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Thoughts on Systematic Layout of Strengthening National Strategic Scientific and Technological Power

Guangzu BAI
Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, Lanzhou 730000, China, baigz@llas.ac.cn

See next page for additional authors

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Thoughts on Systematic Layout of Strengthening National Strategic Scientific and Technological Power

Abstract
Strengthening the national strategic science and technology (S&T) power is the key path to achieve China's scientific and technological independence, and to accelerate the construction process of a powerful nation of science and technology. In the global history of science and technology development in the past century, along with the shift of the world's scientific center, major developed countries have recognized and strengthened their S&T power from the national strategic level at different stages of development. Based on a profound understanding of the significance of strengthening the systematic layout of national strategic science and technology forces, this paper discusses the layout of national S&T power in the national S&T innovation system, by focusing on the "main position" of national innovation, exploring the "no man's land" around the frontier, and facing the "main battlefield" of industrial and economy, respectively. Relevant suggestions are put forward to provide reference for strengthening the national S&T power.

Keywords
national strategic scientific and technological power systematic layout

Authors
Guangzu BAI and Xiaoyang CAO
Thoughts on Systematic Layout of Strengthening National Strategic Scientific and Technological Power

BAI Guangzu¹, CAO Xiaoyang²

1. Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences, Lanzhou 730000, China;
2. Chinese Academy of Engineering Innovation Strategy, Beijing 100088, China

Abstract: Strengthening the national strategic scientific and technological (S&T) power is the key path to achieve China’s S&T independence, and to accelerate the construction of a powerful nation of science and technology. In the global history of science and technology development in the past century, along with the shift of the world’s scientific center, major developed countries have recognized and strengthened their S&T power from the national strategic level at different stages of development. Based on a profound understanding of the significance of strengthening the systematic layout of national strategic S&T power, this paper discusses the layout by focusing on the “main position” of national innovation, exploring the “no man’s land” around the frontier, and facing the “main battlefield” of industrial economy, respectively. Relevant suggestions are put forward to provide reference for strengthening the national S&T power. DOI: 10.16418/j.issn.1000-3045.20210402001-en

Keywords: national strategic scientific and technological power; systematic; layout

The Outline for the 14th Five-Year Plan (2021–2025) for National Economic and Social Development and Long-Range Objectives Through the Year 2035 insists on the core position of innovation in the overall situation of China’s modernization, makes a special deployment to strengthen the national strategic scientific and technological (S&T) power, and regards it as the key path to achieve S&T independence and accelerate the construction of a great country in science and technology. In the global history of science and technology development in the past century, along with the shift of the world’s scientific center, major developed countries have recognized and strengthened their S&T power from the national strategic level at different stages of development. The strategic S&T power has played an important role in achieving major breakthroughs in key areas, leading the construction of national innovation system, boosting the comprehensive S&T power, and occupying the commanding heights of science and technology. As China enters a new stage of development, how to strengthen the systematic layout of national strategic S&T power and how to accelerate the creation of the main source of original innovation are strategic issues worthy of in-depth thoughts.

1 Profoundly understanding the significance of strengthening the systematic layout of national strategic S&T power

The national strategic S&T power is the “national team” for building a great country in science and technology, the “cornerstone” for national security, the “star” guiding cutting-edge exploration, and the “planter” for cultivating emerging industries, which plays the roles of strategic support, leadership, original momentum, and source supply in the national S&T innovation system. Strengthening the national strategic S&T power is to build an institutionalized “S&T elite army” that reflects the will of the nation, serves the national need, and represents the national level. This “S&T elite army” can safeguard the strategic interests of China in critical moments, being ready to assemble at the first call and capable of fighting and winning [1].

1.1 Strengthening the systematic layout of national strategic S&T power is essential for the effective play of national strategic S&T power

National strategic S&T power is the primary basis for meeting the national strategic needs and reflecting the national strategic intentions. Therefore, it is necessary to cover the key areas of national security system with a systematic layout and stick to it for a long time for building a great country in science and technology. The mission of national strategic S&T power is to solve major national S&T problems and overcome common key difficulties in technology development. Thus, the systematic layout should coordinate and mobilize research teams in multiple disciplines and optimize the allocation of resources, thus forming a joint effort to tackle key problems. National strategic S&T power is characterized by source innovation and public welfare sup-
ply. Hence, in the systematic layout, it is essential to keep the input in the basic unpopular disciplines with large investment, long cycle, and slow result achievement, and focus on the emerging interdisciplinary fields with large demand, wide application, and fast iteration. In this way, a common basic technology supply system can be formed. The main task of national strategic S&T power is to lead the construction of high-level innovation entities and optimize the spatial layout of national innovation system. Therefore, coordinated formation and benign interaction of basic S&T power, regional S&T power, and industrial S&T power should be realized with a systematic layout to create a S&T infrastructure cluster and a regional S&T innovation highland with reasonable spatial distribution and complete functional system.

