	26.27	271	5,415	24.13
Total		2,900	59,160	25.91	2,867	57,330	24.11
Direct cost funding per project		20.40			20.00		

Department of Information Sciences

In 2016, the Department of Information Sciences received 7,510 applications for the Young Scientists Fund, which was decreased by 2.50% compared with that in previous year. We funded 1,918 projects with an average funding rate of 25.54%. The total funding for direct cost was 383.8 million yuan and the average direct cost funding intensity was 200,100 yuan per project. In 2017, the Department will continue to pay attention to applications for the Young Scientist Fund, and increase properly the funding rate. The direct cost funding intensity will be increased.

Funding for Projects of the Young Scientists Fund in the Department of Information Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Electronics and technology	167	3,500	26.94	177	3,506	27.44
	Information and communication system	191	3,835	27.25	181	3,639	27.18
	Information acquisition and processing	173	3,453	26.99	166	3,282	27.44
Division II	Theoretical computer science, computer software and hardware	130	2,661	28.20	121	2,435	26.59
	Computer application	256	5,194	28.07	256	5,121	26.64
	Network and information security	162	3,307	28.13	163	3,250	27.08
Division III	Control theory and control engineering	201	4,136	25.64	195	3,930	24.31
	Systems science and system engineering	59	1,206	20.07	66	1,311	21.78
	AI and intelligent system	164	3,369	24.37	160	3,206	23.64
Division IV	Semiconductor science and information devices	173	3,531	26.66	180	3,616	24.32
	Information optics and photoelectric devices	126	2,571	26.81	117	2,351	24.27
	Laser technology and technical optics	141	2,877	26.65	136	2,733	24.41
Total		1,943	39,640	26.52	1,918	38,380	25.54
Direct cost funding per project		20.40			20.01		

Department of Management Sciences

In recent years, the application quality and research level of the Young Scientists Fund in the Department of Management Sciences have shown significant improvement. Most applicants focused on scientific frontier areas, proposed appropriate research methods, and have published high-level academic papers. On the other hand, some applicants still lacked the understanding of research work of projects funded by NSFC; therefore, the proposed research content could not be completed with the limited budget or within the proposed time period. Some other applicants repeated their PhD or postdoctoral research work, or failed to provide information as required by NSFC.

In 2016, the Department received 3,605 applications for the Young Scientists Fund, more than the application number in 2015. 697 projects were funded with a funding rate of 19.33%, and the average funding for direct cost was 170,400 yuan per project.

In 2017, the Department will continue to follow the principle of "expanding the funding scope properly and limiting the funding intensity" for the Young Scientists Fund.

Please note that the requirements given in the general description section of the General Program of the Department of Management Sciences in this Guideline are also applied to the Young Scientists Fund, so please read carefully before submitting proposals.

Funding for Projects of the Young Scientists Fund in Department of Management Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Management science and engineering	197	3,444	21.44	192	3,272	20.10
Division II	Business administration	186	3,252	21.14	199	3,392	19.88
Division III	Macro-management and policy	292	5,104	19.81	306	5,216	18.56
Total or average		675	11,800	20.62	697	11,880	19.33
Direct cost funding per project		17.48			17.04		

Department of Health Sciences

The Department of Health Sciences mainly supports basic and clinical basic research on the occurrence, development, outcome, diagnosis, therapy and prevention of diseases.

Eligible young scientists are encouraged to submit proposals to the Department for funding. Applicants are expected to have the ability to undertake and complete research project independently, and the ability to propose creative scientific questions and research schemes. The PDF copies of no more than five relevant representative papers should be attached to the proposal. More detailed information is to be referred to sections in the Young Scientists Fund and General Program in this guide.

The funding intensity for the Young Scientists Fund has been basically stable resulting from the continued increase of both the national investment and the number of grants.

An overview of the award number, funding, and success rate of the Young Scientists Fund in 2015 and 2016 by the Department is listed in the following table.

Funding for Projects of the Young Scientists Fund in Department of Health Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Average funding for direct costs	Funding rate (%)	Projects	Average funding for direct costs	Funding rate (%)
Division I	Respiratory system, circulatory system, blood system	393	7,047	21.28	397	6,902	18.94
Division II	Digestive system, urinary system, endocrine system/metabolism and nutrition support, ophthalmology, otorhinolaryngology head and neck science, oral and craniomaxillo-facial Science	510	9,143	19.84	520	9,055	17.81
Division III	Neurological and psychiatric diseases, gerontology	312	5,597	21.27	316	5,490	18.92
Division IV	Reproductive system/ perinatology/neonatology , medical immunology	217	3,895	21.03	218	3,799	19.66
Division V	Medical imaging and biomedical engineering, special medicine, forensic sciences	205	3,678	21.20	204	3,546	17.72
Division VI	Medical pathogenic microorganisms and infection, orthopedics and sports medicine, emergency and intensive care medicine/trauma/ burns/laboratory medicine/plastic surgery/ rehabilitation medicine	320	5,740	18.93	328	5,699	16.85
Division VII	Oncology (leukemia not included)	748	13,407	18.85	755	13,147	17.16
Division VIII	Skin and appendages, preventive medicine, endemiology, occupational medicine, radiology	196	3,522	24.90	206	3,592	23.49
Division IX	Materia medica and pharmacology	275	4,938	24.77	275	4,781	22.95
Division X	Chinese medicine, Chinese materia medica, integrated chinese and western medicine	504	9,043	17.08	501	8,699	15.23
Total		3,680	66,010	20.01	3,720	64,710	18.01
Direct cost funding per project		17.94			17.40		

Fund for Less Developed Regions

The Fund for Less Developed Regions supports scientists in specified regions of China to conduct creative research within the funding scope of NSFC, so as to foster and support researchers in these regions, to stabilize and gather outstanding talents to facilitate the construction of the regional innovation system as well as the social and economic development of the regions.

Applicants for the Fund for Less Developed Regions should be satisfied with following qualifications:

(1) Have the experience of undertaking basic research project or doing other basic research;

(2) With senior academic position (title) or doctoral degree, or recommendations by 2 researchers with senior academic position (title) in the same research area.

Researchers meeting above qualifications and working in Inner Mongolia Autonomous Region, Ningxia Hui Autonomous Region, Qinghai Province, Xinjiang Uyghur Autonomous Region, Tibet Autonomous Region, Guangxi Zhuang Autonomous Region, Hainan Province, Guizhou Province, Jiangxi Province, Yunnan Province, Gansu Province, Yanbian Korean Prefecture of Jilin Province, Enshi Tujia and Miao Prefecture in Hubei Province, Xiangxi Tujia and Miao Prefecture in Hunan Province, Liangshan Yi Prefecture in Sichuan Province, Ganzi Tibetan Prefecture in Sichuan Province, Aba Tibetan and Qiang Prefecture in Sichuan Province, Yanan City and Yulin City in Shaanxi Province may apply for the Fund for Less Developed Regions. Researchers seconded by the Organization Department of the Central Committee of the CPC to Xinjiang Uyghur Autonomous Region and Tibet Autonomous Region as aid scientists for 3 or more years are also eligible to apply for this fund, on the condition that they provide certificate documents issued by the organization departments or personnel department of their host institutions to prove their identity of aid scientists when applying for this fund.

Researchers from other provinces and regions, and researchers from the

affiliated institutions to the central government or the PLA in the above regions and provinces cannot apply, but may join the application as main participants. Graduate students cannot apply, but on-job students may apply through their employer institutions at the consent of their supervisors. Researchers without a home institution or their home institutions have not been registered at NSFC cannot apply for the Fund for Less Developed Regions.

In order to provide preference for qualified applicants for the Fund for Less Developed Regions and encourage them to apply for projects of General Program and other competitive programs of NSFC, researchers who have been granted 3 or more projects under the Fund for Less Developed Regions are not be allowed to apply for this fund again since the year 2016, and the Fund for Less Developed Regions grants approved in 2015 and earlier will not be counted in.

Applicants are advised to refer to the outlines of applications for the Fund for Less Developed Regions and make out their application form accordingly. The collaborative units cannot exceed 2, and the research period is 4 years. The funding period for applications submitted by post-doctors is decided in consideration with the letter of commitment from their host institutions.

In 2016, the Fund for Less Developed Regions supported 2,872 projects with a total funding of 1.090 billion yuan. The average funding was 379,700 yuan per project, and the funding rate was 20.29%, which was 1.15% lower than that in 2015 (please refer to the table below for the funding statistics).

In 2017, the average funding for direct costs will be 400,000 yuan per project. Please refer to the actual funding levels of relevant departments and make budget request in a practical manner.

Please refer to sections of the General Program of various departments for the funding scope of the Fund for Less Developed Regions and funding statistics in recent years and relevant requirements.

Funding for Projects of the Fund for Less Developed Regions in 2016

Unit: 10,000 yuan

Department	No. of applications	Awards				Funding rate (%)
		No. of awards	Funding for direct cost	Average funding for direct cost	Share of NSFC total funding for direct cost (%)	
Mathematical and Physical Sciences	670	180	6,950	38.61	6.37	26.87
Chemical Sciences	1,085	238	9,340	39.24	8.56	21.94
Life Sciences	3,202	746	29,100	39.01	26.69	23.30
Earth Sciences	823	183	7,090	38.74	6.50	22.24
Engineering and Materials Sciences	1,947	341	13,630	39.97	12.50	17.51
Information Sciences	1,103	214	8,280	38.69	7.59	19.40
Management Sciences	665	130	3,850	29.62	3.53	19.55
Health Sciences	4,661	840	30,810	36.68	28.25	18.02
Total	14,156	2,872	109,050	37.97	100.00	20.29

Department of Mathematical and Physical Sciences

The Fund for Less Developed Regions in mathematical and physical sciences is aiming at creating a good research environment for these regions, fostering and stabilizing an appropriate amount of researchers, training talents in basic research for local scientific and technological development, and increasing the capability of solving urgent scientific problems in the development of national economy and society. In the evaluation of proposals for the Fund, special attention is paid to researches that have relative good research background with characteristics and advantage，so as to give full play to the role of the Fund for Less Developed Regions in talent fostering, and strengthen the support to researchers in the western regions of China.

Funding for Projects of the Fund for Less Developed Regions in Department of Mathematical and Physical Sciences in 2015 and 2016

Unit: 10 000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Mathematics	Mathematics I	37	1 249	29.13	41	1 436	27.03
	Mathematics II	41	1 416	29.29	43	1 588	25.15
Mechanics	Basic problems and methods in mechanics						
	Dynamics and control	6	259	42.86	3	135	21.43
	Solid mechanics	9	390	29.03	11	446	24.44
	Fluid mechanics	6	276	30.00	6	235	42.86
	Bio-mechanics						
	Explosive and impact dynamics				1	42	100.00
Astronomy	Astrophysics	6	264	40.00	7	288	35.00
	Astrometry and celestial mechanics	3	146	25.00	2	83	18.18
Physics I	Condensed matter physics	22	981	28.95	22	868	27.16
	Atomic and molecular physics	7	310	31.82	5	208	29.41
	Optics	13	583	28.89	15	643	26.32
	Acoustics	3	126	42.86	2	79	25.00
Physics II	Fundamental physics and particle physics	14	601	35.90	10	393	27.03
	Nuclear physics, nuclear technology and its application	8	362	34.78	7	291	41.18
	Particle physics and nuclear physics experimental facilities				1	48	14.29
	Plasma physics	1	37	7.69	4	167	22.22
Total		176	7 000	29.93	180	6 950	26.87
Direct cost funding per project		39.77			38.61		

Department of Chemical Sciences

On the basis of stabilizing the funding scale of the Fund for Less Developed Regions, the Department of Chemical Sciences will make efforts to further promote the research quality and efficiency of the Fund, stabilize a batch of research talents for fundamental research, and continuously bridge the gap with the developed regions. Applicants are encouraged to carry out research by taking advantage of the local resources, so as to promote the economic development of the regions in a coordinated way.

Funding for Projects of the Fund for Less Developed Regions in Department of Chemical Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Inorganic	33	1,303	23.08	38	1,491	21.84
	Analytical	33	1,303	23.40	31	1,216	22.14
Division II	Organic chemistry	54	2,123	23.18	50	1,963	22.12
Division III	Physical chemistry	32	1,263	23.02	34	1,334	22.22
Division IV	Polymers	18	702	22.78	15	590	22.06
	Environmental chemistry	30	1,183	22.73	31	1,216	22.30
Division V	Chemical engineering	38	1,503	21.97	39	1,530	21.08
Total or average		238	9,380	22.88	238	9,340	21.94
Direct cost funding per project		39.41			39.24		

Department of Life Sciences

In 2016, the Department of Life Sciences received 3,202 applications for the Fund for Less Developed Regions (accepted 3,073 as eligible applications), and funded 746 projects. The funding rate was 23.30% with the average direct cost of 390,100 yuan per project. The average funding for 2017 will be similar with that of 2016. In the future, the Department will continue to follow the principle of "fostering regional talents, supporting sustained exploration, gathering outstanding talents and promote regional development" for this Fund, provide steady support to local talents and support researches related to local resources and natural conditions. For details about funding scope, etc., please refer to the sections in the General Program of the Department in this Guide.

Funding for Projects of the Fund for Less Developed Regions in Department of Life Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Microbiology	51	2,035	24.76	44	1,705	24.04
	Botany	57	2,277	24.57	60	2,330	23.53
Division II	Ecology	80	3,224	24.69	67	2,604	23.67
	Forestry	54	2,146	25.23	68	2,661	23.61
Division III	Biophysics/Biochemistry/Molecular biology	14	572	25.93	14	551	24.56
	Immunology	8	304	27.59	7	284	22.58
	Biomechanics and tissue engineering	4	162	16.00	6	216	22.22
Division IV	Neurosciences	12	463	26.09	9	341	23.08
	Psychology	6	222	26.09	8	297	24.24
	Physiology & integrative biology	9	373	24.32	11	442	22.92
Division V	Genetics and bioinformatics	23	937	23.96	28	1,098	23.93
	Cell biology	8	302	25.81	14	530	24.56
	Developmental biology and reproductive biology	9	363	23.68	10	407	22.73
Division VI	Agriculture and crop sciences	91	3,658	23.76	89	3,475	22.70
	Food science	60	2,398	24.00	62	2,415	21.68
Division VII	Plant protection	49	1,975	23.90	49	1,922	23.33
	Horticulture and plant nutrition	52	2,076	23.74	60	2,339	23.72
Division VIII	Zoology	27	1,088	24.32	27	1,051	24.32
	Animal husbandry and grassland science	63	2,549	24.42	63	2,453	23.25
	Veterinary medicine	38	1,532	23.75	37	1,458	23.27
	Aquaculture	14	574	24.14	13	521	22.41
Total		725	29,230	24.35	746	29,100	23.30
Direct cost funding per project		40.01			39.01		

Department of Earth Sciences

In 2016, the Department of Earth Sciences received 823 applications for the Fund for Less Developed Regions from 145 research institutions. Among them, 705 were from universities, accounting for 85.7%, and 107 from research institutions, accounting for 13.0%. Totally, 183 projects were funded with a direct expense of 70.9 million yuan. The average fund was 387,000 yuan per project and the funding rate was 22.24%. Among the projects funded in 2016, 155 were obtained by universities, accounting for 84.7%, and 24 by research institutions, accounting for 13.1%.

In 2017, a standardized selection of "application code", "research field" and "key words" will be tried out continuously in Division I (Geography). When filling out the application forms, applicants should visit the "special focus" under the item of "application acceptance" on the official home page of the NSFC (http://www.nsfc.gov.cn/), and read carefully the "list of application code, research field and key words (D01 and subordinate codes)" in order to make sure their applications in accordance with the funding areas of Division I.

Funding for Projects of the Fund for Less Developed Regions in Department of Earth Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Geography (including soil science and GIS)	112	4,705	22.81	117	4,523	22.29
Division II	Geology	21	882	22.83	24	913	22.64
	Geochemistry	15	642	22.39	16	603	22.86
Division III	Geophysics and space physics	7	297	22.58	8	327	21.05
Division IV	Marine science	4	172	22.22	8	319	21.62
Division V	Atmospheric science	10	412	23.26	10	405	21.28
Total		169	7,110	22.78	183	7,090	22.24
Direct cost funding per project		42.07			38.74		

Department of Engineering and Materials Sciences

According to NSFC policy on the Fund for Less Developed Regions, the Department of Engineering and Materials Sciences will provide steady support to foster researchers in these regions, and encourage applicants to do basic researches by taking advantage of local resources and for regional economic development. In 2016, the Department received 1,947 applications (66 rejected) for the Fund with an increase of 13.13%. 341 projects were funded with a total direct cost of 136.3 million yuan. The average funding was 399,700 yuan per project with a funding rate of 17.51% (19.81% in 2015).

Please refer to the General Program and other related parts of Guide to Programs for general instruction of the department and the funding scope of the Fund.

Funding for Projects of the Fund for Less Developed Regions

in Department of Engineering and Materials Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Average funding for direct costs	Funding rate (%)	Projects	Average funding for direct costs	Funding rate (%)
Materials sciences I	Metallic materials	33	1,330	19.19	33	1,324	17.55
Materials sciences II	Inorganic and non-metallic materials	38	1,527	18.72	39	1,545	17.49
	Polymer materials	23	900	20.54	22	895	17.32
Engineering sciences I	Metallurgy and mining science	45	1,807	20.00	47	1,870	17.03
Engineering sciences II	Mechanical engineering	60	2,394	20.20	58	2,342	17.74
Engineering sciences III	Engineering thermo physics and energy utilization	17	664	21.79	18	703	16.98
Engineering sciences IV	Architecture, environmental and structural engineering	68	2,731	19.60	68	2,707	17.75
Engineering sciences V	Electrical science and engineering	22	875	19.82	21	865	17.21
	Hydrology and marine engineering	35	1,392	19.89	35	1,379	17.95
Total		341	13,620	19.81	341	13,630	17.51
Direct cost funding per project		39.94			39.97		

Department of Information Sciences

In 2016, the Department of Information Sciences received 1,103 applications for the Fund and funded 214 projects with a total direct cost funding of 82.8 million yuan (of which 4 million yuan came from the Major Program). The funding rate was 19.40% and the average direct cost funding was 386,900 yuan per project. In 2017, the Department will continue to give preferential support to the Fund for Less Developed Regions, and properly increase the funding rate. The average direct cost funding will be 400,000 yuan per project. All eligible researchers are welcome to apply.

Funding for Projects of the Fund for Less Developed Regions in Department of Information Sciences in 2015 and 2016

Unit: 10 000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Electronic science and technology	16	575	22.22	15	580	18.75
	Information and communication system	19	694	22.35	16	608	18.82
	Information acquisition and processing	20	741	19.80	20	768	19.23
Division II	Theoretical computer science and computer software and hardware	24	885	22.02	23	894	20.00
	Computer application	47	1,789	22.17	47	1,821	19.83
	Network and information security	23	866	22.33	20	760	19.61
Division III	Control theory and control engineering	19	715	21.84	18	666	21.18
	Systems science and system engineering	13	498	21.31	9	375	16.98
	AI and intelligent systems	24	909	21.54	22	862	19.60
Division IV	Semiconductor science and information devices	10	391	20.83	10	394	18.18
	Information optics and photoelectric devices	8	313	21.05	6	237	19.35
	Laser technology and technical optics	8	314	21.05	8	315	20.51
Total		231	8,690	21.47	214	8,280	19.40
Direct cost funding per project		37.62			38.69		

Department of Management Sciences

In 2016, the Department of Management Sciences received 665 applications for the Fund for Less Developed Regions, slightly more than those in 2015. 130 projects were funded with a funding rate of 19.55%, and the average funding for direct expenses was 296,200 yuan per project.

In 2017, the average funding for direct expenses will be 300,000 yuan per project, and the executive period will be 4 years.

Please note that the requirements described in the general description section of the General Program of the Department of Management Sciences in this Guideline are also applied to the Fund for Less Developed Regions, so please read carefully before submitting proposals.

Funded for Projects of the Fund for Less Developed Regions in Department of Management Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Direct cost	Funding rate (%)	Projects	Direct cost	Funding rate (%)
Division I	Management science and engineering	27	814	20.15	30	888	20.69
Division II	Business administration	36	1,086	19.78	36	1,066	20.00
Division III	Macro management and policy	62	1,870	18.67	64	1,896	18.82
Total or average		125	3,770	19.29	130	3,850	19.55
Direct cost funding per project		30.16			29.62		

Department of Health Sciences

The Department of Health Sciences mainly supports basic research and clinical basic research on the occurrence, development, outcome, diagnosis, therapy and prevention of diseases.

Applicants are encouraged to propose creative research ideas, conducting basic research on local diseases by using modern medical research concepts and methods. Joint research by applicants with researchers in developed regions is also encouraged in order to fully utilize the various advanced research facilities in developed regions.

The PDF copies of no more than five relevant representative papers should be attached to the proposal. More detailed information is to be referred to sections in the Fund for Less Developed Regions and General Program in this guide.

In 2016, 4661 proposals were received by the Department, and 840 of them were funded, with an average funding intensity of 366,800 yuan (direct cost). The funding intensity of this program will remain the same as that in 2016 and the applicants are expected to fill in the budget form with detailed justification.

An overview of the award number, funding, and success rate of the Fund for Less Developed Regions in 2015 and 2016 by the Department is listed in the table below.

Funding for Projects of the Fund for Less Developed Regions in Department of Health Sciences in 2015 and 2016

Unit: 10,000 yuan

Divisions		2015			2016		
		Projects	Average funding for direct costs	Funding rate (%)	Projects	Average funding for direct costs	Funding rate (%)
Division I	Respiratory system, circulatory system, blood system	86	3,221	18.57	89	3,277	19.73
Division II	Digestive system, urinary system, endocrine system/metabolism and nutrition support, ophthalmology, otorhinolaryngology head and neck science, oral and craniomaxillo-facial Science	105	3,934	19.55	101	3,687	18.74
Division III	Neurological and psychiatric diseases, gerontology	51	1,907	16.45	54	1,973	16.51
Division IV	Reproductive system/ perinatology/neonatology , medical immunology	34	1,289	16.43	37	1,339	18.50
Division V	Medical imaging and biomedical engineering, special medicine, forensic sciences	28	1,057	17.18	30	1,097	16.76
Division VI	Medical pathogenic microorganisms and infection, orthopedics and sports medicine, emergency and intensive care medicine/trauma/ burns/laboratory medicine/plastic surgery/ rehabilitation medicine	74	2,761	18.50	74	2,722	17.83
Division VII	Oncology (leukemia not included)	123	4,610	14.52	127	4,656	14.33
Division VIII	Skin and appendages, preventive medicine, endemiology, occupational medicine, radiology	55	2,105	23.81	57	2,136	22.09
Division IX	Materia medica and pharmacology	53	2,007	21.99	55	2,005	20.45
Division X	Chinese medicine, Chinese materia medica, integrated Chinese and western medicine	211	7,909	21.93	216	7,918	19.00
Total		820	30,800	18.80	840	30,810	18.02
Direct cost funding per project		37.56			36.68		

Excellent Young Scientists Fund

The Excellent Young Scientists Fund supports young scholars with good achievements in basic research to conduct innovative research in areas of their own choice, so as to promote fast growth of creative young talents and foster a number of outstanding talents on the international science frontiers. It mainly supports applicants who meet the following qualifications:

(1) Citizenship of the People's Republic of China;

(2) Under the age of 38 (for male, born on or after Jan. 1, 1979) or 40 (for female, born on or after Jan. 1, 1977) by Jan. 1 of the year of application;

(3) Good scientific integrity;

(4) Senior professional position (title) or PhD degree;

(5) Experience of conducting basic research projects or other basic research;

(6) No employment with foreign institutions;

(7) Able to work in home institution for no less than 9 months per year.

