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Novel Endeavors of CAS to Enhance Basic Research

Basic research is the foundation and source of S&T innovation, and the cornerstone for the development of CAS. Recently, a guideline document to strengthen basic research (dubbed as "The Ten Articles of Basic Research" and hereafter referred to as "Ten Articles") was adopted at the Chinese Academy of Sciences (CAS), putting forward a series of new ideas, policies, and measures aimed at this goal. Here we present the involved measures in an overview as below.

1. Adjust basic research positioning

Take as the main task the targeted and systematic basic research in response to national strategic needs and major scientific frontier issues

- Based on the strategic requirements of national development for basic research, guide and promote scientific research institutions and researchers to focus on their core responsibilities, and carry out targeted basic research
- Carry out organized and systematic basic research by leveraging the advantages of the institutionalized approach, multiple disciplines, large platforms and comprehensiveness
- Maintain a certain amount of high-level free exploration and research

2. Optimize the layout of key scientific research

Focusing on the frontiers of the new round of S&T revolution, establish a layout for basic research that leads S&T innovation as well as supports industrial development

- Lay out basic research that leads the development of cutting-edge technology with forward-looking vision, and drives transformative and disruptive technological breakthroughs
- Focusing on strengthening the basic research that supports the development of emerging industries, provide strategic reserves for the cultivation and development of ne w industries and businesses

- Develop basic science system and emerging interdisciplinary studies
  - Overcome a number of challenges in science of the world, and cultivate disciplines for the future
  - Strengthen the leading role of basic disciplines such as mathematics, theoretical physics, and theoretical chemistry in the development of applied disciplines and breakthroughs in core technologies

3. Deepen the reform of scientific research institutions

Accelerate the building of world-class scientific research institutions and establish a basic research hub with international influence

- With the restructuring of the state key laboratory system, reshape the national force of basic research, forming a new type of research organizations that can both "operate independently and work together to achieve breakthrough with concerted efforts"
- Build a group of basic research centers in fields such as mathematics, physics and chemistry to establish world-class science centers in related fields
- Expand the autonomy of scientific research institutions, strengthen the integrated configuration of talents, platforms, and projects, and build an institutional governance system with accurate positioning, consistent powers and responsibilities, scientific management, as well as vibrancy

4. Innovate research topic selection mechanism

Strengthen demand- and problem-oriented approaches, and realize the transition from "what is being done now" and "what is intended" to "what should be done"

- Focusing on the most urgent scientific and technological issues in the national strategic needs and open questions on the world's scientific frontier, identify scientific issues and the main directions, strengthen overall coordination, and avoid repeated and distracting efforts
- Establish two types of topic selection mechanisms by combining top-down and bottom-up approaches
  - Working with key industry sectors and major enterprises and crystallize basic science issues based on the major needs derived from national strategy and the State's economic and social development
  - Crystallize cutting-edge scientific issues from the development of science by giving full play to the role of scientists

- Encourage scientific researchers to independently raise scientific issues and ideas, and increase support for non-consensus and disruptive projects
- Regularly publish the list of important topics, dynamically adjust and update it, encourage people to take science challenges, and continue to research on key issues

5. Reform scientific research organization

Reform basic research organization models and management approaches so as to tap into the potential of innovation and improve innovation efficiency

- Reform the organization model
  - Coordinate the major S&T tasks at the national and CAS levels , and address major challenges with the concerted efforts of core teams and vantage clusters
  - Build open, mobile, tolerant, flexible and scalable scientific research teams in different categories based on the laws and characteristics of different types of basic research activities
  - Support the establishment of clusters of research teams and laboratories on key areas and major scientific issues
- Expand scientific research autonomy
  - On the premise of being in line with their positioning, enhance the autonomy of scientific research institutions in scientific research planning, team building and resource allocation to expand the autonomy of researchers in scientific research.
  - Chief scientist accountability and contracted funding mechanism will be adopted for major basic research projects to allow greater autonomy for scientific research
- Innovate research paradigm
  - Promote the interdisciplinary cooperation and innovative applications of big science, big data, artificial intelligence technology, and robot scientists in the research of large-scale and complex scientific issues, improve the efficiency of basic research by a big margin, and give rise to new disciplines.
  - Make full use of the platform, strengthen the open sharing of all kinds of scientific research resources, and develop a new data-driven scientific research paradigm.