1.2 Strengthening the systematic layout of national strategic S&T power is the inherent requirement for the development trend of science and technology

The new round of S&T revolution and industrial transformation is accelerating and evolving. The deep integration and extensive permeation of disciplines have presented a trend of multipoint and mass breakthroughs [2]. In current S&T revolution, it is the high-tech cluster rather than one or two disciplines that plays a leading role, reflecting the trend of mass breakthroughs. High-tech cluster consists of information technology, life sciences, biotechnology, nanotechnology, new materials, advanced manufacturing technology, aerospace technology, and new energy and environmental protection technology [3]. Therefore, China must strengthen the systematic layout of national strategic S&T power and step up the crossing of basic frontier disciplines and integration of disciplines, so as to conform to the new trend of S&T development.

1.3 Strengthening the systematic layout of national strategic S&T power is an inevitable choice to deal with international competition

The world is undergoing great changes unseen in a century. The S&T competition among major countries has transferred from domain competition to systematic confrontation. Major developed countries are striving to build a national innovation system with the coordinated development of big science and small science, dominated by institutionalized S&T power, deeply involved by government, and efficiently collaborated with all society. Big science is oriented by state demand and focuses on solving common problems of human, and small science targets free exploration. On January 13, 2021, the Center for a New American Security (CNAS) released an official document titled Taking the Helm: A National Technology Strategy to Meet the China Challenge. It pointed out that the United State government must formulate an overall and coherent strategic framework to integrate various initiatives, so as to remain its leadership in the technological fields. In addition, this document emphasizes the whole-of-nation participation to establish an advanced and resilient national innovation system oriented to business, technology, and the globe. Therefore, China must strengthen the systematic layout of the national strategic S&T power, improve the national innovation system, and fully shape its competitive advantage to respond to the new trend of S&T competition among major developed countries.

2 Strengthening the layout of national strategic S&T power around the national S&T innovation system

Vannevar Bush, the science advisor of President Roosevelt, proposed a linear research model [4] of basic research—application research—product development in his report “Science: The Endless Frontier” in 1945. The report provides the basic model of S&T innovation system after the World War II, supporting the United States to remain as the center of world science and a powerful nation in science and technology leading the global S&T development for a long time. We have used to understanding and promoting the construction of national S&T innovation systems according to linear logic. However, the S&T innovation system of China has actually formed three types of development logics and paths [5]: (1) oriented by major national goals and missions and with national research institutes as the main body; (2) oriented by internationalization and with universities as the main body, following the development logic of evaluation based on the publication of high-level international achievements; (3) oriented by market and with enterprises as the main body, featuring import as the main goal instead of research and development.

The evolution of these three types of research paths has been accompanied by the growth of a powerful nation in science and technology with Chinese characteristics. The evolution has unique characteristics in object location, governance mode, implementation subject, resource allocation, process management, achievement evaluation, and value orientation, and has formed a relatively closed and independent operation system. The linear model has difficulties in perfectly describing the rules and characteristics of the innovation processes. Therefore, for the systematic layout of national strategic S&T power based on the new development theory at the new development stage, China should neither exactly copy the typical mode of developed countries nor build a new mode separately from the existing system. Instead, China should implement policies and design layout according to the existing different research types in the national S&T innovation system and make precise efforts in key areas so as to forge advantages.