Young Chinese scholars without Chinese citizenship may apply if they meet the conditions from (2) to (7) listed above.

The following people may not apply:

(1) Grantees of the National Science Fund for Distinguished Young Scholars or the Excellent Young Scientists Fund;

(2) Applicant for the National Science Fund for Distinguished Young Scholars in the same year;

(3) Post-doctors and graduate students.

In 2016, NSFC received 4,413 applications for the Excellent Young Scientists Fund and granted 400 awards with a total funding of 520 million yuan for direct cost.

In 2017, the Fund plans to grant 400 projects and the average funding is 1.3 million yuan per project for 3 years.

Funding for Projects of the Excellent Young Scientists Fund in 2016

Unit: 10,000 yuan

Department	No. of applications	No. of awards	Funding rate (%)
Mathematical and Physical Sciences	496	47	9.48
Chemical Sciences	626	57	9.11
Life Sciences	670	59	8.81
Earth Sciences	420	38	9.05
Engineering and Materials Sciences	796	73	9.17
Information Sciences	703	60	8.53
Management Sciences	140	14	10.00
Health Sciences	562	52	9.25
Total	4,413	400	9.06

National Science Fund for Distinguished Young Scholars

The National Science Fund for Distinguished Young Scholars supports young scholars who have made outstanding achievements in basic research to select their own research directions and conduct creative research, so as to speed up the growth of young scientific talents, attract overseas talents and foster a group of prominent academic pacemakers in the forefront of international science and technology.

Eligibility for application:

(1) Citizenship of the People's Republic of China;

(2) Under the age of 45 by Jan. 1 of the year of application (born on or after Jan. 1, 1972);

(3) Good scientific integrity;

(4) Senior professional position (title) or PhD degree;

(5) Experience of conducting basic research projects or other basic research;

(6) No employment with foreign institutions;

(7) Able to work in home institution for no less than 9 months per years.

Young Chinese scholars without Chinese citizenship may apply if they meet the conditions from (2) to (7) listed above.

The following people may not apply:

(1) Post-doctors doing research or graduate students;

(2) Grantees of ongoing project of the Excellent Young Scientists Fund (application is allowable on the year of completion of the ongoing project of the Excellent Young Scientists Fund);

(3) Applicant for the Excellent Young Scientists Fund in the same year;

(4) Having received the National Science Fund for Distinguished Young Scholars.

Attention:

To further simplify application materials and management procedure, since 2017 recommendation comments from the host institutions are not required, yet comments from Academic Committee or Expert Panel are still required.

In 2016, NSFC received 2,433 applications for the National Science Fund for Distinguished Young Scholars and granted 198 awards with a total funding

of 679.35 million yuan for direct cost.

In 2017, the National Science Fund for Distinguished Young Scholars plans to fund 200 projects, and the average funding is 3.5 million yuan per project for 5 years (2.45 million yuan per project for 5 years in the Mathematical Sciences and Management Sciences).

Funding for Projects of the National Science Fund for Distinguished Young Scholars in 2016

Unit: 10,000 yuan

Department	No. of applications	No. of awards	Funding rate (%)
Mathematical and Physical Sciences	283	24	8.48
Chemical Sciences	345	30	8.70
Life Sciences	320	26	8.13
Earth Sciences	261	21	8.05
Engineering and Materials Sciences	473	37	7.82
Information Sciences	354	28	7.91
Management Sciences	77	7	9.09
Health Sciences	320	25	7.81
Total	2,433	198	8.14

Science Fund for Creative Research Groups

The Science Fund for Creative Research Groups supports prominent middle-aged and young scientists to work as academic leaders and PIs on creative research focusing on key research issues, and fosters research groups with international influence.

Applicants and participants should meet the following requirements:

(1) Experience of conducting basic research projects or other basic research;

(2) Guarantee to work in home institutions for no less than 6 months per year within the funding period;

(3) Have a research team based on long-term collaboration, including 1 academic leader and 5 or more backbone researchers;

(4) The academic leader or the PI should have senior professional position (title), high academic qualifications and international influence, and be less than 55 years old by Jan. 1 of the year of application (born on or after Jan. 1, 1961);

(5) Backbone researchers or group members should hold senior professional position (title) or have PhD degrees;

(6) Applicants and participants should be in the same host institution.

PIs who have been awarded the Science Fund for Creative Research Groups before may not apply again. PI and participants with senior academic title of an ongoing project supported by the Science Fund for Creative Research Groups may not apply or participate in the application. Participants who quit from a project supported by the Science Fund for Creative Research Groups are not permitted to apply again in 2 years after the quit.

Applicants with senior academic titles may only apply for one project of the Science Fund for Creative Research Groups each year.

Attention:

To further simplify application materials and management procedure, since 2017 recommendation comments from the host institutions are not required, yet comments from Academic Committee or Expert Panel are still required.

In 2016, a total of 257 applications for the Science Fund for Creative

Research Groups and 38 awards were made with a total funding of 389.55 million yuan for direct costs.

In 2017, the Science Fund for Creative Research Groups plans to support 38 awards, with duration of 6 years and a funding amount of 10.5 million yuan per award for direct cost (7.35 million yuan for awards by the Mathematical Sciences and Management Sciences).

Awards Granted by the Science Fund for Creative Research Groups in 2016

Unit: 10,000 yuan

Department	No. of applications	awards		Funding rate (%)
		No. of awards	Direct cost	
Mathematical and Physical Sciences	38	5	4,935	13.16
Chemical Sciences	32	5	5,250	15.62
Life Sciences	30	5	5,250	16.67
Earth Sciences	31	5	5,250	16.13
Engineering and Materials Sciences	44	6	6,300	13.64
Information Sciences	37	5	5,250	13.51
Management Sciences	13	2	1,470	15.38
Health Sciences	32	5	5,250	15.62
Total	257	38	38,955	14.79

Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao

In order to take advantage of the overseas (including Hong Kong and Macao) resources of science and technology and encourage overseas excellent young scholars to serve mainland China, NSFC sets up the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao to support excellent overseas (including Hong Kong and Macao) Chinese scholars under the age of 50 to conduct high-level joint research with scientists in mainland China.

The Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao adopts a "2+4" funding mode, and extended funding may be requested at the end of the two-year period.

Two-Year Funding Projects

1. Eligibility for application:

(1) Under the age of 50 by Jan. 1 of the year of application (born on or after Jan. 1, 1967);

(2) Have good scientific integrity;

(3) Hold professional title of associate professor (or above) in the country (region) that applicant lives in;

(4) Engagement in scientific research abroad, in Hong Kong or Macao, and in charge of a laboratory or an important research project, and have made outstanding academic achievements recognized by international peers;

(5) Have collaborator in mainland China, and sign with the host institution of the collaborator the collaborative agreement wherein clarifications are contained on the title, research direction and the proposed goals of the joint research projects, the commitment of the host institution to providing main experimental facilities, human resources and other materials necessary for the joint research;

(6) Have strong research capabilities in both sides and the proposed research should be focused on the international frontiers of sciences;

(7) Guarantee to work in the host institution for more than 2 months per year.

Both the applicant and the collaborator may apply for no more than one two-year project of the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao. Those who have not finished their post-doctor or graduate studies are not eligible collaborators in mainland China.

2. Notes to applicants:

(1) The two-year proposals of the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao are mainly evaluated on the academic aspects, and the capacity of the applicants and the background of the cooperation with their collaborators;

(2) Applicants are advised to prepare the research proposals in accordance with the outlines for the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao, and submit the proposal with relevant required supplementary documents, including (i) valid certificate documents for their professional positions and research work, and (ii) agreement on collaboration.

In 2016, NSFC received 303 applications for the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao and granted 115 awards with an average funding amount of 180,000 yuan per project for direct cost. The total funding for direct cost amounted to 20.70 million yuan.

In 2017, the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao plans to fund 120 projects and the total funding for direct cost will be 180,000 yuan per project for 2 years.

Extended Funding Projects

1. Eligibility for application:

(1) Grantees of two-year projects of the Joint Research Fund for Overseas

Chinese Scholars and Scholars in Hong Kong and Macao that were approved in 2014 are eligible, if their projects have made substantial progress and have been completed in due time. For grantees of two-year projects of the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao that were approved in 2013, they are eligible for application if they did not apply for extended funding after the completion of the two-year project or failed to obtain extended funding;

(2) Applicants have to ensure enough time to stay at the host institution for work during the funding period (2 years) of the project;

(3) Applicants have to sign extended agreement of cooperation with the host institution. The agreement should include the such content as the title, research direction and proposed goal of the joint research project, the host institution’s promise to provide main experimental facilities, human resources, and other materials necessary for the joint research;

(4) Proposed extended cooperation should be focused on the international science frontiers with much of significance and should facilitate disciplinary development and talent

fostering;

(5) The applicants are required to work in the host institution for more than 2 months per year.

Both the applicant and the collaborator may apply for no more than one extended project of the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao. Those who have not finished their post-doctor or graduate studies are not eligible collaborators in mainland China.

2. Notes to applicants:

(1) The extended funding mainly evaluate the progress of the cooperative work, whether the proposed research for extended funding is at the international frontier areas of research, and its contribution to disciplinary development and talent fostering;

(2) Applicants are advised to prepare their research proposals by providing accurate information in accordance with the outlines for the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao, and submit the proposals with relevant required supplementary documents, including (i) valid certificate documents for their professional positions and research work, and (ii) agreement on collaboration.

In 2016, NSFC received 83 extended funding applications for the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao and granted 20 awards with a total funding of 36 million yuan for direct cost.

In 2017, the Joint Research Fund for Overseas Chinese Scholars and Scholars in Hong Kong and Macao plans to fund 20 extended projects and the total funding for direct cost will be 1.8 million yuan per project for 4 years.

International (Regional) Cooperation and Exchange Programs

In order to improve the quality of China's scientific research and its international competitiveness, the International (Regional) Cooperation and Exchange Programs aim at funding Chinese scientists to conduct substantial cooperation with their international collaborators in focused frontier research areas and take full advantage of international scientific and technological resources on the basis of "equal cooperation, mutual benefits, and equal sharing of research results".

The funding system of the International (Regional) Cooperation and Exchange Programs is currently comprised of Key International (Regional) Joint Research Program, International (Regional) Joint Research and Exchange Programs funded under the Agreements/MoUs between NSFC and its foreign partners, and Research Fund for International Young Scientists.

Key International (Regional) Joint Research Program

The Key International (Regional) Joint Research Program (hereafter referred to as Key Joint Research Program), gives priority to research in the following areas: joint research in the priority funding areas of NSFC, joint research in areas that China urgently needs to develop, international mega projects and programs with Chinese participation, and joint research projects utilizing large-scale scientific facilities abroad.

Researchers applying for this program shall, in accordance with the priority funding areas announced by relevant scientific departments, choose innovative joint research subjects centering on major scientific issues, and clarify the necessity and complementarities of the cooperation. Chinese applicants and their foreign partners shall have long-term steady collaboration (e.g., coauthored publications and continued personnel exchanges and communications) and the overseas partners shall have matching fund for this research. In the process of cooperation, attention shall be given to the protection of intellectual property rights.

In 2016, altogether 105 out of the total 610 applications under the Key International (Regional) Joint Research Program were funded with a total funding of 250 million yuan for direct costs, and an average success rate of 17.21%.

In 2017, the Key International (Regional) Joint Research Program plans to fund 100 projects with the same average funding for direct costs per project as in 2016, and each project usually lasts for 5 years.

Eligibility of Applicants

In order to be eligible for this program, applicants should be:

(1) Granted with the title of professor or associate professor; and

(2) Principal investigators of on-going or completed NSFC research project with the duration of no less than 3 years.

Eligibility of Foreign Partners

In order to be eligible for this program, the foreign partners should be:

(1) Independent researchers in charge of research laboratories or key research projects abroad; and

(2) Granted with the title of professor or associate professor in the host countries/regions.

Appendix Documents

Aside from the Chinese application form, the applicant should also submit the following documents as required:

(1) English Application Form: The English Application Form can be downloaded in the Internet-based Science Information System (ISIS) of NSFC and should be uploaded online when filled in.

(2) Letter of Agreement: A copy of the Letter of Agreement signed between the collaborating PIs should be provided. Unilaterally signed letters are not valid. The Letter of Agreement mainly covers:

(i) Research contents and objectives;

(ii) Collaborating PIs and participants;

(iii) Period, mechanism and plan of joint research;

(iv) Ownership, use and transfer of IP rights;

(v) Relevant budgetary arrangements.

The applicant could refer to the sample Letter of Agreement which can be downloaded at http://www.nsfc.gov.cn/nsfc/cen/gjhz/cjwt/cjwt2011-10-26-06.html.

(3) Documents verifying the foreign partners' holding of or participation in research projects related to the submitted application, as well as a list of publications related to the submitted application by the foreign partners in the past 3 years.

(4) Letter of confirmation by the foreign collaborator: If the foreign collaborator cannot sign the English Application Form, a letter of confirmation by him/her should be provided. The letter of confirmation should contain true contact information about the foreign collaborator. The letter of confirmation should be written in official forms including the title, logo and contact information of the foreign collaborator's employer. In addition, the letter of confirmation should contain detailed information such as the title of the research, the content and period of cooperation, the way to share IPR, etc. The foreign collaborator should confirm in the letter that he/she has read and agrees with the English Application Form.

Priority Funding Areas of the International (Regional) Joint Research Program in 2017:

Department of Mathematical & Physical Sciences

(1) New methods and new technologies of experimental mechanics

(2) Nonlinear mechanical issues of complex systems

(3) Sky surveys and space observations

(4) New astronomical technological methods associated with the large telescopes

(5) Quantum computation and simulation in extensible solid physics system

(6) Light field control and its interaction with matter

(7) Precision measurement of physical constants

(8) Research on high performance particle detector

(9) Hadron structure and new cutting-edge research of hadron states

(10) Physical uncertainty of magnetically confined fusion plasma and Advanced measurement diagnosis technology

(11) Physical issues in new energy

(12) Joint research based on large-scale scientific facilities at home and abroad

Department of Chemical Sciences

Applicants are encouraged to focus on topics featuring basic, interdisciplinary, frontier and complementary research.

(1) Catalysis and chemical precision synthesis

(2) Green chemistry and the reaction and process of sustainable chemistry

(3) Process and mechanism of surface and interface chemistry

(4) Theoretical and computational chemistry of complex systems

(5) Precise chemical measurement and imaging

(6) Molecular assembly, structure and function

(7) Molecular basis for advanced functional materials

(8) Natural products chemistry and drug discovery

(9) Chemical biology

(10) Environmental pollution chemistry and control

(11) Scientific issues on the medium scale in chemical process

Department of Life Sciences

Due attention will be paid to joint research between strong partnering research teams and joint research between Chinese researchers and foreign partners with superior research capacities or facilities. Chinese applicants are encouraged in take the lead in joint research activities.

(1) Basic and applied research on stem cells

(2) Synthetic Biology

(3) Theory on the construction and bionic building of vital organs

(4) Collection, data base and analysis of large-scale biological data

(5) Adaptation and response of species and ecosystems to global climate change

(6) Biodiversity

(7) Cross-border monitoring, warning and prevention of major animal and plant diseases and biological invasion

(8) Collection, evaluation and utilization of agricultural biological germplasm resources

(9) Response of agricultural production to global climate change

Department of Earth Sciences

(1) Global change and surface process

(2) Environmental pollution and its impacts

(3) Eco-environment effect of globalization and human activities

(4) System and mechanism of metallogenic accumulation

(5) Processes in and between continental plates

(6) Coupling relation between deep and surface earth processes

(7) Mechanism, monitoring, early warning and risk prevention and control of geological disasters

(8) Solar-terrestrial energy transfer between and its impact on human activities

(9) Water cycle and ecohydrological process

(10) Mechanism and numerical simulation of weather and climate system changes

(11) Asia monsoon-arid environmental systems and global environmental change

(12) Origin and major evolutionary events of key biological taxa and the environmental backgrounds

(13) Life process under extreme conditions

(14) Dynamic process and mechanism of marine multi-scale interactions

(15) Marine ecological system security and deep-sea biological resources

(16) Advanced technology platforms to promote the development of earth sciences

(17) Resources, environment and ecology along the “One Belt and One Road” regions

Department of Engineering and Materials Sciences

(1) Energy materials

(2) Nano material and devices

(3) Biomedical materials

(4) High performance structural materials

(5) Sustainable materials

(6) Resource circulation and clean metallurgy

(7) Advanced manufacturing, green manufacturing and smart manufacturing
(8) Sustainable energy, efficient and clean utilization of energy
(9) High efficiency power electronic system
(10) Efficient high quality motor system
(11) Water resources and water environment
(12) Urban water environment and water quality safety
(13) Civil engineering disaster prevention and whole life reliability
(14) Deep-sea engineering

Department of Information Sciences

(1) Basic theory and key technology of electromagnetic vortex
(2) THz science and technology
(3) Intelligent network and its applications
(4) High performance computation and analysis of scientific research data
(5) Big data calculation theory and system practice
(6) Basic theory and key technologies of new internet
(7) Design method and application verification of new control system analysis
(8) Novel high precision and reliable testing technology and system
(9) High-performance robotics and advanced artificial intelligence system
(10) Uv photodetectors
(11) Integrated circuit design
(12) Microwave photonics
(13) Interactions between spatial structure light field and semiconductor materials
(14) Micro-nano structure optoelectronic devices
(15) Integrated theory and design of millimeter wave circuits and antennas
(16) Detecting imaging theory and key technologies

Department of Management Sciences

(1) Behavioral law in the management systems
(2) Analysis, experiment and modeling of complex management systems
(3) Complex engineering and complex operation management
(4) Analysis and optimization of traffic system in mobile Internet environment
(5) Data-driven financial innovation and risk laws
(6) Laws of entrepreneurial activity and its ecosystem
(7) Laws of the transformation and innovation of Chinese enterprises
(8) Enterprise innovation behavior and national innovation system management
(9) Management science issues in service economy
(10) Laws governing China's green and low-carbon socio-economic development
(11) Research on China's economic restructuring and mechanism reconstruction
(12) Laws of the basic management of national security
(13) Basic laws of state and social governance
(14) Rules and mechanisms of new urbanization management
(15) Mobile Internet medical and health management

Department of Health Sciences

In principle, PIs of programs of large funding amounts such as Key International (Regional) Joint Research Program, Major Program, Key Projects of Major Research Plan Program granted in 2016 will not be considered for funding under the Key International (Regional) Joint Research Program in 2017.

(1) New mechanisms of the common pathology of development, inflammation, metabolism, probiotics, microenvironment, etc.

(2) Pathogenesis and precise diagnosis and treatment of major chronic diseases

(3) Epidemiology of chronic diseases and injuries and related prevention and intervention strategies

(4) Rapid identification, pathogenesis, prevention, early warning new treatment of emerging and emergency infectious diseases

(5) Infectious diseases and antibiotic resistance

(6) Frontier research on first aid, trauma, rehabilitation and regenerative medicine

(7) Women and children's health

(8) Research on the frontier of reproduction, development, aging related diseases

(9) Nutrition, environmental, genetic and health

(10) Stem cells and diseases

(11) Organ fibrosis and prevention mechanism

(12) Tissue and organ damage, dysfunction and intervention

(13) Protection of organs and replacement therapy

(14) Pathogenesis and intervention of neuropsychiatric disorders

(15) Mechanisms of immune-related diseases and new immunotherapy strategies

(16) Interdisciplinary scientific research on diseases

(17) Medical imaging and biomedical engineering

(18) Innovative medical technologies and personalized medicine

(19) Biomarkers and personalized medicine

(20) Discovery of new drug targets and pharmacological validation

(21) Modern scientific connotation of traditional Chinese medicine theories

(22) Material basis and mechanism of traditional Chinese medicine

(23) Basic research on special and forensic medicine

International (Regional) Cooperation and Exchange Programs under Agreements/MoUs

Jointly organized and funded by NSFC and foreign science funding agencies (or research institutions and international organizations), the International (Regional) Cooperation and Exchange Programs under Agreements/MoUs support bilateral and multilateral joint research and academic exchanges between Chinese scientists and their foreign partners. In recent years, greater efforts have been focused on policy research on international collaboration, and both the cooperation channels and funding areas have been expanded with the U.S., Canada, and Australia. More extensive exchanges have been conducted between NSFC and partners in South America. The partnership between NSFC and European partners has been promoted comprehensively by further enhanced diverse collaborative activities with respective European partner countries and the EU as a whole. The collaboration mechanisms with Japan and South Korea have been further deepened, with expanded funding scale for the A-3 Frontier Research Plan. The scientific cooperation

with Israel and Singapore has also been promoted to more expanded research areas. Greater efforts have been put in furthering the bilateral cooperation with partners of key potentials and impacts in such developing countries as India, South Africa, Brazil, Thailand, Egypt, etc. Multi-lateral international cooperation between Chinese applicants and their international partners has been encouraged to take advantage of the coordinative role played by international scientific organizations in promoting cross-border scientific research plans, and participate in and conduct cross-border regional research plans. Besides, NSFC plays an active role in promoting the cooperation between Chinese scientists and their partners along the "One Belt and One Road" route. Adhering to the "one country, two system" policy of the central government, NSFC has always been attaching significance to the collaboration between researchers in mainland China with partners in Hong Kong, Macao and Taiwan regions.

NSFC has by far concluded 86 cooperation agreements/MoUs with science funding agencies and research institutions in 44 countries/regions. By negotiation, NSFC reaches agreements with its foreign partners on cooperation and exchange pattern, funding area, amount of awards, funding amount and review mechanism. Based on mutual agreement, NSFC will launch joint call for proposals with its foreign partners on their websites and then organize scientists to submit and review applications. The International (Regional) Cooperation and Exchange Programs under Agreements/MoUs include Joint Research Program and Personnel Exchange Program.

The Joint Research Program under Agreements/MoUs includes bilateral or multilateral joint research projects funded by NSFC and its international partners under the framework of cooperation agreements /MoUs signed between them to support Chinese researchers and their collaborators abroad to carry out research in basic sciences.

The Personnel Exchange Program under Agreements/MoUs aims to encourage NSFC grantees to participate in extensive international cooperation and exchange activities, and to enhance the innovativeness, talent training, disciplinary development and research quality of the on-going NSFC projects. The Personnel Exchange Program under Agreements/MoUs include personnel exchange program and academic conference program featuring the mobility of scientists. Meanwhile, it encourages scientists to maintain sound bi/multilateral relations with overseas partners through wide cooperation and exchange, laying a solid foundation for future substantial collaboration. Academic Conference Program under Agreements/MoUs is aimed at supporting scientists to hold bilateral or multi-lateral international conferences in China with a view to enabling Chinese scientists to keep pace with the latest research frontiers and hotspots in the international academic arena, to enhancing the partnership between Chinese scientists and their foreign peers, and to promoting the visibility of the results achieved by NSFC funded projects and raising the profile of China's academic community.

Applicants could refer to the following introductions and the calls for proposals irregularly launched on NSFC website for application eligibility, priority funding areas, funding duration, and application requirements. Besides, applicants could also refer to the International Cooperation column of NSFC's website for relevant information about these programs in 2017. An introduction of the funding opportunities under this category in 2017 is listed as follows.