6. Play the role of major infrastructure

Carry out institutionalized basic research based on major scientific and technological infrastructure

- Build a number of basic research bases supported by major national S&T infrastructure, carry out research on major frontier scientific issues and key technologies
- Support the building of a group of targeted and institutionalized scientific research platforms based on major S&T infrastructures, and render continued support to basic research on important fields and major scientific issues
- Propose scientific goals and needs with forward-looking vision, carry out preliminary research, principle verification and technical preparation, and cultivate a number of pioneering and leading S&T infrastructures

7. Strengthen the building of talents team

Speed up the cultivation of a team of high-level basic research talents toward 2030, with young scientists as the backbone.

- Implement a special research post system for basic research
  - Support and cultivate a team of core and backbone talents
  - Cultivate strategic scientists in high-level scientific research practices
- Implement a team-building plan for juniors in the field of basic research
  - Combination of cherry-pick topic selection and talents recruitment
  - Establish a stable support mechanism for long-term basic research and provide a more tolerant environment for scientific research
- Strengthen the team building of young talents
  - Eliminate seniority rankings and support outstanding young talents with scientific ideas and innovative potential to take the lead
  - Increase the proportion of young talents under the age of 45 among persons in charge of talent programss and scientific research projects

- Advance the establishment of a special research assistant team with post-doctorate scholars as the main players
- Take advantage of the integration of science and education to cultivate high-level reserve talents for basic research

8. Reform the S&T evaluation system

Formulate an evaluation system that conforms to the regular patterns of basic research and meets the requirements of institutionalized scientific research

▶ Reform basic research evaluation mechanism

- Establish a quality-, performance- and ability-oriented basic research evaluation mechanism without only focusing on papers, professional titles, academic qualifications, and awards
- Encourage scientific researchers to accommodate the strategic needs of the nation, concentrate on basic research, and focus on key scientific challenges

▶ Optimize basic research evaluation criteria

- Evaluation of results: oriented towards scientific significance and application value, highlight innovative, pioneering and breakthrough contributions
- Evaluation of talents: highlight actual academic contribution and innovation potential
- Evaluation of institutions: focus on scientific research planning, team building, academic environment, ability to undertake major scientific research tasks and key achievements, etc.

▶ Carry out categorized evaluation of basic research

- **Basic research facing the frontiers of world science:** with peer review as the main approach, implement long-term evaluation, implement an evaluation mechanism based on representative works, encourage originality, and tolerate failure
- **Basic research oriented to national strategic needs:** adopt a combination of peer review and demand-side evaluation with a key focus on the role or potential application value of tackling important scientific challenges and supporting core technologies

9. Strengthen international S&T cooperation

Propose and initiate a number of major international scientific programs

- Choose areas of strength, take the initiative to conduct a number of major international scientific programs, and increase the influence and contribution of China to the global S&T community
- Continue to actively participate in the relevant international scientific program that are being implemented
- Take basic research as a starting point, give full play to the unique advantages of the national academy of sciences and the key roles played by scientists, and more actively integrate into the global S&T network

10. Create an enabling scientific research ecosystem

Promote the spirit of scientists and strengthen the value of basic research in serving national development and social progress

- Carry out the campaign to "inherit the spirit of old scientists and promote the spirit of scientists in the new era", and build a number of demonstration bases
- Strengthen academic practice, advance the building of scientific research integrity and ethics system in science and technology, and take "zero tolerance" approach for academic misconduct
- Improve scientific research management and services to ensure that scientific researchers have sufficient time and decent conditions to devote themselves to basic research