2.1 Focusing on the fundamentals of national needs to strengthen the layout of national strategic S&T power

For the fear that the rapid development of science and
technology of China in recent years may pose a threat to the leading position of the United States which had been formed after the World War II, especially in the information age, and then put the United States at a disadvantage in the fourth industrial revolution, the United States has confirmed the Chinese version of Sputnik Moment (1). History and reality have told us that there will be a high probability of S&T competition and even S&T decoupling between major countries. On March 26, 2021, the United States President Joe Biden said in his first presidential press conference that he would increase the percentage of federal research and development spending on science and technology to 2% (equivalent to the percentage during the Apollo moon landing program) of GDP, so as to ensure the leading place in the future Sino-American confrontation. In view of this, at present and for a period to come, the national strategic S&T power serving the national major needs is prominently reflected in supporting China to win the advantage, initiative, and future in the new round of the superpower game. In the construction of a new development pattern, China should reshape internal strengths, strengthen endogenous momentum, and stimulate potential vitality. In conclusion, China delegates the mission of building a powerful nation in science and technology related to security and development to the national strategic S&T power once again.

2.1.1 Strengthening the layout of national strategic S&T power around national security system to guard the bottom line of major security

S&T security is not only an important part but also an important guarantee of national security. Strengthening the layout of national strategic S&T power around the national security system has two requirements. One is to be responsible for defending national territory by realizing the security and control of key S&T fields and maintaining the self-security of the S&T fields. The other is to properly defend national territory by providing strong support for national sovereignty, security, and developmental interests and improving the capability of using science and technology to maintain national security. Specifically, China needs to deploy institutionalized national strategic S&T power in national security and development-related fields such as military security, nuclear security, food security, energy and resource security, cybersecurity, biosecurity, space security, polar security, deep sea security, and ecological security. In addition, cross-professional, interdisciplinary, and cross-field strategic “S&T aircraft carrier groups” should be established to form the systematic capability of collaboration, which aims to provide overall technological solutions for maintaining the bottom line of security in specific fields. This type of national strategic S&T power should adopt the “state own–state run” mode (wholly funded by the state, state management and assessment, run by an independent legal person or relying on national research institutes and universities as appropriate) to build a comprehensive basic research platform. Targeting the overall major strategic goals in the field of national security, strategic science and engineering plans should be organized and formulated with institutional power for leading the coordination of national S&T resources in the field. Major national S&T tasks should be designed and implemented to serve long-term original innovation for building national security capacity and enhancing the ability of shaping the national security trend.

2.1.2 Strengthening the layout of national strategic S&T power in key fields to expand future development space

The Outline for the 14th Five-Year Plan (2021–2025) for National Economic and Social Development and Long-Range Objectives Through the Year 2035 specifies quantum information, photonics and micro-nano electronics, network communications, artificial intelligence, biomedicine, and modern energy systems as the key fields of innovation in the layout. The United States Endless Frontier Act released in May 2020 put forward to invest 100 billion US dollars over the next five years to promote S&T innovation in ten key fields including artificial intelligence, high-performance computing, quantum computing, robotics and advanced manufacturing, disaster prevention, communication technology, biotechnology and genomics, advanced energy technology, and cybersecurity (2). Since major developed countries have actively deployed S&T innovation resources in strategic fields that are essential for future development, China should also strengthen the institutional layout of national strategic S&T power in the strategic fields and create a group of high-level S&T teams that combine the national major development needs with the exploration of emerging technologies, so as to seize the commanding heights of future technological competition and create a first-mover advantage for the new round of development. Differential layout should be employed for such national strategic S&T power according to the stage in the life cycle of the corresponding field, the position of the innovation chain, and the integration degree with the industrial chain. China should appropriately adopt multiple modes such as “state own–state run” and “state own-social run” (6), thereby establishing an in-depth cross-research platform that combines stability and flexibility, perspective and reserve, and continuity and dynamic.

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1. Refers to the unprecedented sense of urgency shown by the United States after the successful launch of the first artificial satellite by the Soviet in 1957.
Considering the national development needs at different stages and limited objectives in key S&T fields in specific technological cycles, new research universities as well as new research and development institutions should be guided to collaborate and carry out major S&T missions. In this way, new opportunities can be fostered for expanding the future development space and shaping the competitive advantages of a great nation.