Asia and Africa

Japan

Japan Science and Technology Agency (JST)

The NSFC and JST Joint Research Program initiated in 2004 on the theme of "S&T for Environmental Conservation and Construction of a Society with Less Environmental Burden". Every year both sides negotiate and define specific priority areas for cooperation, followed by a bilateral workshop alternately held in China and Japan in the defined priority area. Participants in the annual workshop will propose concrete research topics for joint funding. Since 2015, the priority area for both sides has been changed into biological genetic resources.

In 2017, the joint call for proposals with specific collaborative topics will be launched by NSFC and JST on their websites respectively, and no more than 3 projects with a duration of three years would be funded per year, with an investment of 2 million yuan (direct cost)by NSFC for each project.

Japan Society for the Promotion of Science (JSPS)

The call for proposals of exchange project and bilateral workshop is issued jointly by both NSFC and JSPS on their respective websites in June every year. The submission deadline is on Friday of the first complete week in September.

(1) Exchange Project

NSFC and JSPS jointly support 10 exchange projects each year, the duration of which is 3 years. The exchange volume shall not exceed 60 person-days per year for each side.

(2) Bilateral Workshop

NSFC and JSPS support 4 bilateral workshops per year organized jointly by Chinese and Japanese scientists, of which two are held in China and two in Japan. Participants of a bilateral workshop from each side must come from at least three institutions.

South Korea

NSFC and National Research Foundation of Korea (NRF) would jointly support joint research project, exchange project and bilateral workshop in 2017.

Two calls for proposals would be released in 2017 by both organizations on their respective websites, one for joint research project, and the other for exchange project & bilateral workshop. The joint funding for exchange project and bilateral workshop will be decided at the Sino-Korean Joint Committee on Basic Science after deliberation and discussion of participating experts.

(1) Joint Research Project

Three three-year joint research projects are planned to be funded by NSFC and NRF in 2017 with NSFC investing 2 million yuan (direct cost) for each project.

(2) Exchange Project

Around 20 two-year exchange projects are planned to be funded by NSFC and NRF in 2017.

(3) Bilateral Workshop

Around 10 bilateral workshops are planned to be funded by NSFC and NRF in 2017. Participants of bilateral workshops from each side must come from at least three institutions.

Israel

NSFC and Israel Science Foundation (ISF) carry out their joint funding on joint research project and bilateral workshop.

(1) Joint Research Project

Since 2012, NSFC and ISF have launched a joint call annually for proposals on their respective websites. The priority areas are Exact Science (Mathematics, Physics, Chemistry, Earth Science, Nanotechnology, and Computer Science) in 2017. Around 35 three-year projects are planned for joint funding with NSFC investing 2 million yuan (direct cost) for each project.

(2) Bilateral Workshop

Each year, no more than 2 bilateral workshops are planned to be funded by NSFC and ISF. The workshop themes are decided by both sides through negotiation.

Three Asian Countries (China, Japan and South Korea)

A3 Foresight Program

Jointly sponsored by NSFC, Japan Society for the Promotion of Science (JSPS) and National Research Foundation of Korea (NRF), the A3 Foresight Program supports the cooperation of scientists from China, Japan and South Korea to conduct world-class cutting-edge research in selected strategic areas, so as to foster excellent young researchers and make contributions to the solution of common regional issues.

The priority area of A3 Foresight Program for each year is in accord with the theme of the Northeastern Asian Symposium jointly organized by NSFC, JSPS and NRF in the previous year. The priority funding area in 2017 is Molecular Imaging-based Precision Medicine.

The call for proposals is simultaneously announced on the websites in November by the three parties and 2 five-year projects will be jointly funded annually, with NSFC investing 4 million yuan (direct cost)in each approved project.

South Africa

NSFC and National Research Foundation of South Africa (NRF)carry out their joint funding on joint research project and bilateral workshop.

(1) Joint Research Project

In 2017, the joint call for proposals in the area of Earth Science will be launched by NSFC and NRF on their websites respectively, and no more than 10 projects with a duration of three years would be funded per year, with an investment of 2 million yuan (direct cost) by NSFC for each project.

(2) Bilateral workshop

NSFC and NRF support bilateral workshops every year. The themes and number of workshops to be funded would be decided by both sides through negotiation.

Thailand

National Research Council of Thailand (NRCT)

NSFC and NRCT would jointly support joint research project, exchange project and bilateral workshop.

(1) Joint Research Project

In 2017, the joint call for proposals with specific collaborative topics will be launched by NSFC and NRCT on their websites respectively, and around 6 projects with duration of three years would be funded, with an investment of 3 million yuan (direct cost) by NSFC for each project.

(2) Exchange Project

Chinese and Thai scientists are required to submit proposals to NSFC and NRCT respectively. The two agencies would make a funding decision after consultation.

(3) Bilateral Workshop

NSFC and NRCT support bilateral workshops every year. The themes and number of workshops to be funded would be decided by both sides through negotiation.

Thailand Research Fund (TRF)

NSFC and TRF would jointly support joint research project, exchange project and bilateral workshop.

(1) Joint Research Project

In 2017, the joint call for proposals with specific collaborative topics will be launched by NSFC and TRF on their websites respectively, and around 5 projects with duration of three years would be funded, with an investment of 3 million yuan (direct cost) by NSFC for each project.

(2) Exchange Project

Chinese and Thai scientists are required to submit proposals to NSFC and TRF respectively. The two agencies would make a funding decision after consultation.

(3) Bilateral Workshop

NSFC and TRF support bilateral workshops every year. The themes and number of workshops to be funded would be decided by both sides through negotiation.

Singapore

NSFC and National Research Foundation of Singapore (NRF) carry out their joint funding on joint research project and bilateral workshop.

(1) Joint Research Project

In 2017, the joint call for proposals with specific collaborative topics will be launched by NSFC and NRF on their websites respectively, and around 10 projects with duration of three years would be funded, with an investment of 2 million yuan (direct cost) by NSFC for each project.

(2) Bilateral workshop

NSFC and NRF support bilateral workshops every year. The themes and number of workshops to be funded would be decided by both sides through negotiation.

Pakistan

NSFC and Pakistan Science Foundation (PSF) carry out their joint funding on joint research project and bilateral workshop.

(1) Joint Research Project

In 2017, the joint call for proposals with specific collaborative topics will be launched by NSFC and PSF on their websites respectively, and around 10 projects with duration of three years would be funded, with an investment of 3 million yuan (direct cost) by NSFC for each project.

(2) Bilateral workshop

NSFC and PSF support bilateral workshops every year. The themes and number of workshops to be funded would be decided by both sides through negotiation.

Other Cooperation Channels

NSFC has signed bilateral collaborative agreements for funding personnel exchange projects and bilateral workshops with the Department of Science and Technology of India (DST), Council of Scientific & Industrial Research of India (CSIR), Academy of Scientific Research and Technology of the Arab Republic of Egypt (ASRT), etc. The specific projects are jointly decided on a case by case basis through mutual agreement.

International Scientific Organizations

Center of European Nuclear Research (CERN)

According to the cooperation agreement with CERN, NSFC supports Chinese scientists' participation in LHC experiment at CERN together with the Chinese Ministry of Science and Technology and the Chinese Academy of Sciences.

International Center for Theoretical Physics (ICTP)

About 50 Chinese young scholars are funded by NSFC every year in the areas of mathematics, physics and earth sciences to participate in various research activities at ICTP, such as summer seminars and short-term joint research.

An open call for candidates of short-term specific activities at ICTP would be announced on NSFC's website in November every year. A name list of candidates would be recommended by NSFC to ICTP after being selected by relevant experts. The recommended candidates should apply to ICTP according to requirements of each ICTP activity.

International Institute of Applied Systems Analysis (IIASA)

NSFC encourages Chinese scientists to conduct multilateral cooperation with various IIASA Programs in the areas of energy, environment, land use, water, population, etc., and to jointly apply for research funding from various governmental organizations, private and national science foundations, World Bank and EU Framework Program.

NSFC provides full support for 5-7 Chinese young scholars to participate in the annual 3-month Young Scientists Summer Program (YSSP) from June to August at IIASA in Vienna every year. For detailed information and application forms, please refer to the IIASA website at www.iiasa.ac.at. Besides, NSFC also supports workshop, exchange and joint research projects jointly applied by Chinese and IIASA scientists.

As per its 10-Year Strategic Plan (2011-2020), Chinese scientists and IIASA

researchers are encouraged to conduct joint scientific research on 3 global issues, i.e., food and water, energy and climate change, poverty and equity, based on systematic analysis methods.

For more information in 2017, please refer to the call for proposals to be launched by NSFC on its website in due time.

Consultative Group on International Agricultural Research (CGIAR)

NSFC has reached agreements with 11 CGIAR institutions/centers (i.e., Bioversity, CIAT, CIFOR, CIMMYT, CIP, ICARDA, ICRAF, ICRISAT, IFPRI, ILRI, and IRRI) to fund joint research projects conducted by scientists from both sides.

The call for proposals will be released by NSFC on its website in February every year, and the deadline for application is April 20th. Around 18 projects are planned for funding in 2017 with an average funding amount of 2 million yuan (direct cost) per project with duration of 5 years.

United Nations Environment Program (UNEP)

According to the cooperation agreement between NSFC and UNEP, both sides would support scientists to conduct scientific collaborative research in the fields of eco-system management, climate change, disaster prevention & reduction, and resource efficiency. Special importance is placed on cooperation with developing countries in Africa and Asian-Pacific regions.

The call for proposals will be released by NSFC on its website in February every year, and the deadline for application is April 20th. Up to 4 projects are planned for funding in 2017, with a funding amount of 3 million yuan (direct cost) per project for 5 years.

International Union of Pure and Applied Chemistry (IUPAC)

According to the agreement among NSFC, Sao Paulo Research Foundation (FAPESP), the U.S. National Science Foundation (NSF), the German Research Foundation (DFG), and the International Union of Pure and Applied Chemistry (IUPAC), scientists from above countries would be co-funded to carry out joint research in the field of sustainable chemistry starting from 2013. IUPAC is responsible to provide the project implementation framework and scientific guidance including the launch, review and funding of multilateral projects under the support of all contracting funding agencies and research organizations. For more information regarding application in 2017, please refer to the call for proposals to be launched by NSFC on its website in due time.

Multilateral Collaboration under Belmont Forum (BF/IGFA)

According to the agreement between NSFC and Belmont Forum, since 2014 NSFC has supported Chinese scientists to participate in the multilateral cooperation under the framework of Belmont Forum. For more information regarding application in 2017, please refer to the call for proposals to be launched by NSFC on its website in due time.

International Centre for Integrated Mountain Development (ICIMOD)

According to the agreement between NSFC and ICIMOD, starting from 2016, both sides would support Chinese scientists, ICIMOD scientists and scientists from ICIMOD

member countries to carry out cooperation and advance research in China and the surrounding countries on the region of Hindu Kush-Himalayas. For more information regarding application in 2017, please refer to the call for proposals to be launched by NSFC on its website in due time.

BRICS STI Framework Program

According to the agreement to fund joint research projects under the framework of BRICS STI Framework Program among research funding agencies such as NSFC, Chinese Ministry of Science and Technology (MOST), Brazil National Council for Scientific and Technological Development (CNPq), Foundation for Assistance to Small Innovative Enterprises of Russia (FASIE), Russia Ministry of Education and Science (MON), Russian Foundation for Basic Research (RFBR), Department of Science and Technology of India (DST), Department of Science and Technology of South Africa (DST), and National Research Foundation of South Africa (NRF), the aforementioned sides would jointly support scientists of those countries to carry out cooperation starting from 2016. For more information regarding application in 2017, please refer to the call for proposals to be launched by NSFC on its website in due time.

America and Australasia

USA

The National Science Foundation (NSF)

NSFC and NSF jointly support research projects and bilateral workshops.

(1) Joint Research Project

NSFC and NSF accept joint research applications in the areas of environment sustainability, biodiversity, etc. irregularly throughout the year.

NSFC-NSF Joint Research Program on Biodiversity

To promote joint research on biodiversity between Chinese and US scientists, NSFC and NSF together fund joint research projects with an implementation period of 5 years between scientists of both countries. NSFC provides up to 3 million yuan for each approved project. For information about the specific application requirements in 2017, please refer to the call for proposals to be released on NSFC's website.

NSFC-NSF Joint Research Program on Environment Sustainability

NSFC and NSF together fund joint research projects in the area of Environment Sustainability between scientists of China and the U.S. NSFC provides up to 3 million yuan for each approved project with an implementation period of 4 years. Three projects of this kind were jointly funded by NSFC and NSF at the end of 2016. For information about the specific application requirements in 2017, please refer to the call for proposals to be released on NSFC's website.

(2) Bilateral Workshop

NSFC and NSF will continue to fund bilateral workshops in areas and numbers mutually identified and agreed by both parties.

The National Institutions of Health (NIH)

NSFC and the U.S. National Institutions of Health (NIH) signed an MOU in October 2010 to jointly support research projects and bilateral workshops.

(1) Joint Research Project

In 2016, NSF and NIH launched a call in cancer, allergic diseases, infectious diseases including HIV/Aids and comorbidities, medical immunology, mental health with an average funding of 2 million yuan (including direct costs and indirect costs) for 5 years per project. 24 projects of this kind were jointly funded.

For information about the specific application requirements in 2017, please refer to the call for proposals to be released on NSFC's website.

(2) Bilateral Workshop

NSFC and NIH will continue to fund bilateral workshops in areas and numbers mutually identified and agreed by both parties.

Bill & Melinda Gates Foundation (BMGF)

NSFC and Bill & Melinda Gates Foundation (BMGF) signed an MOU in October 2015 to jointly support research projects and bilateral workshops.

(1) Joint Research Project

In February 2016, NSFC and BMGF announced a call for proposals according to their agreement and 4 projects were jointly funded. For information about the specific application requirements in 2017, please refer to the call for proposals to be released on NSFC's website.

(2) Bilateral Workshop

NSFC and BMGF will continue to fund bilateral workshops in areas and numbers mutually identified and agreed by both parties.

Canada

Canada Institutions of Health Research (CIHR)

NSFC and CIHR jointly support research projects and bilateral workshops.

(1) Joint Research Project

In 2017, NSFC and CIHR will jointly support research projects in the areas of mental health and dementia. NSFC will provide up to 5 million yuan for each approved project with an implementation period of 5 years. Up to 7 projects are expected to be jointly supported. For information about the specific application requirements, please refer to the call for proposals to be released on NSFC's website.

(2) Bilateral Workshop

NSFC and CIHR will continue to fund bilateral workshops in areas and numbers mutually identified and agreed by both parties.

Natural Sciences and Engineering Research Council of Canada (NSERC)

Exchange of Postdoctoral Fellows

Based on the agreement between NSFC and NSERC, the two agencies will jointly support Canadian postdoctoral fellows to do basic research in China for two years starting from 2015. NSERC will cover the salaries and living costs of the Canadian postdoctoral fellows. NSFC will cover relevant research costs of the Canadian postdoctoral fellows. For specific application requirements in 2017, please refer to the call for proposals to be released on NSFC's website.

Fonds de Recherche du Québec (FRQ)

NSFC and FRQ jointly support research projects and bilateral workshops.

(1) Joint Research Project

In 2015, NSFC and the department of Natural Science and Technology of FRQ (FRQ-NT) launched a call for proposals in areas of global change and photonics. Three projects of this kind were jointly funded. In 2016, NSFC and the department of Health Research of FRQ (FRQ-S) launched a call for proposals in the area of cancer research. Three projects of this kind were jointly funded. For specific application requirements in 2017, please refer to the call for proposals to be released on NSFC's website.

(2) Bilateral Workshop

NSFC and FRQ will continue to fund bilateral workshops in areas and numbers mutually identified and agreed by both parties.

Australia

National Health and Medical Research Council of Australia (NHMRC)

NSFC and NHMRC signed an agreement on cooperation in Jan., 2013 to jointly support research projects and bilateral workshops.

(1) Joint Research Project

Based on mutual agreement, NSFC and NHMRC launched a joint call for research proposals in the field of type-2 diabetes in February 2015. Seven projects of this kind were jointly funded. For specific application requirements in 2017, please refer to the call for proposals to be released on NSFC's website.

(2) Bilateral Workshop

NSFC and NHMRC will continue to fund bilateral workshops in areas and numbers mutually identified and agreed by both parties.

Brazil

National Council for Scientific and Technological Development (CNPq)

In May 2014, NSFC and CNPq signed an agreement of scientific cooperation to jointly support research projects and bilateral workshops. Biodiversity, green energy, aerospace and ocean research were identified as priority research areas for collaboration.

For specific application requirements in 2017, please refer to the call for proposals to be released on NSFC's website.

Chile

National Commission for Scientific and Technological Research of Chile (CONICYT)

In August 2014, NSFC and CONICYT signed a MoU to jointly support research projects and bilateral workshops. Aerophysics and seismic study were identified as priority areas of collaboration.

For specific application requirements in 2017, please refer to the call for proposals to be released on NSFC's website.

Argentina

National Scientific and Technical Research Council of Argentina (CONICET)

In June 2015, NSFC and CONICET signed a MoU to jointly support research projects and bilateral workshops.

For specific application requirements in 2017, please refer to the call for proposals to be released on NSFC's website.

Ecuador

Secretaria de Educacion Superior, Ciencia, Tecnologia e Innovacion (SENESCYT)

In Jan. 2015, NSFC and SENESCYT signed a MoU to jointly support research projects and bilateral workshops.

For specific application requirements in 2017, please refer to the call for proposals to be released on NSFC's website.

Europe

European Union

European Research Council (ERC)

Talent Program

NSFC and ERC together fund Chinese researchers to go to Europe for single long-term or multiple short-term research visits (6-12 months in total). Chinese researchers could join the ERC-funded project teams to carry out joint research of mutual benefits in closely related scientific fields. NSFC will support the international travel expenses of the Chinese researchers while ERC will provide their local and research costs in Europe through its funded projects. For detailed requirements, please refer to the call for proposals to be launched on NSFC's website.

UK

Royal Society (RS)

(1) Exchange Program

NSFC and the Royal Society of UK (RS) provide support for exchange visits between Chinese and UK researchers with duration of 2 years. NSFC provides up to 100,000 yuan for each project, covering international travel costs of Chinese scientists to UK and local costs of British scientists in China. RS provides at most 12,000 pounds for each project, covering international travel costs for British scientists to China and local costs for Chinese scientists in UK. In August 2016, NSFC and RS announced their call for proposal simultaneously in both countries. Chinese scientists shall submit proposals directly to NSFC and UK scientists to RS, and the results will come out in Jan. 2017. Projects approved will start on April 1, 2017 and end on March 31, 2019.

(2) Talent Program

NSFC, RS and the Academy of Medical Sciences (AMS) together set up the Talent

Program to support the exchange visits as well as joint research activities between excellent young Chinese researchers and their British collaborators. NSFC will provide, in a period of three years, up to half a million yuan for each grantee while RS or AMS will offer up to 111 thousand pounds for each grantee to use as salary top-up, research and training as well as international cooperation and exchange costs. In July 2016, NSFC and RS announced their call for proposal simultaneously in both countries. Chinese scientists shall submit proposals directly to NSFC and UK scientists to RS, and the results will come out in Jan. 2017. Projects approved will start on April 1, 2017 and end on March 31, 2019.

Royal Society of Edinburgh (RSE)

Exchange Program

NSFC and the Royal Society of Edinburgh (RSE) provide joint funding for 2-year joint projects between scientists from China and Scotland, UK, in areas of common interest, according to the MOU signed between NSFC and RSE. The specific areas for cooperation and the number of projects to be approved each year are decided by both sides through negotiation. NSFC provides up to 100,000 yuan for each project, covering international travel costs for Chinese scientists to UK and local costs for British scientists in China. RSE provides at most 12,000 pounds for each project, covering the international travel costs for British scientists to China and local costs for Chinese scientists in UK. NSFC and RSE will announce their call for proposal simultaneously in both countries at the end of 2016. Chinese scientists should submit proposals directly to NSFC and Scottish scientists to RSE, and the result will come out at the start of 2017. Projects approved will start on March 1, 2017 and end on April 30, 2019.

Research Councils UK (RCUK)

(1) Joint Research Program

NSFC, together with EPSRC, BBSRC, NERC, MRC, ESRC and STFC, the 6 research councils under RCUK, support substantial collaborations between scientists of both countries in areas of common interest, in consideration of the existing cooperation between scientists. NSFC and the RCUK will announce their call for proposal after discussion, and scientists from both countries shall submit proposals to their respective funding agencies. According to the agreed evaluation approach and procedures, NSFC and RCUK will jointly make decisions for funding. For detailed requirements about applications in 2017, please refer to the call for proposals to be launched on NSFC's website.

(2) Bilateral Workshop

NSFC will continue to cooperate with EPSRC, BBSRC, NERC, MRC, ESRC and STFC to fund small-scale bilateral workshops co-organized by Chinese and British scientists.

British Council (BC)

Bilateral Workshop

According to the MoU signed between NSFC and BC, both sides will together support small-sized bilateral academic workshops between young Chinese and British researchers to help them build up networks and thus have better career opportunities. In July 2016, NSFC and BC announced their call for proposals simultaneously in both countries. Chinese scientists shall submit proposals directly to NSFC and UK scientists to BC, and the results will come out in Jan. 2017. Projects approved will start on Jan. 1, 2017 and end on Dec. 31, 2017.

Germany

German Research Foundation (DFG)

According to the agreement on cooperation between NSFC and DFG, both sides provide support for joint research projects in areas of common interest between researchers from China and Germany.

For detailed requirements about applications in 2017, please refer to the call for proposals to be launched on NSFC's website. Scientists from both countries shall submit proposals to their respective funding agencies, and according to the agreed evaluation approach and procedures, NSFC and DFG will jointly make decisions for funding.

France

French National Center for Scientific Research (CNRS)

Exchange Program

NSFC and CNRS support exchange visits with duration of 3 years between Chinese and French scientists. NSFC funds up to 150,000 yuan for each project, covering the international travel costs for Chinese scientists to France and the local costs for French scientists in China, and CNRS funds the local expenses for Chinese scientists in France and international travel costs for French scientists to China. For detailed application requirements in 2017, please refer to the call for proposals launched on NSFC's website.

French National Research Agency (ANR)

Joint Research Program

According to the MOU signed between NSFC and ANR, both sides encourage substantial cooperation in areas of common interest between scientists and research groups from both countries. For detailed application requirements in 2017, please refer to the call for proposals launched on NSFC's website.

Italy

Ministry of Foreign Affairs and International Cooperation (MAECI)

According to the cooperative agreement between NSFC and MAECI, both sides encourage and support substantial joint research between researchers and research teams from both countries. For detailed requirements about application in 2017, please refer to the call for proposals to be launched on NSFC's website.

Russia

Russian Foundation for Basic Research (RFBR)

According to the MOU between NSFC and RFBR, both sides support personnel exchange (usually less than 3 months) and joint research program between Chinese and Russian researchers.

(1) Joint Research Program

NSFC and RFBR encourage scientists or research teams of both countries to carry out substantial joint research in areas of common interest. The call for proposals for 2017 will be launched on NSFC's website.

(2) Exchange Program

NSFC and RFBR jointly support exchange activities between Chinese and Russian

researchers for duration of 2 years. Projects approved receive a two-year funding of 90,000 yuan from NSFC, for Chinese researchers' international travel and living expenses in Russia. RFBR also provides funding for Russian researchers' international travel and living expenses in China. The call for proposal will be announced on the websites of NSFC and RFBR in 2017.

Finland

Academy of Finland (AF)

According to the agreement of scientific cooperation between NSFC and the Academy of Finland (AF), both sides provide necessary support for joint research program, exchange activities (usually less than 3 months) and bilateral academic workshops between Chinese and Finnish researchers.

(1) Joint Research Program

NSFC and AF encourage scientists or research teams of both countries to carry out substantial joint research in areas of common interest. For detailed requirements about application in 2017, please refer to the call for proposals launched on NSFC's website.

(2) Exchange Program

Chinese and Finnish researchers shall submit their applications for personnel exchanges and visits anytime throughout the year to their respective funding agencies 3 months in advance, and the joint funding decision is made according to respective evaluations and consultation.

(3) Bilateral Workshop

Chinese and Finnish researchers shall submit their applications for bilateral workshops anytime throughout the year to their respective funding agencies 3 months in advance, and the joint funding decision is made according to respective evaluations and consultation.

Netherlands

Netherlands Organization for Scientific Research (NWO)

According to the MOU between NSFC and the Netherlands Organization for Scientific Research (NWO), both sides support joint research programs, personnel exchange (usually less than 3 months) and bilateral academic workshops between Chinese and Dutch researchers.

(1) Joint Research Program

NSFC and NWO encourage scientists or research teams of both countries to carry out substantial joint research in areas of common interest. For detailed requirements about application in 2017, please refer to the call for proposals to be launched on NSFC's website.

(2) Exchange Program

Chinese and Dutch researchers shall submit applications for personnel exchanges and visits to their respective funding agencies 3 months in advance, and both organizations will make joint funding decisions based on respective evaluations. Applicants may submit their applications anytime throughout the year.

(3) Bilateral Workshop

Chinese and Dutch researchers shall submit applications for bilateral workshops to their respective funding agencies 3 months in advance, and both organizations will make

joint funding decisions based on respective evaluations. Applicants may submit their applications anytime throughout the year.

Austria

Austrian Science Foundation (FWF)

Joint Research Program

NSFC and FWF support substantial joint research between scientists from both countries in areas of mutual interest based on the existing collaboration. For detailed requirements about application in 2017, please refer to the call for proposals to be launched on NSFC's website. Researchers from both countries shall submit their proposals to their respective funding organizations. NSFC and FWF will jointly make decisions for funding according to the agreed evaluation approach and procedures.

Switzerland

Swiss National Science Foundation (SNSF)

Joint Research Program

NSFC and SNSF support substantial joint research between scientists from both countries in areas of mutual interest based on the existing collaboration. NSFC and SNSF will together publish guide to programs, decide through discussion how to organize evaluation and jointly make the final funding decision. Researchers from both countries shall submit their proposals to their respective funding organizations.

Portugal

Portuguese Foundation for Science and Technology (FCT)

Joint Research Program

NSFC and FCT support substantial joint research between scientists from both countries in areas of mutual interest based on the existing collaboration. NSFC and FCT will together publish guide to programs, decide through discussion how to organize evaluation and jointly make the final funding decision. Researchers from both countries shall submit their proposals to their respective funding organizations.

Sweden

Swedish Research Council (VR)

Exchange Program

NSFC and VR jointly support exchange visits and small-sized bilateral workshops between scientists from both countries, and the duration of the approved projects is 2 years. NSFC provides the international travel costs for Chinese researchers to Sweden as well as the expenses of accommodation, meals, inter-city transportation of the Swedish researchers in China and small-sized bilateral workshops; VR supports the international travel costs for Swedish researchers to China as well as expenses for the accommodation, meals, inter-city transportation of Chinese researchers in Sweden, small-sized bilateral workshops, joint publications, as well as some communication and research fees. Up to 250 thousand yuan from NSFC and up to 700 thousand Swedish krona from VR is allocated for each approved joint project. For detailed requirements about application in 2017, please refer to the call for proposals to be launched on NSFC's website.

Swedish Foundation for International Cooperation in Research and Higher Education (STINT)

Exchange Program

NSFC and STINT together support the exchange visits and small-sized bilateral workshops between Chinese and Swedish researchers, and the duration of the approved projects lasts 3 years. The funding from NSFC and STINT will cover the international travel costs for Swedish researchers to China and Chinese researchers to Sweden, as well as expenses of the accommodation, meals and inter-city transportation of Swedish researchers in China and Chinese researchers in Sweden, and small-sized bilateral workshops. Up to 400 thousand yuan from NSFC and up to 600 thousand Swedish krona from STINT is allocated for each approved joint project. For detailed requirements about application in 2017, please refer to the call for proposals to be launched on NSFC's website.

Belgium

National Fund for Scientific Research (FWO)

Exchange Program

NSFC and FWO together funds the exchange visits between Chinese and Belgian researchers from the Flanders regions, and the duration of the approved projects lasts 2 years. NSFC will provide the international travel costs for Chinese researchers to Belgium and the local costs of Belgian researchers in China, while FWO will pay for the international travel costs for Belgian researchers to China as well as the local costs of Chinese researchers in Belgium. For detailed requirements about application in 2017, please refer to the call for proposals to be launched on NSFC's website.

Ireland

Science Foundation Ireland (SFI)

Joint Research Project

NSFC and SFI support substantial joint research between scientists from both countries in areas of mutual interest based on the existing collaboration. NSFC and SFI will together publish guide to programs. Chinese and Irish researchers submit to NSFC and SFI respectively. NSFC and SFI jointly make final funding decisions based on the agreed evaluation methods and procedure. For detailed requirements about application in 2017, please refer to the call for proposals to be launched on NSFC's website.

Czech Republic

Academy of Science of the Czech Republic (CAS)

Exchange Program

NSFC and CAS together funds the exchange visits between Chinese and Czech researchers. NSFC supports the international travel costs for Chinese researchers to Czech Republic as well as the local subsistence of Czech researchers in China. CAS funds the international travel costs for Czech researchers to China as well as the local subsistence for Chinese researchers in the Czech Republic. For detailed requirements, please refer to the call for proposals to be launched on NSFC's website

Hong Kong and Macau SARs and Taiwan Region of China

NSFC has established cooperation with the Research Grant Council of Hong Kong (RGC), Beijing-Hong Kong Academic Exchange Centre, Macau Foundation, Macau Foundation for the Development of Science and Technology, and K.T. Li Foundation for the Development of Science and Technology in Taiwan, jointly funding cooperation and exchange between researchers from mainland China and Hong Kong and Macau SARs, and between researchers from two sides of the Taiwan Straits in areas of common interest. Types of activities that can be funded are joint research projects and exchange projects (including academic workshop and exchange visit).

Hong Kong

NSFC and the Research Grant Council of Hong Kong (RGC) will continue to fund join research in areas of natural sciences in 2017. Priority funding areas include information sciences, biological sciences, new materials, marine and environmental sciences, medical sciences, and management sciences. Meanwhile, to encourage academic exchanges between young researchers from Hong Kong SARs and inland China, academic forums are organized and funded in areas of common interest. For detailed requirements, please refer to the call for proposals launched on NSFC's website.

Macau

In 2017, NSFC and Macau Foundation for Science and Technology Development (FDCT) will, under the framework of the newly signed cooperative agreement, together fund joint basic research projects between scientists from inland China and Macau. The priority areas include: information science, TCM research, marine science, environmental science, biological science, new materials, as well as management science. Meanwhile, NSFC and FDCT will organize and fund academic workshops in areas of mutual interest for academic communities from inland China and Macau region. For detailed requirements, please refer to the call for proposals launched on NSFC's website.

Taiwan

NSFC has been dedicated to encouraging and promoting scientific cooperation and exchange between scientists on both sides of the Taiwan Straits. In 2017, NSFC will continue to support cross-Straits academic workshops held by scientists from mainland China and Taiwan region. NSFC will also fund substantial joint research projects according to the consensus reached with K.T. Li Foundation for the Development of Science and Technology. For detailed requirements, please refer to the call for proposals launched on NSFC's website.

In view of the fact that some universities in Hong Kong and Macao have established research branches in different forms in mainland China, NSFC will not accept applications by one scientist as both inland and outside PIs at the same time.

Sino-German Center for Research Promotion

The Sino-German Center for Research Promotion, jointly founded by NSFC and DFG, aims at promoting scientific cooperation and exchange between Chinese and German researchers in the fields of natural sciences, engineering sciences, and management sciences. NSFC and DFG provide respectively 50% of the Center's budget and the budget for 2017 is around 4,350 million yuan.

The budget of the Center is a special fund for organization and funding of joint research and academic activities between universities and research institutions from China and Germany. Scientists from universities and academic institutions from both China and Germany are eligible to apply for the funding. **The funded projects by the Center will not be counted into the limitation on the number of projects one PI may hold according to NSFC regulations.** Chinese applicants shall have been previously funded by NSFC, with the exception of young researchers under the age of 35 with a PhD degree. German applicants should apply in line with DFG requirements. The Center accepts proposals submitted jointly by Chinese and German scientists at any time of the year, but applications have to be submitted at least 4 months prior to the implementation of the planned academic activities. Applications must be written in both Chinese and German or Chinese and English and the content of the Chinese and German (English) version applications shall be the same. In the applications, the content, theme, academic significance and academic purpose of the project, the participants, contact information, detailed schedule as well as specific costs and distribution shall be specified. Related personnel costs shall be listed according to the funding standard set by the Center on its website. The application form can be downloaded from the Center's website, and shall be submitted directly to the Center after completion (8 hard copies and one electronic copy for each application). The applications will be evaluated by Chinese and German reviewers and the Center will make final decision according to the evaluation results. Specific requirements and relevant information are available on the website of the Center (http://www.sinogermanscience.org.cn).

The Center currently provides funds for the following categories of activities:

1. Bilateral Academic Workshop

The Center encourages Chinese and German scientists to have in-depth discussion on cutting edge issues in a certain scientific research area. The main purpose of the workshop, which can be held either in China or in Germany, is to foster joint research projects through discussion and exchange. Each workshop can have 8-15 participants from the sending party, more but at most 25 participants from the host party. Participants shall represent the academic level of the relative country and come from different universities or scientific institutions. The Center provides funding for international travel expenses and local subsistence of all formal participants and other necessary costs for the workshop. The Center does not provide funding for participants from industries or administrative institutions or postgraduates. Participants from a third country can be invited to attend the workshop and their costs will be covered by the workshop, but the total number of them should be no more than 20% of the number of participants from the sending party.

2. Sino-German Joint Research Group

The Center adopts flexible modules to fund Sino-German joint research groups for

in-depth cooperation between Chinese and German scientists in areas of common interest. Chinese and German scientists may apply for this program to plan for larger projects and establish necessary collaborative platform. Funding for this program covers costs for bilateral workshops, short-term exchange visits, joint research, publications and consumables, etc. Applicants may apply for funding according to the funding requirements of the Center, which does not provide staff salaries. Applicants must be participants of workshops or undertakers of projects funded by the Center so as to ensure a solid foundation for cooperation. The funding period is 3 years and should not be extended. Funding for each project approved is usually 3 million yuan (or equivalent Euros) for both Chinese and German scientists.

3. Funding Schemes for Young Scientists

(1) Short-term Seminar

The scheme aims to introduce advanced scientific methods, techniques and their applications and provide training on specific issues in a certain area. The Center may fund 4 to 6 senior scientists from both countries as lecturers and participants shall be mainly university undergraduates, graduates or young researchers. The number of participants is assessed according to specific conditions, such as equipment and infrastructure of the laboratory, but it shall not exceed 40 people in total. The number of participants shall not exceed 15 from sending party, and 25 from the hosting party. The seminar can be held either in Germany or in China and usually lasts at most 14 days, including two days for arrival and departure. Funding includes international travel, local accommodations as well as costs for the organization of the meeting and academic tours.

(2) Lindau PhD Students Program and Post-Lindau Program

Lindau Program: The Center, together with Lindau Nobel Laureates Foundation, funds 30 (including 15 in the field of economics) excellent PhD students or post-doctors under the age of 35 to participate in the Nobel Laureate meeting in Lindau, Germany, followed by a week-long visit to the German research institutions. Candidates are selected throughout the country and must be recommended by their home institutions. The final approval list is decided by correspondence review and interviews by Chinese and German reviewers.

Post-Lindau Program: grantees with PhD degree of this program may apply for the funding from the Center for a stay of less than 12 months in Germany if they could get invitations from German research institutions or universities, and approval from their host institutions.

(3) Visit of German Excellent Young Researchers to China

This funding scheme is launched by the Center for excellent young German scientists. During the trial period, eligible applicants for this program are grantees of DFG's Emmy Noether Program or other programs of equivalent quality, such as the principle investigators of SFB-excellent Young Research Groups, grantees of the ESF Starting Grants, Lichtenberg Professorship and principle investigators of Young Research Teams. The Center funds German young scientists to come to China for academic visits and research, and explore bilateral cooperation with their Chinese partners. The funding covers international and domestic travel costs and local subsistence in China. Short-term academic visits usually last less than 2 weeks, cover at most 3 cities, and shall be arranged by host institutions and hosts.

(4) Young Scientists Forum

The forum aims at providing an opportunity for Chinese and German young scientists to meet and discuss with the outstanding scientists in their own fields. The forum shall have a specific focused theme and can in principle invite at most 40 young scientists under the age of 40, and one senior scientist from each side depending on the scale of the forum. The number of participants shall not exceed 15 from sending party, and 25 from the hosting party. Funding includes international and domestic travel costs, local subsistence and other necessary costs for the forum.

4. Publication

The Center funds publication of proceedings, joint publications and special journals for scientific results of Chinese and German cooperation. Funding will be at most 5,000 Euros or 50,000 yuan. The Center does not fund publication of textbooks, translated works, etc.

5. Pre-Activity Planning

The Center invites application from qualified applicants who would like to pay a visit to make preparation and plans for a meeting or a project, and to organize small-scale meetings to formulate such plans. The funding is provided for a short visit of less than 5 days and only 1 person can be funded.

6. Personnel Exchange Program

Undertakers of various on-going funding programs or programs that have just come to an end can apply for this program, and the specific requirements will be published online recently.

The Research Fund for International Young Scientists

The Fund supports foreign young scientists to conduct basic research in mainland China in all areas of NSFC's funding scope so as to promote long-term sustainable academic collaboration and exchanges between Chinese and foreign young scientists.

Grantees are also eligible for renewing the existing Fund in case of need.

Applicants with foreign citizenship should meet the following qualifications:

(1) Less than 40 years old by Jan. 1, 2016 (born on or after Jan. 1, 1976);

(2) Have a PhD degree;

(3) Have the experience of conducting basic research or postdoctoral research;

(4) Guarantee of full-time work at the host institutions during the project implementation;

(5) Abide by Chinese laws and NSFC's relevant rules and regulations while doing research in China.

The host institution should meet the following conditions:

(1) Appoint a contact person responsible for providing consultation to the institution's applicant and assist project management such as the use of budget.

(2) Sign an agreement with the applicant. The agreement should include the following items:

(i) The title of the research project and the expected outcomes;

(ii) Living expenses and necessary working conditions that the host institution offers;

(iii) The attribution of the intellectual property;

(iv) Obligation to have applicant work in full time at the host institution during the project implementation.

The PI of the granted project can apply for renewal if needed and provided that the on-going project has made good progress.

In 2015, 107 foreign young scientists were granted with 28 million yuan direct cost. Among them, 17 foreign young scientists were granted project renewal. It is expected that 120 foreign young scientists (includes 20 project renewal) will be granted with 30 million yuan direct cost in 2016.

Project duration: one year or two years starting from Jan. 1, 2018.

Award size: 200,000 yuan per project for one year or 400,000 yuan per project for two years, the award only includes direct cost.

Application procedure

Applicants should fill out and submit on-line proposal forms via the Internet-based Science Information System (ISIS) with the following supplementary documents:

(1) Copy of agreement signed by applicant and host institution;

(2) Copy of applicant's PhD degree certificate;

(3) Copies of the front pages of no more than five representative papers.

Please pay attention to the column of Research Fund for International Young Scientists on NSFC's homepage for more detailed information on application and requests.

Please visit http://www.nsfc.gov.cn/nsfc/cen/gjhz/jjzb/index.html.

Programs of Joint Funds

The joint funds set up by NSFC and other relevant government departments, provincial governments and industrial sectors aim at supporting basic research in agreed scientific areas.

The joint funds are designed to play a guiding role of the National Natural Science Fund, guide and integrate social resources in basic research, promote cooperation of relevant departments, industries and regions with universities and research institutions, foster scientific and technological talents and enhance China's indigenous innovation capabilities in relevant areas, industries and regions.

The joint funds are part of the Natural Science Funds. The application, evaluation and management of the joint funds will comply with management methods such as the *Regulations*, *NSFC's Rule on Funding Management* and *NSFC's Rule on Joint Fund Management*.

In 2017, the joint funds in the *Guide* include NSAF Joint Fund, Join Fund of Astronomy, Joint fund of Research on Major Science Facilities, Iron and Steel Joint Fund, Civil Aviation Joint Fund, NSFC-General Technology Joint Fund on Basic Research, NSFC-Automobile Industry Innovation Development Joint Fund, NSFC-Guangdong Joint Fund, NSFC-Yunnan Joint Fund, NSFC-Xinjiang Joint Fund, NSFC-Henan Joint Fund, Joint Fund for Promoting S&T Cooperation across the Taiwan Strait, NSFC-Liaoning Joint Fund, NSFC-Zhejiang Joint Fund for the Fusion of Informationization and Industrialization, and NSFC-Shanxi Joint Fund for Coal-Based Low Carbon Research, NSFC-Guangdong Big Data Science Center Program and NSFC-Shenzhen Robot Basic Research Center, etc. **Guidance for other Joint Funds will be published on NSFC website.**

Applicants for the Joint Funds should:

(1) Have the experience of conducting basic research;

(2) Have senior professional position (title) or PhD degree;

(3) Meet other requirements in the Guide to Programs.

For any research achievements of the Joint Fund, NSFC's contribution and support to the project should be acknowledged in a prominent place and in an appropriate form according to the *Guide* with the name of the joint fund and the project number.

Applicants for the joint funds should be prepared according to relevant project type (such as General Program or Key Program) outlines. Please select “Joint Fund” for funding category, “Fostering Program Project” or “Key Program Project” or “Foster Local Talents” or “Center Project” or “Integrated Project” for subcategories, and select the name of the joint fund in the notes section. **Applications without correct selection will not be accepted.**

NSAF Joint Fund

Jointly set up by NSFC and the China Academy of Engineering Physics (CAEP), the Fund is aimed to encourage scientists in related fields to carry out basic and applied researches for national security, so as to explore new research directions, discover new phenomena and laws, upgrade the innovative ability of science and technology in national defense, and foster young professionals in this area.

In 2017, this joint fund plans to fund two types of projects, namely "Key Program Project" and "Fostering Program Project". The Key Program project has 7 directions, with average direct cost funding of 2.4 to 3 million yuan per project for 4 years. There are 9 encouraged research directions for Fostering Program Project, and 42 projects with defined targets are planned to be funded with an average funding of 650,000 yuan per project for 3 years.

I. Directions for Key Program Project

1. The microstructure characterization and thermodynamic response of TATB based explosives

2. High accuracy detonation models and its uncertainty evaluation

3. Investigation on some key problems of the dynamic-static melting curve discrepancy in the VB group elements

4. The studies on basic problems of high-performance terahertz tomography based on quantum cascade lasers

5. Theory and simulation study on the pulsed vacuum arc plasma plume

6. Interactions of Am(III) and Eu(III) with typical colloids in the environment

7. Simulation and prediction of strain generation and evolution in the growth of typical thin films

Note: CAEP researchers can apply for or participate in application for this program. Collaboration among two or three institutions is encouraged.

II. Directions and Projects for Fostering Program Projects

1. Projects for encouraged research directions

(1) High order numerical methods for compressible multiphase flows

(2) Study on multiscale dislocation dynamics plasticity model for the dynamic mechanical behavior of polycrystalline metal

(3) Research on conducting property of friction pairs composed by Au based alloys in complex moving mode under multi-factor conditions

(4) The mechanism for body stress and crack propagation in ceramics under thermo-mechanical loads

(5) Study on micro scale structure stress and mechanical characterization in package devices

(6) New methods for solid-state amplification and low-loss transmission of terahertz waves

(7) Physical principle and key techniques of micro-nano inertial sensors based on cold atom interference

(8) Shape extraction and fine recognition methods for non-cooperation target base on FMCW microwave imaging

(9) Transport mechanism study of ion in solid state lithium battery and exploration of novel materials system

Note: CAEP researchers may not apply, but may be a participant.

2. Projects with defined targets

(1) Investigation on the chemical reaction mechanism of high nitrogen content pyrazine-based explosives

(2) Research on the shaping behavior and initiation mechanism of reactive jet

(3) The study of multi-dimensional Riemann problem for multi-fluid flows

(4) Spatio-temporal multiscale method based on continuum and kinetic theory

(5) Numerical study on RM instability of reactive fluids laden with dispersed particles

(6) The investigation on mechanisms for penetration of concrete target driven by long rod projectile under super high speed

(7) Local nonlinear dynamic modeling and prediction of structural vibration

(8) Prediction confidence assessment method for models with multiple response variables

(9) Study on the machining mechanism of 3D micro/nano structures on spherical surface based on micro force control

(10) Measuring method of ultra-high-dynamic-range temporal contrast for ultra-short pulse laser

(11) Study on the miniaturization key technique of 11MeV deuteron linear accelerator

(12) Research of low contrast image enhancement and multi-mode tomography for fast neutron imaging based on accelerator

(13) Influence behavior of topology structure to polysiloxane melt rheology performance

(14) Investigation on a new targeted nanomaterial agent for in-vivo contrast-enhanced terahertz imaging

(15) Research of multi-physics co-analysis for stacked RF-SiP

(16) Joining physical mechanism research on micro spot resistance welding of micro filament

(17) Theoretical study on thermal wave thermography inspection by synthetic-aperture for area defect of micro solder joint

(18) Real time control of multi feedback loop for phase matching and distinguish method of weak signal

(19) The study on highly-precise synchronization technique based on free-space frequency transfer

(20) Fast direct finite element solver for large scale electromagnetic computation

(21) The measurement algorithm research of aerocraft's relative position and attitude based on non-cooperation target image

(22) Robust modelling and control of multi-axis motion with time-varying uncertainties

(23) Intelligent recognition of multiple objects for laser point cloud based on machine learning

(24) Research on design method and output laser characteristics of field-flattened, a high-order mode fiber

(25) Study on generation of near transform-limited pulse from fiber laser by spectral-breathing self-similarity

(26) Research on mid-infrared Raman laser with high power and high brightness

(27) Research on analysis of mode output and measurement method for high power fiber lasers

(28) Three-dimensional measurement of non-uniform stress field in sub-surface of optical component

(29) Research on constitutive mechanism and configuration design of high-current electron gun by multipactor

(30) Study of the photocathode based on plasmon-enhanced metal-semiconductor nanostructures

(31) The study of phase transformation stress relaxation of NiTiNb shape memory alloy

(32) Study on the fundamental issues of aluminum composites with lead

(33) Correlation model for the component and structure-mechanical property of PBX explosives

(34) The mechanism of plume formation for laser welding of metals with low ionization energy and its influence on laser transmission

(35) Research of radiation effects at cell and tissue scales based on organ chip

(36) Numerical simulation and performance evaluation of failure behavior of polymer foam in abnormal environments

(37) Study on the formation mechanism of energetic cocrystal

(38) Phase transition control method and mechanism of high explosive

(39) Building of high effective thermal conductive path in polymer binder and mechanism study

(40) Study on the penetration behavior of multicomponent mixed-gases in special rubber sealant materials

(41) Influence factors and mechanism of the hydrogen-helium damage on the hydrogen resistant steel membrane

(42) Study on heat conduction network and mechanism of elasticity matrix phase change composite materials

Note: CAEP researchers may not apply, but may participate in projects.