2.1.3 Strengthening the layout of national strategic S&T power around the regional development strategy to stimulate the endogenous momentum

In order to speed up the construction of a new development paradigm with the domestic circulation as the mainstay and the domestic and international circulations reinforcing each other, the most fundamental thing is to keep high-level S&T independence [7]. China should focus on the major regional development strategies and rely on the layout of the national strategic S&T power to build a number of high-level regional innovation highlands with distinctive advantages and obvious radiation and leading effects, thereby accelerating the formation of the echelon linkage and in-depth layout between the strategic fulcrum of the domestic large circulation and the important nodes of the domestic and international circulations. This kind of national strategic S&T power is responsible for shaping the regional innovation growth pole and aims to “build a plateau in the plain and lift a peak on the plateau.” It needs to deeply combine the characteristics of regional endowment and industrial structure and form a regional potential difference between internal and external circulation. It has the dual positioning of national overall layout and local development needs, is driven by both S&T innovation and institutional innovation, and features the interconnection of internal development and opening up. This national strategic S&T power has multiple roles as designer, organizer, and implementer of the regional innovation ecosystem, which stimulates the endogenous momentum of multiple innovation subjects and the circulation vitality of multiple types of elements, so as to promote the coordination of national and regional strategic S&T power to build an inward development pattern and incorporate into the global innovation system.

2.2 Exploring the “no man’s land” around the frontiers to strengthen the layout of national strategic S&T power

After years of accumulation, China has entered the “no man’s land” in more and more fields around the frontiers of world S&T exploration and started to address the major frontier scientific problems. With the development of frontier research towards the ultra-macro, ultra-micro and extremely complex directions, the research in the “no man’s land” needs not only the advanced equipment and major S&T infrastructure but also the collaborative operation and integrated innovation of multiple disciplines. In addition, such research needs to bear the high trial-and-error cost and opportunity cost in the attempts of multiple technological paths. Therefore, China should strengthen the layout of national strategic S&T power in the “no man’s land” around frontier fields, so as to accelerate the creation of original innovation sources.

2.2.1 Arranging national strategic S&T power around major S&T infrastructure to explore the frontiers of sciences

In the era of big science, major theoretical discoveries and scientific breakthroughs are highly dependent on major S&T infrastructures. Therefore, it is suggested to focus on the “no man’s land” of S&T frontiers such as space and astronomy, particle physics and nuclear physics, energy and new materials, earth systems and environment, and life and health. Moderately advanced layout and systematic updating should be implemented for national major S&T infrastructures to form institutionalized national strategic S&T power. The role of major S&T infrastructures should be fully played as a multidisciplinary, high-performance, large-scale, strong collaborative and comprehensive innovation platform for the conduction of frontier research and the production of original discoveries and major research achievements. Additionally, the role of major S&T infrastructures should be fully played in the international exchanges of science and technology, which can attract world-class scientists to settle their household registration in China and promote the flow of top talents to China, laying a foundation for China to become the future world scientific center. The basic leading role of major S&T infrastructures should be fully played for regional development, and the unbalanced and inadequate regional development of China should be appropriately considered in the layout to provide a basic platform support for the innovation-driven and leap development of central and western China.

2.2.2 Arranging national strategic S&T power around the major application needs to ensure the source supply

To explore the “no man’s land” around S&T frontiers, we need to locate the scientific problems for solving realistic problems. The national strategic S&T power should be systematically deployed around the key areas of basic research for application. Especially, the direction of basic research needs to be found around the major strategic needs of China, so as to solve the core scientific problems of key technological bottlenecks. To make major breakthroughs in original discoveries, original theories, and original methods, we should focus on the innovation of sources instead of the whole process and take the urgent and difficult S&T tasks (e.g., research and development of prevention and control measures against major emerging infectious diseases) to maintain the strategic determination and supply key basic technologies. The “no man’s land” cannot be explored by the innovation behind closed doors. The national strategic S&T
power should build a high-end open scientific platform, optimize the open research environment, and enhance open science skills. The rapid development of open innovation, open resources, open data, open research tools, open peer review, open academic exchange, and open scientific policies should be fueled in the research life cycle to accelerate the establishment of the open scientific ecosystem.

2.2.3 Arranging national strategic S&T power around disruptive innovation and promoting organizational innovation

The uncertainty surges after stepping into the “no man’s land” around S&T frontiers. The boundaries between basic research, applied research, technology development, and industrialization in the conventional sense are becoming blurred. Innovation activities are breaking through the boundaries of geography, organization, and technology. Therefore, the traditional management approach of “plan–guideline–project” is no longer suitable for the innovation in “no man’s land,” especially the disruptive innovation. A new mode of research organization (such as the model of Advanced Research Projects Agency of the United States Department of Defense) should be developed by the multipoint layout of national strategic S&T power in the “no man’s land” to support the cutting-edge, challenging, and high-risk innovation activities in the chain mode and explore the technologies which can bring about fundamental changes in the future for industrial cultivation, economic growth, and social development. The organization and management of national strategic S&T power should be innovated. The organization mode should be continuously optimized for disruptive technical discovery, project approval, resource allocation, process management, and evaluation. At the same time, the decoupling of exploratory frontier research and practical application should be moderately promoted, and some talented researchers should be encouraged to do the curiosity-driven unconventional original research.

2.3 Strengthening the layout of national strategic S&T power for the “main battlefield” of industrial economy

On March 16, 2021, General Secretary Xi Jinping published the important paper “Strive to Become the World’s Major Scientific Center and Innovative Heights” in the journal Qiushi. In this paper, he emphasized the need to fully understand that innovation is the primary driving force and the need to provide high-quality S&T supply to support the construction of a modern economic system. The cyclical shift of the global scientific center also demonstrates that to become global scientific center, major countries need to boost science, technology, and economy to form a virtuous cycle of positive correlation since the second industrial revolution in the middle of the 19th century. In the context of superpower game, the security of industrial chain has become seriously dependent on the security of the S&T chain behind it. Therefore, laying out the national strategic S&T power around the industrial innovation is in urgent needs. Efforts should be made to ensure that the national strategic S&T power is not vacuum, vicarious, or offside in the main battlefield of industrial economy, thus taking the path of innovative development with strong science and technology, robust industry, sturdy economy, and mighty nation.

2.3.1 Supporting leading enterprises to strengthen innovation capacity and cultivating the mainstay of national strategic S&T power

On March 24, 2021, General Secretary Xi Jinping stressed that innovation is not a matter of family background and the state will give fully support as long as it has contributions to the nation. The competitive enterprises around the national strategic emerging industries should be supported to take the lead in the construction of national strategic S&T power, undertake major national S&T projects, and deploy the future industrial technologies with foresight. The leadership of the corporate champions should be formulated quickly to break through the core technologies of the industry. Meanwhile, the industrial innovation mechanism of middle and small-sized enterprises in applying, incubating, and extending the industrial innovation chain should be formed. The environment of industrial innovation should be cultivated, in which the leader enterprises formulate the rules of industry-standard technology, and middle and small-sized enterprises collaborate to form and share the technological innovation platform. These measures will promote the production of multiplier effect by new national system for key core technology research and the large-scale market advantages of a large country employing the socialist market economy system. The backbone role of state-owned and private enterprises, especially high-tech private enterprises, should be further played in the layout of national strategic S&T power. The state-owned enterprises, private enterprises, and traditional research institutes should be treated equally without discrimination in terms of strategy formulation, guideline demonstration, project undertaking, platform construction, and talent rewards. Particularly, the private enterprises need to be included in the list of national innovation mainstay. It is suggested to enhance the support on the technological innovation of middle and small-sized enterprises and introduce the Chinese versions of Small Business Innovation Research (SBIR) program and Small Business Technology Transfer Program (STTR) as soon as possible.

2.3.2 Establishing industrial innovation councils in different fields to coordinate and promote the innovative activities of industrial technology

Efforts should be made to overcome the problems such as

the overlapping management of industrial technology innovation activities, valuing research and development process over market effect, valuing the research and development of products over basic principle, and valuing short-term performance over construction of industrial ecology. Innovation councils should be set up in the core industries of the national economy as an important part of the national strategic S&T power, so as to deploy the national S&T resources in the industrial fields and coordinate industrial technological innovation activities. For the key basic fields of industry, enterprises should be encouraged to sort out the list of key shortcomings and weaknesses (especially basic industrial software and key material components with small quantities, high value, long-term dependence on imports, and short-term irreplaceable, namely the list of strangle problems). The experts of production, teaching, and research should work together to make the list of the corresponding research issues (namely, the list of stuck problems). The map that covers the entire chain of product–technology–principle should be drawn based on the demands and problems. Legal research institution (may adopt the public-private partnership) should be established under the council to organize the institutionalized power to address the long-term and fundamental scientific problems, and the intellectual property rights of the research results should be owned by the council and authorized for the use by relevant domestic enterprises. For short-term and urgent scientific problems, the scientific research institutes and universities are required to publish the S&T plans and deploy the S&T projects in the top-down manner by open competition mechanism to select the best candidates. The achievements must be transformed by two or more companies in a specific field upon project closure to prevent technological monopoly, and the approach of income from the results shall be agreed by both parties.