Please refer to separate publications or the CAEP website (http://www.caep.ac.cn) for detailed information on specific content and form of research results, etc.

Joint Fund of Astronomy

NSFC and the Chinese Academy of Sciences (CAS) jointly set up the Joint Fund of Astronomy, which opens to all universities and research institutions in China (especially non-astronomy research ones), and combine NSFC's strength in evaluation, funding and management with the function and roles of the national research platforms (observation bases) in astronomical fields that have already been established by the Chinese Academy of

Sciences. This combination will promote the effective use of these facilities to conduct astronomical research by researchers in universities and other research institutions, develop astronomical methods and technology, improve observation capacity of these facilities, foster research talents in related areas, improve innovation capabilities and academic positions internationally, and make astronomical research in China better serve the national strategic needs.

The Joint Fund of Astronomy includes “Fostering Program Project” and “Key Program Project”. Key Program Project will not specify project titles and applicants may decide their project titles, research contents, research schemes and research funding according to the following 1-5 important scientific issues. The sixth issue is not within the scope of Key Program Project. In 2017, the Joint Fund of Astronomy plans to fund about 6-9 Key Program projects.

As a part of the National Natural Science Fund, the application, evaluation and management of the Joint Fund of Astronomy comply with the regulations of NSFC and the agreement signed between NSFC and CAS. In 2017, for the Fostering Program Project, the average direct cost funding will be 500,000 yuan per project for 3 years, and for Key Program Project, the average direct cost funding will be 2.5 million yuan per project for 4 years.

Funding Areas in 2017

(1) Use of observation facilities of all wave band and data to conduct observation and theoretical research on cosmology, galaxies, stars, the sun and solar systems and other basic astronomical areas by scientists from research institutions and universities outside CAS astronomical observatory system (researchers in CAS astronomical observatory system are not allowed to apply as PIs, but may participate in the research as principal members of the research group).

(2) Focus on observation techniques for space programs, including new observation techniques, new methods in space and pre-studies on key techniques of astronomical satellite, etc.

(3) High energy, ultraviolet, optical, infrared and radio techniques related to astronomical observations, including high energy X, γ imaging technology, high-resolution detector technology (position resolution and energy resolution) and polarized measurement, the detection of week photoelectric signals, storage and transmission techniques, high energy, optical, infrared and radio techniques related to astronomical telescopes, automated control techniques and machinery, etc.

(4) Applied basic research on problems in major astronomical projects such as data, computation and information access, etc., including storage and sharing of mass astronomical data, data mining, high performance computation and virtual observatory techniques.

(5) Basic astronomical methods (astronomical measurement and celestial mechanics) and key scientific issues originated from national strategic needs.

(6) Pre-studies on scientific problems and technical schemes in large astronomic observation facilities that are under planning, including frontier scientific problems to be studies, assessment on proposed technical scheme for planned observation facilities, clarify technical parameters of the facilities, and verification of scientific targets according to the

capability of the planned observation facilities (only Fostering Projects are accepted in this area).

Joint Fund of Research on Major Science Facilities

NSFC and the Chinese Academy of Sciences (CAS) have jointly set up the Joint Fund of Research on Major Science Facilities, which aims at making use of NSFC's strength in evaluation, funding and management to attract researchers in universities and research institutions to conduct frontier, multidisciplinary and intercrossing researches by using national major science facilities built by the CAS, foster research talents of major science facilities, develop new research directions, bring into full play the overall capability of these major science facilities, promote the exchange and opening up, upgrade our innovation capability in basic science and creativity in frontier science areas and improve international standings of China, and make Chinese basic research better serve the national strategic needs.

As a part of the National Natural Science Fund, the application, evaluation and management of the Joint Fund of Research on Major Science Facilities comply with the regulations of NSFC and the agreement signed between NSFC and CAS. The major science facilities referred to in this joint fund are BEPC and BES in Beijing, HIRFL-CSR in Lanzhou, SSRF in Shanghai (including protein facilities), and NSRL and SHMFF in Hefei.

The Joint Fund of Research on Major Science Facilities includes "Fostering Program Project" and "Key Program Project. In 2017, the average direct cost funding for a Key Program Project is 2.4-2.6 million yuan per project for 4 years and that for Fostering Program Project is not less than 540,000 yuan per project for 3 years.

I. Three Major Funding Areas

(1) Research using general equipment, focusing on multi-disciplinary research in physical sciences, information sciences, materials sciences and environmental sciences, etc., and the development of new research directions.

(2) Research using special devices, such as high energy physics research on BESIII and nuclear physical research on HIRFL-CSR in Lanzhou.

(3) Research on techniques and methods that improve the experimental capability of major facilities and the development and key technology for small specialized devices.

II. Priority Research Areas in 2017

Fostering Program Project

Multidisciplinary research on synchrotron radiation in physics, chemistry, life sciences, medical sciences, environmental sciences, materials sciences, geology, agriculture, metrology, microelectronics and micromechanics; experimental studies on τ-charm physics on BESII and basic research on relevant software and data analysis; nuclear physics experimental studies on HIRFL-CSR in Lanzhou and applied basic research on heavy ions;

studies on ion beam in life sciences, medical sciences, materials sciences and semiconductor defect engineering; new technology and methodology of beam line; key technology of advanced X-ray detector; particle accelerator and key technology, method and equipment for particle detectors, magnetic resonant technology and new method of preparation for functional materials in steady high magnetic field.

Key Program Project

Research areas are more than funded projects in number, and applicants may decide the project title, research content and research scheme according to their own situation. It is encouraged that applicants collaborate with researchers working in labs of facilities.

1. Research on scientific problems based on Synchrotron Radiation Facility

(1) Transit and transfer process of environmental pollutants

(2) Structure and property of energy materials

(3) Structure and physical properties of complex materials

(4) Structure and functions of macro biomacromolecular complexes and membrane protein

(5) Fine structure of cells and biotissues

(6) New catalyst and mechanism of catalysis

(7) Structure and properties of matters in extreme conditions

2. Research on scientific problems based on steady state strong magnetic field facilities

(8) Correlated materials in strong magnetic field conditions (no less than 20T)

(9) Studies on mechanisms related to life activities based on strong magnetic field resonant spectroscopy and imaging

(10) Chemical synthesis, material preparation and properties under high magnetic field (no less than 20T)

3. Frontier physics and expanded studies based on BEPCII and HIRFL

(11) New resonant state in Tau-charmonium energy region

(12) Hadron spectroscopy in Tau-charmonium energy region

(13) Singular nuclei reaction and structure

(14) Highly ionized ion and fine spectroscopy

(15) Heavy ion radiation effects

4. New principles, new methods and key technology for the facilities

(16) New method and new technology of HIRFL experiments

(17) Experimental method, key technology and devices for beam station

(18) New theory and methods of imaging

(19) New principles, new methods and new technology and key components for accelerator

(20) Key technology of detector and electronics

(21) Method and software of experimental data analysis and processing

(22) New method and technologies of characterization and measurement of materials in strong magnetic field

(23) New theory and key technology of advanced light sources

Joint Fund for Iron and Steel Research

The Joint Fund for Iron and Steel Research is financially supported by NSFC and China Baowu Steel Group Corporation Ltd. (former Baosteel Group Co., Ltd). Aiming at basic issues and key technology in the development of Chinese iron and steel industry, it funds prospective and innovative research that can speed up the advancement of new technologies and improve the quality of products in metallurgy and material. In 2017 the total funding is 30 million yuan. The direct cost for Fostering Program will be 0.5 to 0.8 million yuan per project in 3 years and that for Key Program will be 2 to 3.8 million yuan per project in 4 years.

Nationwide, the Joint Fund's funding range covers new metallurgical technologies and interrelated techniques, materials, energy, environment, equipment, and information sciences, etc. Proposals should be submitted to the Department of Engineering and Materials Sciences of NSFC.

I. Research Directions encouraged for Fostering Program

1. Simulation of multicomponent and multiple phase reaction system and the theory and method of scale magnification during the process of fluidized ironmaking
2. Consumption process and effect factors of coke in blast furnace
3. Formation and control mechanism of surface crack for hypo-peritectic alloy steels
4. Ultrapure special smelting theoretical basis of ultra-high strength aviation steels
5. Microstructure control and mechanism of nanostructured super bainitic steels
6. Tube forming and machining, organization design and performance evaluation of metallurgy composite pipeline in titanium steels for marine engineering
7. Cooling model and microstructure control mechanism of hot rolling seamless steel pipe
8. Development foundation of high-performance connector threaded used in deep high temperature and high pressure oil and gas wells
9. Macro-micro coupling model during hot stamping process for high-strength automotive steels
10. High-speed laminating mechanism and key control technology of metal plate
11. Mechanism of intergranular corrosion of welded joints for ultrapure ferritic stainless steels
12. The mechanism and control of nucleation and growth of precipitated phases in key heat-resistant steels for ultra-supercritical boiler
13. Magnetic domain structure, magnetization mechanism for grain oriented silicon steel and its effects on noise, loss, etc.
14. Foundation research of high-efficiency separation and utilization for the elements in cold-rolled sludge
15. High density energy storage mechanism of industrial waste heat and the control of inter-regional cold/heat/electricity for comprehensive utilization
16. Foundation of increasing direct radiation heat transfer in the flame furnace
17. The abnormal diagnosis, optimization theory, method and application of steel products based on industrial large data technology

II. Areas encouraged for Key Program

1. Cleanliness and solidification structure control of nickel-based alloys and special steel (Application code 2: E0418)

2. Microstructure control mechanism of slab viscoplastic zone during heavy reduction rolling (Application code 2: E041603)

3. The mechanism of Al element in the new generation of automotive steel with high strength and toughness (Application code 2: E0101)

4. Friction stirring welding technology and related foundations of homogeneous/heterogeneous materials for ultra-high strength Al alloy and Mg alloy (Application code 2: E041607)

5. Study on water system optimization and zero emission technology in iron and steel complex (Application code 2: E0420)

6. Free applications for Key program of new process, new technologies and related energy and environmental protection of iron and steel industry (Application code 2: E0422)

In the above 6 areas about 5-8 projects will be funded according to application and evaluation situations.

Joint Fund of Civil Aviation Research

The Joint Fund of Civil Aviation Research is set up jointly by NSFC and the Civil Aviation Administration of China (CAAC). The Fund is open to all scientists in China. It is aimed to attract researchers from the universities and research institutions across China to participate in basic research and applied basic research in the development of aviation science and technology, so as to enhance the ability of original innovation in the aviation industry, promote the integration of knowledge and technology innovation in the field, and contribute to making China a nation with strong aviation industry.

As a component of the National Natural Science Fund, the Joint Fund is managed by both parties. Researchers in non-aviation sectors are encouraged to carry out joint research with those in aviation sectors.

Funding plan and research areas in 2017

In 2017, we plan to allocate 16.8 million yuan to support 3 key projects with 2.1 million yuan per project for 4 years, and “Fostering Program project” with 400,000 yuan per project on average for 3 years. Young researchers (born after Jan. 1, 1982) will be funded first.

The following areas will be funded in 2017.

1. Fostering Program Projects

(1) Theory and method of smart traffic and information security and air space management, new aviation system, passenger and goods flow, air traffic control simulation and verification;

(2) Theory and technology for airport perception, information technology application in airline management.

(3) Theory and technology for criminal prevention and control, decision optimization

and practice in emergency management.

(4) System reliability and safety for civil aviation systems, theory of aviation security, new technology and method for security checks, new materials and new technology and detection for aircraft operation and maintenance.

(5) Design of smart maintenance system and verification in the life cycle of civil aircrafts.

2. Key Program Projects

(1) Mechanism of scale formation in engine duct and cleaning technology

(2) Wake evolution and risk control in near ground flight.

(3) Visibility measurement system for airport in complex air environment,

(4) Design and verification of smart maintenance system for civil aircraft in the whole life cycle.

NSFC-GenerTec Joint Fund for Basic Research

The NSFC-GenerTec Joint Fund for Basic Research was jointly established by NSFC and China Academy of General Technology in 2015. The joint fund aims at pooling talented scientists and research teams to solve major scientific issues and key technical problems for China Academy of General Technology in serving the country and fulfilling its mission, and promoting research and team building in related disciplines.

In 2017, the NSFC-GenerTec Joint Fund for Basic Research calls for proposals of "Key Program Project" and "Fostering Program Project" on two research fields. Average funding (direct cost) for each "Key Program Project" will be 2.6 million for 4 years and the funding could be increased for projects of exceptionally high quality. Average funding (direct cost) for each "Fostering Program Project" will be 0.7 million for 3 years. The NSFC-GenerTec Joint Fund for Basic Research is open to all Chinese researchers. Qualified researchers are welcomed to apply for this fund according to the research scope and requirements listed in this Guide.

I. Themes for Key Program Project

1. Information technology

(1) Target identification and transliteration of speech data in complex environments

(2) Information detection and security protection technologies for Internet of Things

(3) User persona and location technology based on large-scale and multi-source data

(4) Protection and utilization of software vulnerability, vulnerability harmfulness analysis technology and assessment methods

(5) Auditory scene analysis and specific sound detection in complex sound fields

(6) Active defense technology for mobile internet

(7) Multi-granularity network security assessment models

(8) Source tracing technology and countermeasures for network attack in a big data environment

(9) Secure steganography technology for multiple information channels

(10) Anonymization and countermeasures in mobile network and devices

(11) Rapid 3D scene reconstruction technology based on virtual reality

(12) Analysis of encryption systems with undisclosed cryptographic algorithms

(13) Methods and key technologies of image acquisition under weak light environment

(14) Hybrid computing framework-based accelerated computing technology

(15) Flow-based network behavior analysis and detection technology

(16) Multi-dimensional data-based language truthfulness validation technology

(17) Small-sample machine learning for drug repositioning based on big data in biology

(18) Brain-computer interface-based emotional information interaction technology

2. Chemistry

(1) Methods of separating and analyzing unknown chemicals in foodstuffs and drugs

(2) Deflagration hazard assessment methods for sensitive materials containing strong oxidizers

II. Themes for Fostering Program Project

1. Information technology

(1) Big data processing and analysis technology

Keyword spotting from images with complex background; high-precision approximate calculation for stream big data; entity disambiguation and association technology for multi-source data; detection and prediction of small-crowd events in a big data environment; analysis of virtual identity and relationship on social networking applications; multi-level Cache technology for burst-mode massive dataflow.

(2) Wireless signal detection and antenna technology

Research on the iterative detection method and convergence condition for multilayer power signal and the building of trust propagation model; detection and isolation method for multilayer power signal with imperfect prior knowledge; miniaturized high step-up receiving antenna techniques, design theory and methods for novel antennas such as liquid antenna, metamaterial antenna, and metamaterial lens antenna, theories and methods of structured design of integrated enclosed broadband antenna.

(3) Virtual reality and visualization

Quick modeling of virtual scene based on digital earth; virtualization display and collaborative interaction of network security situation; visualization analysis of network security data.

(4) Vulnerability discovery and analysis

Automatic extraction and modeling of source code vulnerability and defect patterns in an open-source environment; source code directed binary program dangerous operation and memory modeling; source code directed breakdown points multi trigger path searching and verification technique; path feasibility detection and test case generation for suspected code vulnerabilities.

(5) Cryptographic techniques

Key techniques of asymmetric cryptography analysis; cryptography analysis technique transcending the limits of computational complexity; theory and techniques of post quantum cryptography; key techniques of optical asymmetric cryptosystem; encryption techniques based on homomorphic encryption for high efficiency database.

(6) Safety analysis for industrial control system

Industrial control scene-oriented low-level data fusion and semantic information extraction methods, depth correlation model for threat data, industrial control behavior-driven security baseline and unknown risk prediction mechanism; hazardous properties of industrial control system vulnerabilities, hidden layer feature mining based on machine learning, automatic recognition of malicious activities against industrial control system; industrial control network situation analysis and visualization techniques in time, spatial and multi-dimensional domains.

(7) Steganography and steganalysis

New theories, methods and techniques of steganography and steganalysis; detection of steganography based on behavior analysis and confrontation methods; information hiding methods based on optical transmission; theories and techniques of covert communication by wireless signal; techniques of covert transmission by network channel; theories and techniques of information camouflage and hiding.

(8) Cognitive computing and searching

Visual cognitive computing model; visual information analysis based on multi-model fusion; intelligent information processing technique based on novel brain computer interface.

(9) Emotional intervention techniques

Exploration of the psychological and brain mechanisms of emotion recognition capability using the latest brain science research techniques such as cognitive-behavioral experiments, brain stimulation intervention, neuropharmacology, neuroimaging, etc., and development of specific emotional intervention techniques.

(10) Prediction of individual behavioral patterns based on cognitive neuroscience

Development of effective predictive indicators and computing models for individual behaviors using techniques of cognitive neurosciences and neuroendocrinology; improvement of the accuracy of predicting an individual's capability, personality and other personal traits from the perspective of cognitive processing.

(11) Research on the brain mechanism of lying and related key techniques based on social cognitive neuroscience

Social cognitive analysis on lying from the perspectives of psychological theories, emotional recognition and control, social motivation and sense of control; exploration of the brain mechanism of lying based on social cognitive neuroscience, and development of related key techniques.

2. Chemistry

(1) Signal enhancement and visualization techniques for document examination

Development of high-efficiency detection methods for trace substances in samples to address common issues in document examination, trace detection and anti-counterfeit detection of forensic examination, exploration of visual detection techniques for documents by a comprehensive application of multiple high-sensitivity instruments.

(2) Document recovery techniques for inkjet-printed documents in extreme situations

Research on the recovery, recognition and visualization of inkjet-printed documents in extreme situations based on component analysis of the inkjet printing materials by chemical, spectroscopic and other techniques.

Joint Fund for the Innovation-Driven Development of China Automobile Industry

The Joint Fund for the Innovation-driven Development of China Automobile Industry is financially supported by NSFC, China Association of Automobile Manufacturers and eight domestic automobile enterprises, namely, First Automotive Works, Dongfeng Motor Corporation, SAIC Motor Corporation Limited, Chongqing Changan Automobile Co., Ltd, Guangzhou Automobile Group Co., Ltd, Brilliance Auto Group, Anhui Jianghuai Automobile Co., Ltd, China National Heavy Duty Truck Group Co., Ltd. By giving full play to the guiding and coordinative role of NSFC on the basis of combining government-industry-university-research and application, it funds major basic research in China's Automobile Industry Development and related areas, so as to promote the sustainable development and improve capability of independent innovation of the industry.

In 2017, the Joint Fund for the Innovation-driven Development of China Automobile Industry calls for proposals of the "Key Program Project" in three priority areas with average direct funding of 2.5million yuan per project for four years. Any eligible scientists and technicians in the country are encouraged to submit applications in accordance with research scope and requirements listed in this Guide.

I. Intellectualization

1. The environmental perception and modeling technology of intelligent vehicles
2. The theory and key technologies of path-planning and independent decision-making of intelligent vehicles
3. The basic theory of information security and key technology for the protection of internet connected intelligent vehicles
4. The EM safety and credibility evaluation of the electricity and electronics system of internet connected intelligent vehicles
5. The theory and method of intelligent vehicles suspension design based on multi-source information fusion
6. The dynamic control of fuel consumption and effectiveness optimization of motorcade of heavy-duty commercial vehicles under the Real-time emissions constraints
7. The systematic evaluation method for the impact of vehicle intellectualization on security, energy conservation and emission reduction and congestion alleviation

II. Lightweight

1. The study on common key technologies and performance study of steel/ aluminium and all-aluminium vehicle body materials
2. The study on the lightweight designing study of multi-material vehicle structure
3. The dynamic mechanical behavior and service safety evaluation of ultra-high strength steel for vehicles
4. The low-cost manufacturing, service performance and material structure control study of reinforced high-performance fiber auto parts

5. The manufacturing and parts molding study of magnesium alloy material for vehicle

III. Electrification

1. The study on a new high specific energy power battery system based on lithium-rich oxide cathode

2. The study on the thermal field distribution, heat transfer mechanism and thermal management of vehicle power battery system

3. The study on the attenuation mechanism of power cell performance and the equivalent life prediction model under complex vehicle operating conditions

4. The study on the simulation and testing technology of fuel cell stack

5. The study on the optimal configuration method of hybrid power system and coordinated control of electromechanical coupling

6. The research on the intelligent management system of power battery

7. The research on the intelligent control system of dual clutch automatic transmission

NSFC-Guangdong Joint Fund

The third phase of the NSFC-Guangdong Joint Fund is jointly established by NSFC and the People's Government of Guangdong Province (NSFC-Guangdong Joint Fund) from 2016 to 2020. It aims at giving full play to the guiding role of NSFC, directing the investment of social scientific and technological resources into basic research, attracting and gathering outstanding scientists all over the country, solving the major S&T issues and key technology problems concerning the strategic development of economy, society and science and technology in Guangdong Province and its surrounding areas. It tries to promote the development of science and technology and build up the team of talents in Guangdong Province, enhance the independent innovation capability and international competitiveness of universities and research institutions in Guangdong province, and promote the sustainable development of economy and society of Guangdong province.

NSFC-Guangdong Joint Fund calls for proposals of "Key Program Project" or "Integration Program Project" from three priority areas including Intelligent Information Processing and New-Generation Communication, Resource and Environment, and Agriculture. "Key Program Project" provides an average direct funding of 3 million yuan per project for four years; "Integration Program Project" provides an average direct funding of 14 million yuan for four years. Any eligible scientists and technicians in the country are encouraged to submit applications in accordance with research scope and requirements listed in this Guide.

I. Integration Projects

1. Intelligent information processing and new generation communication

Research on the basic science and application technology of new-generation optical interconnection for high performance computing

Proposals are expected to focus on the research on the new generation optical interconnection technology for high performance computing, explore the new beam polarization control mechanism and technology, find effective methods for its efficient generation, stable transmission and multiplex coaxial reuse, study the principles, methods and techniques of integrating optical communication components with high-performance microelectronic devices, and lay the foundation for mastering the core technologies of next-generation high-performance computer optical interconnection technology. Main research areas include:

(1) The efficient generation and regulation mechanism of new beam

Proposals are expected to study the simple and efficient generation mechanism of coaxial and multiple new beam and the new mechanism and new method of generating multi-channel polarization multiplexed beam channel, such as q-plate, free optical surface and superstructure surface. Proposals are also expected to study the method, technique and technology of controlling the polarization characteristic of the beam, design and produce the polarization response of two-dimensional, three-dimensional micro-nano structure based on liquid crystal, metal and dielectric materials, and prepare efficient beam polarization control, beam combining and channel multiplexing device. The 50 to 100 beam multiplexing and demultiplexing are expected to be achieved.

(2) A new type of beam communication integrated device based on silicon

Proposals are expected to develop silicon-based optical communications devices integrated with traditional micro-electronic chips. They should explore the technology of efficiently generating, reusing and probing new polarized beam channels on standard silicon-based chips, study the new beam launch and reception of micro-cavity, waveguide, superstructure surface and other integrated photonics devices on, research into technical means of devices in high-speed signal response, low latency and other aspects, and study the principle and technology of on-chip precise control of beam channel switching. They are expected to support more than 8 new beam generation, multiplexing, demultiplexing and detection, with less than -10dB inter-loop crosstalk; while supporting the entire C-band wavelength division multiplexing with a 25GHz bandwidth single channel, and the device efficiency reaches more than 30%.

(3) The transmission of new beam in free space and fiber

Proposals are expected to establish the theoretical model of the new beam propagation in free space, develop the theory of channel perturbation based on the polarization analysis variables, investigate how the orthogonal modes carried by the coaxial multi-channel optical channel affect the propagation characteristics of the new beam, and explore the new mechanism and new technology of the thermal turbulence disturbance of the beam against the heat dissipation between the cabinets of the high performance computer. They should study the excitation, transmission and coupling mechanism of the new beam in the optical fiber, and develop a new type of fiber technology which can support multi-channel low crosstalk transmission.

“Integration Program Project” should include the above-mentioned three research aspects, carry out in-depth and systematic research focusing on the project theme of “Research on the basic science and application technology of new generation optical interconnection for high performance computing”, and research results should include principles, methods, technology, devices as well as patents.

2. Resource and Environment

Study on the geological process of the crustal structure in South China and northern South China Sea

Proposals are expected to focus on the geological characterization, timing and material transport of the continental shelf structure of South China and the formation of the northern margin of the South China Sea, carry out multi-disciplinary integrated research, and obtain the deep structure and magmatic characteristics of the transitional area between land and sea in the southern part of South China; proposals should clarify the correlation between deep processes and shallow structure, topography and basin evolution, so as to explore the formation and development of active tectonics in the coastal area of southern South China and the northern South China Sea as well as the inoculation mechanism of earth disasters, and provide support for the groundbreaking progress of the evolution of the sea-land transition zone and its disaster assessment. Main research areas include:

(1) The magmatic and deep processes in the northern margin of the South China Sea

Proposals are expected to describe the magmatic characteristics of the process of tuffing and thinning in the southern China continent and the southern margin of the South China Sea; construct the fine age spectrum and geochemical database of metamorphic igneous rocks in the area, and reveal the temporal and spatial evolution trend of the age and composition; clarify its magmatic process and petrogenesis; analyze source region characteristics and tectonic setting of magmatism; recover the deep thermal structure of the lithosphere; understand the dynamic model of the deep lithosphere reconstruction process and its shallow response; and clarify the interrelationship between the formation and evolution of mesozoic plate tectonics and South China continent and South China Sea.

(2) The deep structure and shallow response of continental crust in South China

Proposals are expected to obtain the deformation and metamorphism of the South China continent since the Late Paleozoic and its time-space framework; dissect the fine structure of key areas and superposition of different periods, and analyze the deformation styles of the permutation and combination and changes in basin and mountain; study the wide-angle reflection, the refractive seismic profile and the broadband seismic array data of the high-resolution deep seismic reflection profile and the transection of the Nanling metallogenic belt in the South China continent, and explain the deep structure of the South China continent; research into the rheological characteristics of the crust and its relationship with the deep structure and shallow structure; reconstruct the tectonic Setting of the South China Continent during the Period of the Phanerozoic Important Change and its structure features.

(3) The active faults and structural system in the northern South China Sea

Proposals are expected to reveal the tectonic deformation and crustal changes of the continental margin of the southern margin of the South China Sea and the continental shelf of the northern South China Sea based on GPS observations and sea-land seismic data; depict the crustal structure and the boundary of the main land in the northern South China Sea; analyze the structural features, deformation modes and activity habits of the typical active faults; describe the control and influence of different nature faults on seismic activity; study on the seismogenic tectonics in the northern margin of the South China Sea and the mechanism of strong earthquakes; discuss the coupling relationship between seismic structure and magmatic channel in the transition zone between sea and land, restore the

overall outlook of the northern South China Sea crustal structure and coordinate its internal relations with the tectonics of South China.

(4) The coastal landform change and depositional response in the Northern South China Sea

Proposals are expected to analyze the rate and range of lifting and stripping in different sections of different stages of land-sea transition zone in the southern margin of South China, and control its temporal and spatial pattern of uplifting and recovering its paleostructure and its evolution history. They should analyze the spatial and temporal changes of the topography of the northern South China Sea and restore the sequence framework, deposition system and filling methods of the critical section of the northern part of the South China Sea; trace sedimentary source type, basin prototype character and evolution in different evolution stages; explore the evolution of coastal landforms and the transport mode and dynamic process of the supply of material sources in the northern South China Sea; and reshape the tectonic landform of the sea-land along the northern margin of the South China Sea and the temporal and spatial evolution of paleogeographic pattern.

(5) The dynamic coupling and earthquake disaster of northern South China Sea and its surroundings

Proposals are expected to recognize the tectonic deformation and basin evolution of the sedimentary basin in the northern South China Sea and its conjugation relationship with southern margin; analyze of the tectonic effect of the Indian-Tibetan collision and the red-river fault strike-slip in the western margin of the South China Sea; study the control and influence of regional tectonic movement on the geological evolution of the northern margin of the SCS; understand the structural features and deep processes of the northern South China Sea and its surroundings based on the geophysical section of the South China Sea; analyze the geological structure and evolution of the northern South China Sea and its intrinsic relationship with the peripheral subduction mechanism, and reproduce the dynamic process of the formation and evolution of the South China Sea.

"Integration Program Project" should include the above-mentioned five research areas, carry out in-depth and systematic research focusing on the project theme of "Research on the basic science and application technology of new generation optical interconnection for high performance computing", and research results should include principles, methods, technology, devices as well as patents.

II. Key Supporting Project

1. The intelligent information processing and new generation communication

(1) A new generation of critical information technology

In accordance to the development strategy of the information industry of Guangdong province, proposals are expected to carry out the exploratory research and application development of the information technology in the new generation information based on the machine intelligence, big data, cloud computing and Internet of Things environment to meet the important needs of the in-depth integration of the new-generation information technology and traditional industries, and lay the foundation for the information industry to continue leading the industrial development. Main research areas include:

(i) Computational intelligence method and key technology;

(ii) Compass satellite navigation communication technology;

(iii) Highly reliable information technology in marine environment.

(2) Intelligent manufacturing theory and key technologies

In accordance with the implementation need of the strategy of "China Manufacturing 2025" and "Innovation-driven development" of Guangdong province, proposals are expected to carry out related research on the information and intelligence as the core development technology to meet the need of building intelligent factories and developing intelligent equipment and promote the in-depth integration of industrialization and the informatization in Guangdong Province. Main research areas include:

(i) Networked control theory and key technologies for intelligent manufacturing;

(ii) The real-time acquisition and knowledge automation of industrial process data.

(3) The optical information perception, transmission and new generation communication

Proposals are expected to carry out optical fiber sensor and transmission core technology and application research to meet the major demand of life health, big data, and smart city for the new generation of information technology. Or carry out the basic theory and technology research focusing on the demand of core issues and their application including the generation, reception, modulation, coding, and transmission of signals involved in the visible optical communication technology. Main research areas include:

(i) The theory and technology of ultra-sensitive fiber sensing;

(ii) The optical interconnection theory and technology in data center;

(iii) The theory and technology of visible optical communication.

(4) The high performance integrated chip

Aiming at the key scientific and technical issues such as the new type of photovoltaic chip, new communication and computing circuit chip and the on-chip system, proposals are expected to conduct basic research on integrated circuits, chip system circuit design, signal processing theory and application development needed for optoelectronic interconnection and ultra-high frequency vacuum, so as to meet the major demand of upgrading and transformation of the high-performance integrated chip industry in southern China.

(i) Photoelectric interconnection chip;

(ii) High power, ultra-high frequency and low power integrated chip;

(iii) Key technologies of high performance system-on-chip.

2. Resource and Environment

(1) Resources and ecological environment in Nanling area

Nanling, the watershed of the Yangtze River and the Zhujiang River, is an important natural geographical dividing mountain in China, featuring distinctive geographical, ecological and cultural characteristics. The region is rich in non-ferrous metal resources and biological resources. Extreme human activities have caused serious environmental and ecological problems which are a serious impediment to the sustainable socio-economic development of the region. Proposals are expected to carry out relevant research on the development and utilization of natural resources and ecological and ecological protection in the region. Main research areas include:

(i) Study on typical mineralization mechanism in Nanling Area;

(ii) The pollution control and ecological restoration of heavy metals in metal mining area and surrounding areas of Nanling Area;

(iii) Ecological protection and non-point source pollution control.

(2) The ecological environment of Pearl River Basin

Proposals are expected to carry out related basic research on the chemical pollution, water security, water ecology and ecological health effects in the Pearl River Basin. Main research areas include:

(i) The eutrophication and hypoxia mechanism in the Pearl River Estuary;

(ii) The migration mechanism and ecological risk of pollutants in Pearl River Estuary;

(iii) The hydrological-ecological environment evolution and drinking water safety in the Pearl River Basin.

(3) The Environmental Evolution and Pollution Control of Urban Agglomeration in the Pearl River

Proposals are expected to carry out research on the pollution control of urban agglomeration in the Pearl River basin, and main research areas include:

(i) The evolution of urban agglomeration and environment effects of the Pearl River Delta

(ii) Causes, effects and control of atmospheric compound pollution in Pearl River Basin

(4) Marine resources and coastal environment in the South China Sea

Proposals are expected to carry out basic research focusing on the metal and energy mineralization mechanism and precision exploration technology in the South China Sea and the degradation mechanism and restoration of the ecosystem of the island reef vegetation. Main research areas include:

(i) Genesis and accumulation mechanism of polymetallic nodules (shell) in the deep waters of South China Sea;

(ii) The basic theory and key technology of deep oil and gas resources exploration in South China Sea;

(iii) Genetic mechanism and resource effect of natural gas mud volcano in Guangdong Province;

(iv) Degradation mechanism and restoration of vegetation ecosystem in South China Sea.

3. Agriculture

(1) Study on biodiversity response and biological disaster prevention and control under global environmental stress

Global environmental problems such as global warming, acid rain, ozone layer, PM2.5 and other environmental problems are the common concerns of the whole world. Against the background of these environmental stresses, the physiological, biochemical and biological characteristics, yield traits and ecological adaptability of agricultural organisms will correspondingly generate diversified responses. In the meantime, the high temperature, humid climate and planting and breeding patterns in southern China have a great impact on the major crop diseases and insect pests, the major animal epidemics and disaster outbreaks and genetic variation. The study on the mechanism of the major animal epidemics and disaster outbreaks, the mechanism of interaction between pathogenic microorganisms, intermediate hosts and host organisms, and the invasive routes and prevention and control technologies is of great importance to agricultural products and food safety, agricultural ecological security and sustainable development of modern agriculture in southern China. Main research areas include:

(i) Effects and mechanisms of the acid rain on the farmland and soil biodiversity in South China;

(ii) Responses of typical crops in South China to global increase of greenhouse gases and elevated temperature and its regulation mechanism;

(iii) The outbreak mechanism, molecular epidemiology and host immune mechanism of major animal diseases in South China;

(iv) The mechanism of interaction between major plant diseases, vector insects and host crops in South China.

(2) The study on the molecular mechanism of high quality and high yield formation and pest resistance in main crops in South China

Cultivating and applying new varieties of high quality and high resistance to pests and diseases is an important foundation for ensuring the supply safety of high quality agricultural products and the safety of ecological environment. With the economic development, the industrialization and urbanization are moving forward, while the sharp drop in arable land, water shortages, environmental degradation, pests and diseases, extreme temperatures and other natural disasters happen frequently, and the quality and safety of the main crops in southern China are facing serious challenges. For a long time, the main objective of crop selection is high quality, high yield and high (multi) resistance, but the molecular basis for high quality and the formation of pest resistance is not very clear, leading to the low yield and poor resistance to pests of main crop varieties of South China despite the high quality. Therefore, quality is not resistant to pests and other issues. Therefore, the study on the Molecular Mechanism of High Quality and High Yield Formation and Pest Resistance is of great significance to cultivate a new generation of crop varieties of high quality, high yield and disease resistance.

(i) The molecular basis for the formation of high quality and high yield traits in main crops in South China;

(ii) Excellent resistance resources to major diseases and insect pests, resistance gene identification and their genetic mechanism in South China.

(3) The basic research on environment-friendly agricultural input

Proposals are expected to carry out basic research on environmental-friendly agricultural inputs to avoid the frequent recurrence of agricultural pest outbreaks and the problem of overlong time, high frequency, large amount and low efficiency of fertilizers use. They should explore synergistic mechanism, reduce amount of pesticide based on the interaction between pesticides and crops, pesticides and fertilizers, and ensure the quality and safety of agricultural products.

(i) The chemical pesticide reduction and the basis of environmentally friendly alternative products;

(ii) The mechanism of reduction and synergism for the interaction of pesticide and chemical fertilizer;

(iii) The mechanism of reduction and synergism of the feed, veterinary drugs and vaccines for the interaction between nutrition metabolism and immune potential of livestock and aquatic animals.

NSFC-Yunnan Joint Fund

The NSFC-Yunnan Joint Fund is jointly established by NSFC and the Yunnan Provincial Government to implement the *National Medium- and Long-Term Program for Science and Technology Development 2006-2020*, the guidelines of the National Conference on Science and Technology and the Action Plan on Building an Innovation-Oriented Yunnan. It aims at pooling talented scientists across the country to carry out basic researches on important scientific issues and key technical problems that are closely related to the socio-economic and scientific development of Yunnan and surrounding regions, boosting the development of science and technology and the growth of scientific talents in Yunnan, improving indigenous innovation capability and international competitiveness and promoting the sustainable development of regional economy and society.

In 2017, the NSFC-Yunnan Joint Fund calls for proposals of "Key Program Project" in 4 priority research areas. Average funding (direct costs) for each project will be 2.4 million for 4 years. The NSFC-Yunnan Joint Fund is open to all Chinese researchers. Qualified researchers all over the country are welcomed to apply for this fund according to the research scope and requirements listed in this Guide.

I. Biodiversity conservation

1. Biodiversity

Studies on the biodiversity of important animals, plants and microorganisms in the plateau regions of Yunnan at the molecular, genetic, species and ecosystem levels

Main research orientations:

(1) Basic researches on the sustainable development of the rubber plantation ecosystem in Yunnan

(2) Functions and mechanisms of microorganisms in farmland ecosystem in Yunnan

(3) Species and functions of gut bacteria in endemic domestic animals in Yunnan

(4) Exploitation and utilization of endemic wildlife resources in Yunnan

(5) Adaptive evolution mechanism of endemic species in Yunnan

2. Agricultural and forest resources

Main research orientations:

(1) Genetic basis of good traits of main domestic animals and crops in Yunnan

(2) Pest occurrence and control mechanism for local and cross-border agriculture of Yunnan

(3) Basic researches on the conservation and sustainable utilization of endemic medicinal animals and plants in Yunnan

II. Population and health

1. Basic researches on discovery of active substances and development of vaccines aiming at major human diseases by using typical medicinal resources in Yunnan

Main research orientations:

(1) Studies on the discovery, structure, function and pharmacological mechanism of new natural active substances based on special resources in Yunnan

(2) Pathogenesis of pathogens of major cross-border infectious diseases in Yunnan and immune protection mechanism of novel vaccines

(3) Efficacy, material foundation of medicinal effectiveness and pharmacological mechanism of ethnic medicine and featured Chinese medicine in Yunnan

(4) Formation mechanism of active substances of major medicinal bio-resources in Yunnan

2. Basic researches on the pathogenesis, prevention and treatment of high-incidence diseases and major diseases in Yunnan

Main research orientations:

(1) Basic researches on high-incidence diseases, endemic diseases and chronic diseases in Yunnan

(2) Basic researches on the epidemiology, pathogenesis, prevention and treatment of insect-borne tropical diseases, major infectious diseases and drug addiction in Yunnan and surrounding areas

(3) Endemic animal disease modeling and related applied basic research

III. Resources and environment

1. Environmental changes and adaptation of river basin

Main research orientations:

(1) Ecosystem changes in Jinshajiang river basin and adaptive utilization

(2) Conservation and utilization of typical plateau Karst lakes and lakefronts

(3) Environmental change mechanism and regulatory mechanism of river basin in plateau mountainous areas

(4) Ecosystem evolution mechanism in key geological period in Yunnan

(5) Evolution of the geological and geographical environment and the impact on biodiversity in Yunnan

2. Utilization of resources of plateau mountains and environmental protection

Main research orientations:

(1) Formation mechanisms and prevention of major geological disasters in Yunnan

(2) Mineralization mechanism of typical mineral deposit in Yunnan and prospecting technologies

(3) Control of environmental risks and environmental remediation mechanism in exploitation of non-ferrous metal resources

(4) Vertical distribution pattern and adaptive utilization of natural resources in mountain areas

(5) Land use models of mountain areas and living environment optimization

IV. Comprehensive utilization of mineral resources and new materials

Proposals are expected to be focused on theories, methods and cutting-edge technologies that meet the demand of comprehensively utilizing the advantageous mineral resources and special secondary resources of Yunnan and developing key new material industries.

1. Comprehensive utilization of mineral resources and secondary resources

Main research orientations:

(1) Clean and efficient use of nonferrous metal resources such as copper, lead, tin,

zinc and nickel

(2) New extraction techniques for light metals such as aluminum, magnesium and titanium

(3) High-efficiency recycling of secondary resources of noble metals

(4) New methods of comprehensive utilization of secondary resources of (1) nonferrous metals

2. New materials of rare-noble metals and battery materials

Main research orientations:

(1) Design and preparation techniques of rare-noble metal materials

(2) Novel battery materials and device fabrication

3. Material preparation and process control

Main research orientations:

(1) New methods and technologies of deep processing of titanium, aluminum and copper

(2) Performance and preparation techniques of nonferrous metal functional materials

(3) Preparation techniques of high-purity silicon, germanium and indium and their chemical compounds

NSFC-Xinjiang Joint Fund

The second phase of the NSFC-Xinjiang Joint Fund is jointly established by NSFC and the People's Government of Xinjiang Uygur Autonomous Region for the period from 2016 to 2020 to implement the guidelines of the National Working Conference on Scientific and Educational Assistance to Xinjiang. It aims at making full use of the guiding role of the National Natural Science Fund, attracting a number of talented scientists to work in Xinjiang, boosting the development of science and technology and the growth of scientific talents in Xinjiang, improving innovation capabilities of universities and research institutions in Xinjiang and promoting the sustainable development of Xinjiang's economy and society.

In 2017, the NSFC-Xinjiang Joint Fund calls for proposals of "Fostering Program Project", "Key Program Project" and "Special Grant for Local Young Talents" in 4 priority research areas. For "Fostering Program Project", the average funding (direct costs) for each project will be 600,000 yuan for 3 years; for "Key Program Project", the average funding (direct costs) for each project will be 2.8 million yuan for 4 years. "Special Grant for Local Young Talents" supports researchers with good research achievements in Xinjiang to conduct innovative research within the scope outlined in the *Guide.* It supports up to 2 outstanding local young researchers under the age 45 in each research area, with a funding of 900,000 yuan (direct costs) for 4 years. The NSFC-Xinjiang Joint Fund is open to all Chinese researchers. It is a platform for providing scientific and technological assistance to Xinjiang. Qualified researchers are welcomed to apply for this fund according to the research scope and requirements listed in the *Guide*.

I. Agriculture, biodiversity and biological resources

1. Agriculture

(1) Mechanisms of formation, elimination and detection of hazardous substances in featured food of Xinjiang

(2) Etiology and pathogenesis of major diseases of livestock and poultry in Xinjiang

(3) Basic researches on the genetic improvement and cultivation of main crops in Xinjiang

(4) Mechanisms of soil formation, fertility improvement and cultivation for farmlands in arid regions

2. Biodiversity and bioresources

(1) Relations between soil moisture and desert vegetation in the peripheral regions of oasis

(2) Correlations between above-and below-ground functional traits of dominant plant species in arid regions

(3) Interaction between water constraints, nutrition constraints and energy constraints in arid regions

(4) Component analysis and functions of active substances of endemic medicinal plants in Central Asia

(5) Basic researches on biodiversity and effective utilization of bio-resources of Tarim basin

II. Water resources and mineral resources

1. Water resources

Proposals are expected to be basic researches on water resources and environment to guarantee water security in Xinjiang.

Main research orientations:

(1) Characteristics of the atmospheric water cycle of the Tian Shan Mountains and the impact on regional climate and hydrology

(2) Changes of water and soil resources and social adaptation mechanism under climate change and human activities

(3) Water demand and regulation patterns of agriculture in Xinjiang

2. Mineral resources

Proposals are expected to respond to the demands of guaranteeing of security of national resources and building a mineral resources base in Northwest China, focus on advantageous mineral resources in Xinjiang and neighboring areas, conduct researches on tectonic changes, metallogenic mechanism and prognosis of the main metallogenic belt in Xinjiang and provide guidance and support to mineral exploration.

Main research orientations:

(1) Basic researches on metallogenetic pattern and prospecting indicators of main mineral resources (such as manganese, lead, zinc, nickel and lithium) in Xinjiang

(2) Characteristics and seepage flow patterns of conglomerate reservoir

(3) Accumulation regularity, resource potential and geological features of high efficient mining of coal-bed methane in Xinjiang

(4) Environmental effects of exploitation and utilization of regional mineral resources

III. Comprehensive utilization of oil and mineral resources

Proposals are expected to be basic researches on the comprehensive utilization of oil and mineral resources in Xinjiang with special advantages and respond to the demands of developing related industries.

Main research orientations:

(1) Basic researches on new materials based on special mineral resources in Xinjiang

(2) Water-saving production and new productive process of downstream petrochemical products in Xinjiang

(3) Comprehensive utilization of low-quality mineral resources and low-value byproducts

(4) Gasification and staged conversion technologies for different types of coals in Xinjiang

(5) New metallurgy methods and techniques for nonferrous metals

IV. Information security

Proposals are expected to focus on the complexity of the multilingual network environment in Xinjiang, especially the dissemination of multilingual information, analysis of cyberspace security based on network traffic big data, and language production and perception mechanism of ethic languages.

Main research orientations:

(1) Mechanisms and methods of network information dissemination and public opinion guidance in Xinjiang

(2) Methods and realization of multi-language automatic translation in Xinjiang

(3) Public security-oriented content analysis of network big data and intelligent service

NSFC-Henan Joint Fund

The second phase of the NSFC-Henan Joint Fund is jointly established by NSFC and the People's Government of Henan Province (NSFC-Henan Joint Fund) from 2016 to 2020. It aims at giving full play of the guiding role of NSFC, directing the investment of social scientific and technological resources into basic research, attracting and gathering outstanding scientists all over the country, solving the major S&T issues and key technology problems concerning the strategic development of economy, society and science and technology in Henan Province and its surrounding areas. It tries to attract, cultivate, and gather groups of scientific talents to Henan Province, enhance the independent innovation capability and international competitiveness of universities and research institutions in Henan province, and promote the sustainable development of economy and society of Henan province.

NSFC-Henan Joint Fund calls for proposals of "Fostering Program Project" and "Key Program Project" from four priority research areas. "Fostering Program Project" provides an average direct funding of 500,000 yuan per project for three years; "Key Program Project" provides an average direct funding of 2.2 million yuan per project for four

years. Any eligible scientists and technicians over the country are encouraged to submit applications in accordance with research scope and requirements listed in this *Guide*.