2.3.3 Constructing the industrial technology institute system to ensure the supply of key standard technologies for industry

The conditional industries should be encouraged to set up the industrial technological institutes with mixed ownership depending on the industrial clusters. As an effective part of the national strategic S&T power, the industrial technology institute system aims to serve the research and development of key common technologies and continuously enhance the supply of industrial technologies under the condition of balanced interests. The institutes should focus on solving the deterministic problems under the multi-objective constraint of the research and development of common key technologies, narrowing the time gap between scientific breakthrough and industrial application, and improving the transformation efficiency of S&T achievements to industrial technology. Moreover, they should pay attention to the product innovation and lean production characterized by small and micro innovation, meta synthesis, and rapid iteration and help the enterprises solving innovative ecological problems such as standard setting, patent layout, industrial base platform construction, and industrial chain closed-loop construction, thereby driving the formation of positive cycle of high-level industrial innovation and high-quality development of enterprises. The diversified investment and benefit return mechanism of the industrial technology institute should be explored, which is based on the state as the mainstay and involves industry, local authority, foundation, enterprise, and social force.

3 Major measures for strengthening the systematic layout of national strategic S&T power

3.1 Strengthening the top-level design and systematically designing the schematic diagram of the layout of national strategic S&T power

The construction advisory committee of national strategic S&T power should be established, which is led by the strategic scientists and involves the participation of departments, agencies, and local authorities. The committee is responsible for the overall design of the systematic layout of national strategic S&T power. On the basis of the overall objectives and basic positioning of different types of national strategic S&T power, the feasibility of the mainstay responsible for its construction, operational governance mechanism, organization mode, assessment orientation, overall construction schedule, and support policies should be fully demonstrated, and the schematic diagram of the systematic layout of national strategic S&T power will be formulated at a high level.

3.2 Exploring the practical experience of the systematic layout of national strategic S&T power based on pilot schemes

The pilot schemes of national strategic S&T power should be orderly launched on the basis of the existing experience. The contractor organization system, management and evaluation mechanism, resource support mode, research innovation paradigm, interest allocation mechanism, talent agglomeration form, and platform construction mode should be included in the pilot schemes. From these schemes, the best practice of the whole nation system and concentrating resources to accomplish big tasks in the construction of national strategic S&T power can be explored. Finally, the effective experience of the new type of national strategic S&T power should be summarized in serving the major needs of China and exploring the S&T frontiers.

3.3 Comprehensively ensuring the implementation of the systematic layout of national strategic S&T power with the collaboration between the central and local governments

The overall deployment of the central government for the construction of national strategic S&T power should be fully
and accurately implemented, and the local government should be mobilized to join in the construction. Efforts should be made to promote the collaboration between central government and local governments for the establishment and operation of national laboratories, national key laboratories, comprehensive national scientific centers, and major S&T infrastructures. It is recommended to jointly implement strategic scientific plans and projects and deploy the S&T resources of the bases, projects, talents, and policies for the benign interaction between central and local governments as well as the construction of national strategic S&T power.

4 Creating the favorable support conditions for the systematic layout of national strategic S&T power

4.1 Strengthening the strategic S&T research

“Without full-scale consideration, the simple action is negligible. Without a long-term strategy, the short-term achievement is inappreciable.” The national strategic S&T power should find China’s advantages in the global innovation system and locate the position of China in the future S&T pattern, so as to seize the opportunity in the new competition pattern. Strategic research power in key fields such as basic sciences, engineering, and industrial technology should be arranged. Long-term attention should be paid to major innovation areas in which China may make the revolutionary breakthroughs as well as to the trend of global S&T development. In this way, we can predict the disruptive technologies in advance that are difficult to reach consensus in the early stages of development and proactively plan a road map to occupy the commanding heights of the future S&T development. Several original places of strategic S&T development idea should be created to provide independent, objective, and impartial advice based on national interests and position for the questions which are critical, global, and basic in the top-level design of national strategic S&T power, the research and judgment of major S&T issues, the organization of key S&T plans, and the layout of important S&T innovation highlands. Thus, the question of “who can be asked by the state” in the field of S&T innovation can be solved.

4.2 Promoting the innovation of institutional mechanism

Efforts should be made to explore the new subject selection mechanism of national strategic S&T power, strengthen the mechanism of the discovery and proposal of the frontier and original scientific problems, and improve the selection and support mechanism of disruptive and non-consensus studies. These measures will help establish a smooth mechanism of transformation from industry demand and regional demand to national demand. The new task selection mechanism of national strategic S&T power should be explored to change the major project responsibility system with the individual scientists as the mainstay and establish the mechanism of legal entities as independent responsibility main bodies applying for and undertaking national S&T tasks. The third-party assessment and dynamic adjustment mechanism of national strategic S&T power should be explored, and unconventional evaluation systems such as non-consensus evaluation, innovation level evaluation, and cross evaluation should be comprehensively used for the selection and discovery of the pathfinders and leaders in the field of science and technology in China[9]. In a word, the scientific and objective third-party assessment and dynamic adjustment of national strategic S&T power should be conducted by the international peer assessment, bibliometric assessment and disruptive assessment.

4.3 Cultivating the strategic S&T talents

The talent training mechanism of strategic S&T power should be explored to establish the entrepreneurial platform mechanism, which is conducive to the strategic scientists, leading S&T talents, outstanding young talents, non-consensus talents. The problems of relying on relations and titles in the project contract, which are caused by overvaluing titles and papers in the evaluation system, should be solved. It is suggested to try recommendation and career systems for talent selection and support. We should get rid of the traditional method of talent selection based on project. Instead, the talents should be selected according to the research interests. That is, the researchers choose the projects and play a leading role in the implementation of major S&T projects with foresight and reserve, so as to achieve the independent selection of subjects, independent exploration, and independent innovation. The break-even and leading mechanisms of research project organization should be explored. In particular, attention should be paid to the rules of top innovative talents showing special thinking, demands becoming higher, results achieving at younger ages, and continuous accumulation of research achievements. Therefore, the recommendation system and self-recommendation system of top-notch talents should be adopted to implement the non-consensus research plans[10].

4.4 Cultivating the innovative cultural environment

The performance of national strategic S&T power requires the cultivation of an innovative environment. The researchers should be encouraged to carry forward the creative and adventurous spirits, challenge authority, surpass the formers while overcoming the manner of following the formers. The institutional culture should tolerate failure and encourage trial and error to break the convention and develop new approaches. In addition, researchers should be encouraged to devote to less popular fields and be the first with courage to try something new. They should always keep in mind that
persistence is the key to success and center around great achievements. Moreover, researchers should follow the norms of the academic community, adhere to the “eight rules” and the “negative list” of research activities. Academic democracy, self-discipline, and integrity should be put in priority. Efforts should be made to induce the sense of researchers in taking national mission and responsibility of serving the country with science and technology in the new era. The sense of personal honor and pride of joining the new journey of strengthening the country with science and technology should be taken as the main driving force of career development.

References

BAI Guangzu, Associate Research Fellow at the Information Center, Northwest Institute of Eco-Environment and Resources, Chinese Academy of Sciences (CAS). He is President of the Lanzhou Branch of Youth Innovation Promotion Association of CAS and Deputy Secretary General of Gansu Provincial Association for High Level Technical Experts. He has been focusing on technical information mining and research on industrial development strategies and regional innovation systems. He has hosted or participated in over 30 research projects including the National Social Science Foundation projects, Important Talent Project of Gansu Province, and State Key Research Projects of National High-end Think-tank Council. E-mail: baigz@llas.ac.cn

CAO Xiaoyang, corresponding author, Associate Research Fellow at Chinese Academy of Engineering Innovation Strategy and Graduate School of China Academy of Engineering Physics, as well as Member of the Emerging Technology Management Committee, Chinese Institute of Business Administration. He has been focusing on the research in the fields of disruptive technology innovation, scientific and technological innovation strategies, and national strategy to secure technologies. He has hosted or participated in projects supported by the Special Fund for Science and Technology Innovation Strategy Research under the Ministry of Science and Technology of the PRC, advisory projects led by Academy members of Chinese Academy of Engineering, the National Social Science Fund of China, the State Key Research Projects of National High-end Think-tank Council, etc. E-mail: caoxiaoyang@gsaep.ac.cn