I. Biology and Agriculture

1. Key Program Projects

Proposals are expected to study the genetic mechanism of high and stable yield and the mechanism of pest outbreaks in Henan wheat and maize and other major crops; or analyze the molecular basis of important traits of the peanut, sesame, peony and other unique economic crops; or carry out basic research on the infection and transmission mechanism of important viruses and poultry reproductive performance regulation and other aspects, for the purpose of ensuring the healthy breeding and quality of important livestock and poultry in Henan region. Main research areas include:

(1) The infection and transmission mechanism of important viruses in Henan province

(2) The pest outbreak disaster mechanism of the major food crops in Henan province

(3) The genetic mechanism of male sterility and fertility restoration in wheat

(4) The genetic and molecular regulatory mechanisms of important economic traits of Henan multi-purpose peony

(5) The basic research on the reasonable and efficient use of nitrogen in main food crops

(6) The control factor mining and molecular analysis of important agronomic traits of peanut, sesame and other economic crops

(7) The molecular mechanism of reproductive performance in poultry of Henan region

2. Fostering Program Projects

Proposals are expected to study: the conservation and sustainable use of biodiversity in Henan province; the foundation for the exploitation, creation and genetic improvement of high-quality, high-yield, highly-efficient and multi-resistant germplasm resources of crops; the formation and regulatory mechanism of important agronomic traits of crops; the abiotic and biotic stress resistance mechanisms of crops; the genetic mechanisms for the water, nutrient, demand law and efficient use of corps; the occurrence law and preventing and controlling mechanism of agricultural pests and diseases; the ecological effects and mechanisms of crop-virus-mediator interaction; the development and utilization of functional microbial resources; the genetic improvement and sustainable use of the unique trees, flowers, horticulture and medicinal plants; the pathogenesis, prevention and control of major livestock and poultry, aquatic animals diseases; the pathogenesis and prevention of Food - borne Zoonosis; the extraction and separation, intensive processing and comprehensive utilization of functional components of agricultural products; the pesticide residue control and quality safety system for agricultural products.

II. Population and Health

1. Key Program Projects

Proposals are expected to study the pathogenesis, find new drugs and put forward a new prevention and cure program through carrying out related basic and clinical basic research with the focus on the occurrence, development, diagnosis, treatment and

prevention of high incidence and major diseases in Henan Province. Main research areas include:

(1) The pathogenic mechanism and early specific diagnosis of important food-borne parasites in Henan province

(2) The early diagnosis of common digestive malignant tumors in Henan province

(3) The molecular mechanism of adverse drug reactions based on pharmacogenomics

(4) The pathogenesis and intervention strategies of brain injury in premature infants and its serious sequelae

(5) Mechanism of Chinese medicine in preventing and treating purpura nephritis in children

(6) The basic research and drug intervention of fungal keratitis

2. Fostering Program Projects

Proposals are expected to conduct basic diseases research based on genomics, epigenetics and proteomics; the immune regulation and disease; the important medical pathogens and their interaction with the host; the pathogenesis and prevention mechanism of endemic diseases in Henan province; the pathogenesis and prevention and treatment basis for major infectious diseases and paroxysmal disease; the molecular genetics, early identification and prevention of hereditary diseases and congenital diseases; the origin of tumor cells, complex biological network of tumor, stem cell regulation, tumor microenvironment, early diagnosis and intervention; the pathogenesis and prevention basis of cardiovascular diseases, digestive diseases, senile diseases and metabolic diseases; mental illness and mental health; the design, synthesis and action mechanism of innovative drug; the key technologies and foundation for Henan authentic Chinese medicine research and development; the basic research on traditional Chinese medicine prescription; the prevention and treatment of major diseases mechanisms of traditional Chinese medicine; the basic research on the informationalization of traditional Chinese medicine; the basic clinical research on the integrated traditional Chinese and western medicine.

III. New Materials and Advanced Manufacturing

1. Key Program Projects

Proposals are expected to carry out advanced materials preparation and causative performance and other related basic research with the focus on local characteristics and industrial advantages of Henan province. Main research areas include:

(1) The basic research on the preparation and application of Plasma-assisted deposition of graphene films

(2) The design, fabrication and application of nano-functional materials for low-grade reservoir exploitation

(3) The fundamental research on design, preparation and application of new ionic liquid materials

(4) The design and synergistic effect of new broadband electromagnetic wave absorbing material

(5) The study on third-order nonlinear optical materials for light-controlled metal organic clusters

(6) The construction and performance control of new oxide semiconductor materials

for coal and gas detection

(7) The basic research on the design, preparation and application of composite functional materials for food packaging

(8) The basic research of structure design theory and application of fiber reinforced concrete recycled materials structure

(9) The synergistic mechanism of separation interface and process of low quality bauxite

2. Fostering Program Projects

Proposals are expected to study: the key scientific issues in the design, preparation, processing and application of metals and alloys, and metal matrix composites; the interaction of metals with the environment and their failure mechanisms; the design and preparation of inorganic nonmetallic materials; the structure of polymer materials/functional design, preparation and performance studies; the preparation, characterization and performance studies of novel nano-materials; fundamental issues in the preparation and application of energy storage and conversion materials; the composition, structure, properties and characterization of intelligent materials, new energy materials, biomedical materials and ecological environment materials; the research on the preparation and performance of optoelectronic information materials; the design and manufacturing research of high efficiency and energy-saving process equipment; the design of mechanical surface/interface function and control of friction performance; the theory and method of intelligent manufacturing and precision machining; the information perception, fusion and evaluation of mechanical systems and manufacturing processes.

IV. Resource and Environment

1. Key Program Projects

In accordance with the demand of sustainable development of resources and environment in Henan Province, proposals are expected to conduct the related basic research on the geological hazard forecast and forecast, the geographic information system construction, the coal resources and other mineral resources development, the ecosystem degradation mechanism and sustainable utilization, and the environmental protection of water source area in South-to-North water transfer project.

Main research areas include:

(1) The study on the formation mechanism and precautionary theory of typical landslide in west Henan province

(2) The big data fusion mechanism and mining method of “wisdom of the central plains” space-time region

(3) The study on the occurrence features and development mechanism of coal system gas in Henan province

(4) The study on ecosystem degradation mechanism and sustainable utilization in grain core area

(5) The characteristics of nitrogen deposition and ecological effect in the middle route water source area of the of South-to-North water transfer project

2. Fostering Program Projects

Proposals are expected to study the mineralization mechanisms and occurrence law of the unique or insufficient mineral resources; the comprehensive development and

utilization and selection basis of mineral resources; the clean conversion and efficient use of energy and resources; the common scientific basis of energy-saving and emission reduction and low-carbon emissions and conversion; the biochemical base in the development and utilization of renewable energy; the interaction law between the efficient exploitation of resource and the environment; the theory and methods of ecological restoration of degraded (damaged) ecosystems; the new methods of comprehensive treatment and utilization of bulk solid wastes; the mechanism and detection methods of natural disasters; urban geology and rail transportation; the influence of climate change on agricultural production and land use; the ecological mechanism of sustainable use of land in grain core area; the spatial and temporal big data mining and remote sensing measurement; the environmental behavior and effects of the soil pollutants and water pollutants; the comprehensive utilization of inter-basin water resources and the synergistic defense mechanism of flood and drought; the advanced treatment and recycling of industrial polluted water.

Joint Fund to Promote Cross-Straits Scientific and Technological Cooperation

The second phase of the Joint Fund to Promote Cross-Straits Scientific and Technological Cooperation is jointly established by NSFC and Fujian Provincial Government for the period from 2016 to 2020. It aims at making full use of the guiding role of the National Natural Science Fund to guide social S&T resources into basic research, attracting and gathering scientists across the Taiwan Straits to conduct S&T cooperation, solving major scientific issues and key technological problems mutually concerned by Fujian and Taiwan, boosting the growth of scientific talents, improving innovation capabilities of the cross-Straits economic zone and promoting the sustainable development of regional economy and society.

In 2017, the joint fund calls for proposals of “Key Program Project” in 4 priority research areas. Average funding (direct costs) for each project will be 2.8 million yuan for 4 years. The joint fund is open to all Chinese researchers. Qualified researchers are welcomed to apply for this fund according to the research scope and requirements listed in this Guide.

I. Agriculture

1. Molecular mechanism of the formation of agronomic traits of important crops and forest trees in Fujian and Taiwan

2. Occurrence and spreading regularities and control mechanisms of diseases and pests of important crops and forest trees in Fujian and Taiwan

3. Basic researches on the genetic analysis and breading of important traits of main aquaculture species in Fujian and Taiwan

4. Basic researches on the occurrence regularity, prevention and control of diseases of important farmed animals in Fujian and Taiwan

5. Mechanisms of quality changes in the processing and storage of featured agricultural products in Fujian and Taiwan

II. Population and health

1. Researches on innovative drug with special features of Fujian and Taiwan
2. Design, production and key scientific issues of new biomedical materials
3. Basic researches on quality control of Chinese medicinal materials in Fujian and Taiwan
4. Diagnosis and treatment of malignant tumors of digestive system, hematologic system, respiratory system and oral cavity for population of Fujian and Taiwan
5. Pathogenesis and intervention strategies of inflammation and immune-related diseases
6. Pathogenesis and intervention strategies of major diseases and rare diseases of the nervous system and visual system
7. Artificial intelligence-based Traditional Chinese Medicine diagnosis-treatment system

III. New materials and manufacturing

1. Design, structure modification and application of new materials for photovoltaic conversion
2. Basic researches on the design, preparation, processing and application of structural materials
3. Basic researches on the design, preparation and application of advanced energy storage materials
4. Key techniques and methods of high-precision intelligent manufacturing
5. Value-added utilization of marine biomass
6. Basic research on the design, preparation and application of new catalyst materials

IV. Electronic information

1. Theories and techniques of fast imaging and image processing for biomedical research
2. Theories and applied basic research of visual perception and virtual reality
3. Theories and applied basic research of big data acquisition, storage and analysis
4. Basic research on structured light laser and its application
5. Theories and applied basic research of wireless information and power transmission
6. Theories and applied basic research of data security in cyber space
7. Theories and techniques of architecture and access of heterogeneous underwater acoustic sensor network

NSFC-Liaoning Joint Fund

The NSFC-Liaoning Joint Fund is jointly established by NSFC and the Liaoning Provincial Government for the period from 2015 to 2019. It aims at making full use of the guiding role of the National Natural Science Fund to guide social S&T resources into basic research, attracting and gathering a number of talented scientists, solving major scientific

issues and key technological problems in the industrial development of Liaoning, improving innovation capabilities of Liaoning and promoting the revitalization of old industrial base.

In 2017, the NSFC-Liaoning Joint Fund calls for proposals of "Key Program Project" in 4 priority research areas. Average funding (direct costs) for each project will be 2.5 million yuan for 4 years. The NSFC-Liaoning Joint Fund is open to all Chinese researchers. Qualified researchers all over the country are welcomed to apply for this fund according to the research scope and requirements listed in this Guide.

I. High-end equipment manufacturing

1. Theories and methods of high-end equipment design

With the aim of revitalizing old industrial base of Northeast China, proposals are expected to be oriented to the development demands of high-end equipment and key components with Liaoning's advantageous features, focus on the design, manufacturing and performance improvement of products such as high-end compressor, high-end large-size bearing, large-scale tunnel boring machine, large-scale rubber& plastic machinery, etc. Applicants are encouraged to conduct researches on the theories and technologies of structural reliability design of large-size complex machinery, performance-oriented meso-scale structural design of key structures, operating stability control and life prediction of key components. The aim is to remove the bottlenecks in the improvement of performance and reliability of large-scale high-end equipment and to support the indigenous innovation of high-end products of the equipment manufacturing industry of Liaoning.

Main research orientations:

(1) Stability enhancement mechanism and control of high-pressure ratio centrifugal compressor

(2) Reliability and life prediction of large-scale high-speed and heavy-load rolling bearing

(3) Design and assessment of the structural reliability of large-scale complex machinery

(4) Theories and techniques of phase transformation and heat transfer, structure modification in the process of mixing and extrusion of polymerized substances

2. High-quality and high-efficiency processing methods for high-performance components

Proposals are expected to be oriented to the demands of the revitalization and development of equipment manufacturing industry in Liaoning, aim at solving difficult problems in the high-quality and high-efficiency processing of key components of high-end equipment and new electronic integrated circuits, focus on high-quality and high-efficiency processing of key components such as integral blisk and ultra-thin wafer, conduct researches of basic theories and key techniques of the mechanism and process of high-quality and high-efficiency processing, develop new processing equipment and improve the high-end equipment manufacturing capability of Liaoning province.

Main research orientations:

(1) Abrasive water jet technique for the processing of complex curved components of aero engine

(2) New processing techniques for ultra-thin wafer dicing

3. Testing and management of the operating and electronic manufacturing of major equipment

Proposals are expected to be in line with the intelligent manufacturing strategy proposed by Made in China 2025 and oriented to the advantages and development needs of the intelligent manufacturing industry of Liaoning, focus on basic theories and key technologies of key issues in the operating and electronic manufacturing of high-end equipment such as equipment operating stability and diagnosis, scheduling and optimization of manufacturing process, and promote the improvement of major equipment operating and manufacturing technology industries in Liaoning.

Main research orientations:

(1) Stable operating mechanism and intelligent diagnosis of large-scale rotating machinery

(2) Scheduling and optimization of material handling system in the manufacturing of integrated circuits

II. New materials

Proposals are expected to be oriented to the transformation-upgrading and innovation capacity improvement of traditional materials industries of Liaoning, focus on key materials and products strongly needed by major national projects and equipment such as rare-earth automotive steel, nickel alloy, aluminum alloy, super-thick steel plate and synthetic fiber, conduct researches on the regulation of microstructure and properties of materials, remove the common bottlenecks of material processing, and improve the indigenous innovation capacity and new product quality in the development of new products of new material industry of Liaoning.

(1) The mechanism and control of the impact of rare earth oxysulfides on automotive steel plasticity

(2) Residual stress formation of large-size high-quality nickel alloy electrode and control measures

(3) Applied basic research of super-thick steel plate made by continuous casting and low-compression ratio direct rolling

(4) Processing techniques and control of microstructure and properties of large-section and large inner-radius-to-thickness ratio aluminum alloy profiles

(5) Aggregation structure and properties of bio-based polyamides PA56

(6) Aggregation structure and properties of adaptive steroid membrane in visual light environment

III. Information technology

Proposals are expected to be oriented to the development demand of information technology industry of Liaoning and focus on topics of privacy information protection for mobile communication, medical CT, robotic arm, data management for machine tool industry, collaborative translation, etc. Applicants are encouraged to conduct researches on theories and key technologies of communication network and system security, diagnostic imaging, bio-inspired and animal-like robots, database theory and system and machine translation to remove common technical bottlenecks in information technology and support the indigenous innovation of information technology in Liaoning.

Main research orientations:

(1) Theories and key techniques of low-dose imaging of spectral CT with continuous energy levels

(2) Privacy information protection mechanism for mobile communication users

(3) Theory and methods of intelligent operation of robotic arms

(4) Basic theories and key techniques of ergonomic design of machine tools and outsourcing management of product data

IV. Agriculture

Main research orientations:

(1) The impact of abiotic stress on the growth of fruits and vegetables in northern cold regions of China and regulation mechanism

(2) Basic researches on the formation of good quality in the processing of seafood of Liaodong Bay

(3) Physiological, ecological and genetic basis of the improvement of quality and yield of japonica rice in Northeast China

(4) Basic researches on the improvement of quality and yield of corn in Northeast China

NSFC-Zhejiang Joint Fund for the Integration of Industrialization and Informatization

The NSFC-Zhejiang Joint Fund for the Integration of Industrialization and Informatization is jointly established by NSFC and the Zhejiang Provincial Government for the period from 2015 to 2019. It aims at attracting and gathering talented scientists across the country, solving major scientific issues and key technological problems related to the integration of industrialization and informatization in the social, economic and scientific & technological development in Zhejiang National Demonstration Zone of Integration of industrialization and informatization and neighboring regions, and promoting the scientific and technological development and the building of talent teams in the region.

In 2017, the NSFC-Zhejiang Joint Fund for the Integration of Industrialization and Informatization calls for proposals of “Key Program Project” in 5 priority research areas. Average funding (direct costs) for each project will be 2.1 million yuan for 4 years. The joint fund is open to all Chinese researchers. Qualified researchers are welcomed to apply for this fund according to the research scope and requirements listed in the *Guide*.

I. High-end industrial automation

Proposals are expected to be oriented to needs of the integration of industrialization and informatization in areas such as medical and pharmaceutical industry, chemical engineering, papermaking, clothing, equipment manufacturing, etc., focus on “saving manpower by using machines” and “intelligent factory”, give emphasis to basic theories and key technologies of advanced industrial automation, improve the application of automatic,

intelligent and network-based systems in enterprises, and facilitate the transition from "made in Zhejiang" to "created in Zhejiang".

Main research orientations:

1. Basic theories and key technologies of motion control system based on real-time industrial Ethernet

2. Key techniques of monitoring and fault diagnosis for running state high-end equipment

II. Industrial cyber-physical system

For the reason that Zhejiang has numerous small and medium enterprises and industrial data is dispersed and characterized by heterogeneity, uncertainty, correlative coupling and complexity in spatial and temporal distribution, proposals are expected to be oriented to the needs of industrial transformation and upgrading and acceleration of industrialization-informatization integration in Zhejiang, conduct researches on basic theories and key technologies of industrial cyber-physical system, and comprehensively improve the intelligent level of industrial production of Zhejiang.

Main research orientations:

1. Basic theories and key techniques of large-scale and intensive integration into industrial cyber-physical system

2. Methods and key techniques of energy supply to wireless sensor networks

3. New devices and chips for the industrial cyber-physical system

4. Basic theory and key techniques of high luminous efficacy multi-primary laser

5. Theories and key technologies of reliable and safe chip for solid-state memory controller

III. Intelligent manufacturing

Proposals are expected to be oriented to the needs of transformation and development of manufacturing industry in Zhejiang, focus on a broad range of industries such as equipment manufacturing, light industry, textile, chemical engineering, medical industry, electric power, building materials, metallurgy, automobile, shipbuilding, logistics, etc., develop high and new technologies, take the integration of industrialization and informatization as the means, give emphasis to key theories and technologies of intelligent manufacturing such as network-based collaborative design, manufacturing and service, intelligent industrial robot, intelligent equipment, intelligent basic components, etc., and push forward the upgrading of equipment manufacturing industry in Zhejiang by promoting digitized, network-based and intelligent production process, components and equipment products.

Main research orientations:

1. Basic theories of the big data-driven performance design, manufacturing and operation of high-end equipment

2. Key technologies of intelligent servo electro-hydraulic power unit

3. Methods and key techniques of trans-scale in situ measurement for micro-nano manufacturing

4. Application basis and key technologies of finishing robot for complex curved surfaces

5. Failure mechanism and intelligent operation and management of special equipment

6. Performance and precise control of injection molding of polymers

7. The design theory, method and key techniques of intelligent high-power centrifugal pump

8. Design of materials for solid-state lithium ion battery and key battery manufacturing techniques

9. Basic theory and key techniques of mobile heavy-load industrial robot

IV. Smart city

Proposals are expected to be oriented to the major needs of the building of smart cities and the sustainable development of cities in Zhejiang, focus on basic theories and key techniques of smart city for which major breakthroughs are strongly needed, use the internet, big data and other information and communication technologies to improve the levels of decision-making and city management, build up the smart city management and service network systems based on big data, cloud computing and the Internet of Things, and provide technical support to the industrialization of smart city.

Main research orientations:

1. Basic theories and key techniques of cybersecurity and protection of smart city infrastructure systems

2. Basic theories and key techniques of intelligent drive in complex urban environment

3. Materials and devices for high-performance wireless and passive sensor

4. Comprehensive impact resistant methods and intelligent monitoring technique for large-scale marine engineering structure

V. Smart ocean

Smart Ocean is an important strategy for Zhejiang to perceive the ocean, utilize marine resources and protect the ocean. Proposals are expected to be oriented to the needs emerged from the development of National Marine Economy Demonstration Zone of Zhejiang province, focus on ocean information sensing and digitalization techniques such as ocean remote sensing, ocean sensing and mobile observation, and provide new theories and methods for marine disaster forecast and warning and ocean environment supporting.

Main research orientations:

1. Offshore disaster mechanism and online monitoring and warning techniques for offshore disasters

2. Real-time radioactivity monitoring technique for coastal ocean and its application

3. Offshore environment observation and monitoring techniques based on mobile platforms

NSFC-Shanxi Joint Fund for Coal-Based Low-Carbon Technology

The NSFC-Shanxi Joint fund for Coal-based Low-carbon Technology is jointly established by NSFC and the Shanxi Provincial Government for the period from 2015 to 2019. It aims at attracting and gathering talented scientists across the country, solving major scientific issues and key technological problems of coal-based low-carbon energy in Shanxi, promoting S&T development and talent team building in the region.

In 2017, the NSFC-Shanxi Joint Fund for Coal-based Low-carbon Technology calls for proposals of "Key Program Project" and "Fostering Program Project" in 4 priority research areas. For the "Key Program Project", the average funding (direct costs) for each project will be 2.9 million yuan for 4 years. For the "Fostering Program Project", the average funding (direct costs) for each project will be 700,000 yuan for 3 years. The joint fund is open to all Chinese researchers. Qualified researchers all over the country are welcomed to apply for this fund according to the research scope and requirements listed in the *Guide*.

I. Coal and coal bed methane mining

1. Key program project

(1) Multi-scale features and fluid-structure interaction mechanism of middle rank coalbed methane reservoir in Shanxi

(2) Formation mechanism of gob water accident in coal mines of Shanxi and basic researches on prevention and control

2. Fostering program project

Proposals are expected to be oriented to the demands for safe, green and high-efficiency mining of coal and coalbed methane in Qinshui, Hedong, Xishan and other coal mines in Shanxi, focus on coal and coalbed methane and high-efficiency mining process and techniques, and conduct researches on the geologic, geochemical and geo-microbiological basis of gas formation and new theories, methods and techniques of precision prospecting and mining.

II. Ecological restoration of mining area

1. Key program project

(1) Mechanism of ecological damage and degeneration caused by coal mining in large-scale mining areas of Shanxi

(2) Soil evolution process and oriented cultivation of reclaimed mines in hilly Loess Plateau

(3) The soil-water-vegetation coupled mechanism in the restoration process of damaged ecology in mining areas of arid and semiarid regions

2. Fostering program project

Proposals are expected to focus on the ecological degeneration caused by long-term and high-intensity coal mining and conduct basic researches on the following topics:

mechanisms of surface crack expansion and slope damage induced by coal mining, mechanisms of carbon capture and soil organic matter increase in reclaimed mines, the soil-microorganism-vegetation interaction mechanism and effects in reclaimed mines, the influences of microorganism on soil nutrient cycling in reclaimed mines, optimization and regulation of the structure and function of restored ecosystem in mining areas, and temporal-spatial evolution and driving mechanism of ecosystem services in typical mining areas.

III. Coal chemical industry

1. Key program project

(1) Engineering fundamentals of catalytic conversion of methanol to chemicals

(2) Chemical and engineering fundamentals of the full utilization of Fischer-Tropsch synthetic products

(3) Catalysis and engineering fundamentals of conversion of coal-based acetylene to oxygen-containing chemicals

2. Fostering program project

Proposals are expected to focus on the coal conversion process and conduct basic researches on the following topics: coal structure and reactivity, the chemical basis of gasification process, chemical and engineering basis of pyrolysis process and deep processing of chemicals, and the effective utilization of coal gangue, coal pitch and carbon dioxide. Priorities will be given to basic researches related to the staged coal conversion process.

IV. New materials

1. Key program project

(1) Basic researches on the rolling of magnesium-aluminum composite plate

(2) Basic researches on the solidification and hot deformation process of super heat resistant austenitic stainless steels

(3) Structure and functions and controllable preparation of coal-based carbon materials

2. Fostering program project

Priorities include: basic researches on new carbon-based materials and devices such as energy devices, optoelectronic devices, super-thin and high thermal conductivity components, low energy consumption electronic components and environmental materials; basic researches on the design of new magnesium alloy and aluminum alloy, new theories and methods of shape and property-controlled forming of high strength and toughness components; and the design, preparation, processing and service performance of high-performance, long-service life, high-quality and resource-conserving stainless steels.

V. Energy conservation and environmental protection

1. Key program project

(1) Basic researches on the high-efficiency leaching of multiple metals from fly ash

(2) Basic researches on the ultra-low emission of pollutants from coal-fired flue gas

(3) Basic researches on the high-efficiency utilization of waste heat from coal-fired power plant

2. Fostering program project

Proposals are expected to focus on the pollutions caused by multiple pollutants from the coal utilization process and conduct basic researches on the following topics: energy conservation and waste gas treatment in the utilization of coal, control of waste water and solid waste, utilization of carbon dioxide, health impact and toxicology of coal-fired pollutants and combined removal of coal-based waste gas.

NSFC-Guangdong Center for Big Data Research

NSFC and the Guangdong Provincial Government jointly set up Center for Big Data Research in 2015. It aims at making full use of the guiding role of NSFC and data and computation resources in Guangdong Province, to promote the development of big data development.

This project focuses on smart city construction, targets at areas of smart traffic, smart medicine and health, smart security, smart disaster prevention, smart finance, smart education and smart management, and gathers talents all over China to solve major scientific and technological issues in big data research.

This project will be based on Tianhe-2 super computer, emphasizing on interdisciplinary research and collaboration, and encourage cooperation with universities and research organizations in Guangdong Province.

Application for the following areas will be accepted.

I. Center Project

In 2017, we plan to fund 2 projects in the following 2 areas. Direct cost funding will be 30 million per project for 4 years.

Applicant should be academic leader in the area and have good organizing and coordinating ability, and can play a leading role in the project. PIs in the main research direction should be very active in research. **The applicant should be a PI in one main research direction.**

Research content should cover 5 research directions in the area. Research targets and contents should be closely related and supportive to each other. Team members should be well balanced. **Collaborating organizations should be properly arranged.**

Area One: basic algorithm and supporting environment for big data analysis and processing based on supercomputer

To meet the need of big data applications, the project shall integrate basic algorithms of big data analysis and processing, develop original computation method and algorithm in new types of distributive parallel computing environment, provide use to use operation platform for big data analysis and processing programming, set up parallel computing based on Tainhe-2, and provide online services to external clients

1. Basic algorithm and theory of big data computation

Develop basic algorithm for basic computation problems of big data, such as basic computation in statistics, generalized multi body problems, graph computation, large scale

algebraic computation, etc. development of at least 5 basic algorithm are required.

2. Core algorithm and theoretical analysis of big data analysis

Study core algorithm and distributive and parallel technology, using data modeling and computation, find structure, trend and related models, design at least 5 core algorithm of big data analysis for distributive parallel computation environment, such as clustering algorithm, sorting algorithm, regression algorithm, correlation algorithm, etc.

3. Core algorithm and theoretical analysis of big data processing

Study core algorithm and distributive and parallel technology, using data modeling and computation, find structure, trend and related models, design at least 5 core algorithm of big data processing for distributive parallel computation environment, such as searching, inquiry, sequencing, comparison, origin tracing, transfer and deduction, etc.

4. Supporting environment for mixed programming and optimization of parallel algorithm for big data computation

Based on Tianhe-2, study parallel programming model for big data analysis and processing, and develop key technology for supporting environment for distributive parallel big data analysis and processing, including dynamic load balancing of resources and highly effective dispatching method, data transfer and I/O mechanism, etc.

5. Big data analysis and service platform and demonstration based on Tianhe-2 super computers

Based on research results of 1 to 4, construct 2 parallel computing bases for big data analysis and processing; design service support platform for big data analysis and processing, and on-line computing services, so as to achieve high efficiency operation of big data analysis and processing applications; and verify and platform and algorithm using 1 to 2 big data analysis and processing applications.

Area Two: basic theory and key technology for smart traffic based on big data

Using Tianhe-2 as a platform, the project shall develop an integrated and coordinated urban traffic model and a demonstration version in practical applications, by using complex traffic control system modeling and decision optimization, autonomous coordination and smart decision making involving the movement of million people.

1. Correlation and knowledge gathering of real time traffic data

Study expression and method of modeling traffic data theory and method of large scale multi area knowledge graph learning, develop dynamic construction and real time searching algorithm for traffic knowledge graph model for travel of multi million people.

2. Mining and evolution analysis of urban traffic laws

Study correlation mechanism of traffic factor and mining of urban resident travel laws to achieve real time processing of travel data by million people and mining of characteristics and knowledge laws and visualized analysis platform for urban traffic on Tianhe-2.

3. Coupled modeling and optimization of decision making for traffic environment

Develop method of analysis and emergency response, coordinated decision making and smart control for 10 thousand road joints on Tianhe-2 by integrated analysis of traffic flow, energy consumption and vehicle emissions, risks, etc.

4. Smart sensing of behaviors and autonomous coordinated service for traffic

groups

Study theory and method of group travel in open network, multi resources integration and optimal allocation, develop mechanism of man-machine autonomous coordinated services, and achieve sensing and merging and autonomous service for multi million people on Tianhe-2.

5. Demonstration of urban traffic coordinated technology integration and application for urban traffic based on big data

Use Tianhe-2 to make demonstrations and applications in more than two typical cities.

II. Key Programs

In 2017, we plan to fund 12 key program projects in the following 12 research directions in 3 areas. Direct funding will be 4-6 million per project for 4 years. Collaborators are limited to 2.

Area One: basic theory and key technology of big data management analysis for government administration

1. Sharing and merging of big data for government administration

Use Tianhe-2 to develop integrated tools to support big data applications for government administration.

2. Key technology of behavior knowledge graph for big data of government administration

Develop data management and data analysis platform of super large behavior graph to support government decision making based on big data on Tianhe-2.

3. Deep learning supported government big data analysis and key technology of prediction

Study smart prediction and evaluation based on deep learning, and provide support for government decision making and evaluation of results.

4. Demonstration of big data application of integrated government administration

Use Tianhe-2 as a platform, develop a platform of government administration by management and analysis of big data of government, and develop a platform of as a demonstration of integrated administration of government based on big data applications.

Area Two: visualization and smart control of urban geological environment based on big data

Use Tianhe-2 to study theory and method of using geosciences data to develop visualization and smart control system prototype for urban geological environment.

The visualization platform on Tianhe-2 requires that the experimental area be at least 500 square kilometers and depth greater than 200 meters, and analyzed model have more than a1 million computation nodes.

1. Key technology of temporal and spatial visualization of urban geological environment and merging with big data

Based on Tianhe-2, study integrated 3D visualization management and glass earth theory, method and technology to achieve 3D modeling of urban geological visualization,

and provide 3D geological model for cities.

2. Monitoring, simulation, control and warning of urban geological disasters

Develop 3D geological models of typical cities in Guangdong Province and make large scale data analysis, data mining and verifications in application using Tianhe-2.

3. Monitoring, simulation, control and warning of urban water environment

Develop smart monitoring, control, pollution source tracking, warning and emergency models and decision making supportive prototypes systems, and develop 3D geological models of typical cities in Guangdong Province and make data analysis and verifications in application using Tianhe-2.

4. Monitoring, simulation, control and warning of urban soil pollutions

Develop decision supporting software prototype, and make big data analysis and application verification on TIanhe-2 using mass monitoring point data based on 1:50,000 to 1:1,000,000 soil, geochemical, atmospheric sink and general hydrological surveys.

Area Three: deep merging of big data for urban smart disaster control

Use Tianhe-2 to make correlated big data analysis of smart disaster control and make large scale demonstrative applications in provincial cities.

1. Key technology of temporal and spatial visualization of urban geological environment and merging with big data

Based on Tianhe-2, study integrated 3D visualization management and glass earth theory, method and technology to achieve 3D modeling of urban geological visualization, and provide 3D geological model for cities.

2. Active monitoring and precision control of disaster rick of major urban infrastructure

Use big data technology to monitor and control disaster risk of major urban infrastructure, and make demonstration in one city using Tianhe-2 as a platform.

3. Control of disasters of urban underground pipeline network and syntax correlated risk decision

Identify characteristics of risks for underground pipeline system in super large cities, develop visualized analysis system on Tianhe-2 platform with over one thousand nodes for big cities with area over 10 thousand square kilometers, and demonstrate in 1 city.

4. Scenario simulation and emergency decision making with help of big data technology

Develop big data simulation platform for cross-region operation safety and risk warning system for cities of over 50 square kilometer on Tianhe-2 platform and make application demonstrations in 2 cities.

NSFC-Shenzhen Robotics Research Center Project

The NSFC- Shenzhen Robotics Research Center Project is jointly established by NSFC and the People's Government of Shenzhen Province (Robotics Research Center

Project) from 2016 to 2020. It aims at giving full play of the guiding role of NSFC, jointly solving the cutting-age issues and key technology problems in robotics research, and promoting the sound and rapid development of robotic industry.

The Robotics Research Center Project calls for proposals of "Key Program Project" from the following priority areas with an average direct funding of 3 million yuan per project for four years. Any eligible scientists and technicians in the country are encouraged to submit applications in accordance with research scope and requirements listed in this *Guide*.

I. Research on Robotic Basic Components and Basic Software

In accordance to the basic needs of the development of the robot industry, proposals are expected to carry out basic research to extract the scientific problems from the theoretical design, manufacturing process, assembly technology focusing on basic components such as the driver, reducer, controller, sensor and terminal execution, etc.; or research on the supporting software such as platform software, databases, cloud computing platform required for the study and application of robot. Main research areas include:

1. Key technologies of robot joint servo motor
2. Key technologies of multidimensional force sensors for high speed robot
3. Key technologies of open high performance robot control platform
4. Key technology of intelligent reconfigurable end-effector
5. Key technologies of robot universal software platform

II. Research on Robot Common support Technique

Proposals are expected to study the common support technology of robot system integration and application based on the aspects of robot perception, human-computer interaction, decision judgment and execution control. Main research areas include:

1. Cognitive and target behavior recognition methods of service robot in active environment
2. Visual theory and realization of industrial robots for flexible customization
3. Key technologies of service robot auditory system and speech signal processing in complex environment
4. Efficient and accurate mapping of mobile robots and key techniques of positioning and navigation chip
5. Autonomous tasks cognition and planning method for service robot
6. The forming mechanism of robot intelligence and the mechanism of autonomous learning evolution
7. The intelligent cooperative control theory and method of robot cluster

III. Research on industrial Robots

Aiming at the strategic requirements of high-tech manufacturing industries such as electronic information, intelligent equipment and new energy in Shenzhen, proposals are expected to study the key technologies of industrial robots with flexible operation configuration to meet the needs of new manufacturing mode that is customized, flexible, accurate and rapid, thus promoting the popularity of industrial robots.

1. On-line diagnosis method of industrial robots operational state

2. Key technology of robot intelligent manufacturing system based on human-machine cooperation

3. Key technologies of mobile industrial robot for flexible manufacturing

4. Key technologies of large-scale different-component welding robot

5. Design and control of assembly robot for 3C industry

6. Key techniques of self-learning programming for industrial robots

IV. Research on Medical Rehabilitation Robot

To meet the wide range of needs for intelligent robots in the medical service field in Shenzhen City, proposals are expected to focus on research of rehabilitation, surgery and other service robots. Main research areas include:

1. Key techniques of limb injury treatment and rehabilitation robot

2. Precise perception and precise manipulation of minimally invasive surgical robot

3. The planning and evaluation of robotic surgery based on virtual reality

4. The operation theory and implementation of surgical robot sharing based on empirical learning

5. Key techniques of endoscopic assisted surgical robot

V. Research on Special Robot

To meet the wide range of needs of machines in place of human beings under special conditions, proposals are expected to study the robots needed in the fields of aerospace, marine engineering, energy and power, and disaster prevention and reduction; or study the unmanned aircraft/ship/car; or focus on cutting-edge science and new special robot, so as to enhance the human ability to fulfill tasks and explore the unknown. Main research areas include:

1. Key technologies of rope - driven robots

2. Key technologies of patrol robots for high voltage power line

3. Key technology of modular deformation robot adaptable to complex environment

4. The key technology of bionic amphibious work robot

5. Key techniques of autonomous awareness, navigation and control for underwater vehicles

6. Monitoring mission-oriented UAV group network and collaborative key technology

7. Key technologies of micro / nano operational robot system

Tianyuan Fund for Mathematics

Tianyuan Fund for Mathematics is a special fund to integrate collective wisdom of mathematicians, explore funding method that suits the unique features of mathematics, and make China a strong country in mathematics. This fund supports researchers to conduct research according to the features and need of mathematics, foster young talents, promote academic exchange, optimize research environment, spread mathematical culture and thus strengthen creativity of China in mathematics. The fund mainly provides the following 4 types of funding in the year 2017.

1. Tianyuan Center of Mathematics

The main objective of the Tianyuan Youth Center of Mathematics is to set up a platform for cooperative research and academic exchange. Focusing on several topics and interdisciplinary areas, this program aims to foster research talents through various types of academic activities, and promote research in various branches of mathematics and interdisciplinary studies in China.

This project aims at frontier areas and important directions in mathematical research, and supports various academic exchange activities all over China. Applicants can decide by themselves the project name and shall include the significance, scope, plan, and background of the proposed activity, and possible collaborators in the application.

We plan to fund 3 projects in 2017, and the funding is about 3 million yuan per project.

2. Mathematical summer schools and training workshops for young teachers

The summer schools are high quality core basic courses for mathematical postgraduate students and young teachers so as to consolidate mathematical basis of postgraduate students and young teachers. Summer school has three types of theme, namely, basic mathematics, applied mathematics and statistics.

The training workshops are for young teachers in the western and northeastern regions of China to improve their capability in mathematical research and teaching. Training workshops will be focused on two themes, one for teachers with mathematical background and another for teachers with non-mathematical background. Either of teachers training workshops may be

organized in the mid-west or the northeast.

The application should include name, contents, number of teachers and students.

The funding will be 600,000 yuan per project.

3. Special lectures on mathematics, high level workshops

Special lectures are organized for postgraduate students focusing on one or several related themes so as to introduce frontier topics in mathematical research. Lectures could include basic courses and special courses with large audience lasting for 3 weeks. Application should provide teaching outline, teaching contents and name list of the lecturers.

High level workshop programs mainly support research groups of high level and excellent mid aged and young mathematicians to sponsor workshops on clear topics and important international mathematical issues. At least one review paper should be published after the workshop, and proceedings or papers are highly recommended.

Each project will be funded with up to 200,000 yuan.

4. Mathematical culture and knowledge dissemination

This category of funding provides support for publications of popular mathematical books, including domestic and translated foreign books, so as to attract primary and middle school students to learn mathematics and promote public understanding of mathematics. It also funds the publication of national influential journal related to mathematical culture, dissemination of mathematics, mathematical education and mathematical modeling, so as to improve journal quality and impact on the public. In addition, it sponsors the important national activities of mathematical dissemination by universities, research institutions, science associations and mathematical society above provincial level.

Please note that there are big changes in the types of funding in 2017, and research projects will not be funded, including Tianyuan youth grants.

The funding is for one year, and will be direct cost funding only.

Special Fund for Research on National Major Research Instruments

The Special Fund for Research on National Major Research Instruments aims to encourage and foster the exploratory research and development of instruments with creative ideas, and major research instruments and equipment with original creative ideas, which should be based on frontier of science and national needs and guided by scientific targets, so as to provide new means and tools for scientific research and enhance indigenous innovation in China.

Projects funded by the Special Fund for Research on National Major Research Instruments comprise of departmental recommendation projects and free application projects.

Funding for Projects of Special Fund for Research on National Major Research Instruments in 2016

Unit: 10,000 yuan

	No. of applications	No. of awards	Direct cost	Average funding for direct costs
Departmental recommendation	62	4	27,025.03	6,756.26
Free application	588	85	55,381.73	651.55

The funding period for projects of the Special Fund for Research on National Major Research Instruments is 5 years, and in general the number of collaborating institutions in one project should not exceed 5.

1. Funding scope

(1) Research and development on indigenous scientific instruments and equipment with originality and important roles for exploring research frontiers.

(2) Research and development on scientific instruments for discovering new phenomena, revealing new laws, verifying new principles and acquiring new data on the basis of breakthroughs in core technology and integrated

innovation.

Besides, free application projects of the Special Fund for Research on National Major Research Instruments are also encouraged to target development of new scientific instruments with potentials of applications in broad areas.

2. Eligibility and requirements for application

(1) Eligibility: qualified applicants should meet the following criteria:

(i) Have the experience of conducting basic research;

(ii) Have senior professional position (title).

Post-doctors, postgraduate students, researchers without home institutions, and researchers whose home institutions have not been registered at NSFC are not eligible for application.

(2) Requirements:

(i) For free application projects in 2017, applicants may submit research proposals via their home institutions. The budget cap for direct costs is 10 million yuan per project. (ii) For departmental recommendation projects in 2016, the following departments are entitled to recommending projects of the Special Fund for Research on National Major Research Instruments: Ministry of Education, Chinese Academy of Sciences, Ministry of Land and Resources, Ministry of Industry and Information Technology, Ministry of Environmental Protection, Ministry of Agriculture, National Health and Family Planning Commission, China Earthquake Administration, State Administration for Quality Supervision and Inspection and Quarantine, China Meteorological Administration, State Oceanic Administration, China Academy of Engineering Physics, Equipment Development Department and Logistic Support Department of People's Republic of China Central Military Commission. In 2017, the budget for direct costs of the departmental recommendation projects of the Special Fund for Research on National Major Research Instruments should be no more than 10 million yuan per project.

3. Notes on application

(1) Applicants are advised to read this Guide to Programs carefully and prepare research proposals in accordance with the Outline of Preparation of Applications of the Special Fund for Research on National Major Research Instruments. Please choose the "Special Fund for Research on National Major Research Instruments" from the funding categories, and choose "free application" or "departmental recommendation" under the subcategory of funding. Applicants are advised to clarify the details if they are carrying out projects which have some links with the current application. Explanation of the similarities and differences in research contents between the ongoing project and

the current application should be presented in the application.

(2) For applicants and participants with senior academic positions (titles), the number of applications plus ongoing projects of the Special Fund for Research on National Major Research Instruments as well as the Special Fund for Research on National Major Research Instruments administered by the Ministry of Science and Technology should not exceed one in total.

(3) Projects of the Special Fund for Research on National Major Research Instruments are funded by way of cost reimbursement, so applicants are advised to make their budget requests in an objective and practical manner according to the real costs of the development of instruments.

Appendix

Contact of NSFC Departments and Bureaus

Department		Tel
Department of Mathematical and Physical Sciences		
Division of General Affairs		62326910
Division of Mathematical Sciences		62327178
Division of Mechanics		62327179
Division of Astronomy		62327189
Division of Physical Sciences I		62327181
Division of Physical Sciences II		62327182
Department of Chemical Sciences		
Division of General Affairs		62326906
Division I	Inorganic Chemistry	62327170
	Analytical Chemistry	62327075
Division II	Organic Chemistry	62327169
Division III	Physical Chemistry	62327172
Division IV	Polymer Science	62327167
	Environmental Chemistry	62327173
Division V	Chemical Engineering	62327168
Department of Life Sciences		
Division of General Affairs		62329190
Division I	Microbiology	62329135
	Botany	62329135
Division II	Ecology	62327197
	Forestry	62329321
Division III	Biophysics, Biochemistry and Molecular Biology	62327213
	Biomechanics and Tissue Engineering	62327213
	Immunology	62329240
Division IV	Neurosciences	62329352
	Psychology	62329352
	Physiology and Integrative Biology	62329352
Division V	Genetics and Bioinformatics	62329117

Department		Tel
Division VIII	Animal Husbandry and Grassland Science	62327194
	Veterinary Science	62327194
	Fisheries	62327194
	Zoology	62326914
Department of Earth Sciences		
Division of General Affairs and Strategic Planning		62327157
Division I	Geographical Sciences	62327161
Division II	Geochemistry	62327158
	Geology	62327166
Division III	Geophysics and Space Physics	62327160
Division IV	Marine Sciences	62327165
Division V	Atmospheric Sciences	62327162
Department of Engineering and Materials Sciences		
Division of General Affairs		62326884 62326887
Division of Materials Science I	Metallic Materials	62328301
Division of Materials Science II	Inorganic Non-metallic Materials	62327144
	Organic Polymer Materials	62327138
Division of Engineering I	Metallurgy and Mining	62327136
Division of Engineering II	Mechanical Sciences and Manufacturing	62327098
Division of Engineering III	Engineering Thermal Physics and Energy Utilization	62327135
Division of Engineering IV	Architectural Engineering, Environmental Engineering and Civil Engineering.	62327142
Division of Engineering V	Hydro Science and Marine Engineering	62327137
	Electrical science and Engineering	62327131
Department of Information Sciences		
Division of General Affairs and Strategic Planning		62327146
Division I	Electronics and Information Systems	62327147
Division II	Computer Sciences	62327141
Division III	Automation Sciences	62327149

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Department		Tel
Division V	Cell Biology	62329117
	Developmental Biology and Reproductive Biology	62329170
Division VI	Agricultural Infrastructure and Crop Sciences	62326918
	Food Sciences	62326918
Division VII	Plant Protection	62327193
	Horticulture and Plant Nutrition	62327193
Department of Health Sciences		
Division of General Affairs		62328991 62328941
Division I	Breath, Blood	62327215
	Cycling	62328559
Division II	Digestive, Urinary, Endocrine, Eye, ENT, Oral sciences	62329153
Division III	Neurological, Psychiatric, Geriatric medicine	62327198
Division IV	Reproductive, Perinatal, Neonatal, Medical Immunology	62326924
Division V	Medical Imaging, Biomedical Engineering, Special medicine, Forensic Medicine	62329131
Division VI	Medical Microbiology and Infectious Diseases, Movement Disorders, Trauma, Burns, Surgery, Severe Acute Medicine, Laboratory Medicine, Rehabilitation Medicine	62327195
Division VII	Oncology I	62327207
Division VIII	Oncology II	62329157
	Skin, Preventive Medicine, Science Endemic, Occupational Medicine, Radiology	62327212
Division IX	Pharmacology	62327199
Division X	Traditional Chinese Medicine, Integration of Traditional Chinese Medicine and Western Medicine, Chinese Materia Medica	62328552

Department		Tel
Division IV	Optical Information Devices	62327143
Department Management Sciences		
Division of General Affairs		62326898
Division I	Management Science and Engineering	62327155
Division II	Business Management	62327152
Division III	Macro Administration and Policy	62327151
Bureau of Planning		
Division of General Affairs		62326980
Division of Programs		62327230 62325557
Division of Talent Fostering		62328623 62325562
Division of Interdisciplinary Sciences		62327015 62328484
Bureau of Finance		
Division of Budgeting		62326585 62328485 62326460
Division of Fund Accounting		62326760 62328485 62327225
Bureau of International Cooperation		
Division of Foreign Affairs Planning		62329743
Division of Asian, African and International Organizations Affairs		62326998 62325449
Division of American and Australasian Affairs		62325540 62325377
Division of European Affairs		62325309 62327014
Office for Hong Kong, Macao, and Taiwan Affairs		62326934
Center of Administrative Services		
General Office		62327218
NSFC Periodical Office		
General Office		62327204
Sino-German Center for the Promotion of Science		
Operator		82361200