Development Path and Required Environment for Innovative Talents in the New Era: Postprint

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Abstract

The report of the 20th National Congress of the Communist Party of China indicates that education, science and technology, and talent represent the foundational and strategic underpinning for comprehensively building a modern socialist country. Achieving high-level self-reliance and strength in science and technology hinges critically on talent, necessitating that institutional innovation focus on the bold selection and full utilization of outstanding young talent, and on supporting young talent to take center stage and play leading roles. This article focuses on the responsibilities and missions of innovative talent in the new era, providing recommendations from two perspectives: the pathway for young researchers to endeavor to become innovative talent needed in the new era through self-cultivation, and the measures for their institutions to foster better growth environments for them.

Full Text

Preamble

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The report to the 20th National Congress of the Communist Party of China emphasizes that education, science and technology, and talent are foundational and strategic pillars for building a modern socialist country in all respects. Achieving high-level self-reliance and strength in science and technology depends critically on talent, and institutional innovation must focus on boldly selecting and empowering outstanding young talent, supporting them to take on major responsibilities and play leading roles. This article concentrates on the responsibilities and missions of innovative talents in the new era, offering recommendations from two perspectives: the path through which young researchers can strive to become innovative talents needed for the new era via self-cultivation, and how their institutions can create a better growth environment for them.

Keywords: science and technology, innovation, self-reliance and strength, youth, talent, cultivation

The report to the 20th National Congress of the Communist Party of China states that education, science and technology, and talent are foundational and strategic supports for comprehensively building a modern socialist country. Realizing high-level scientific and technological self-reliance and strength hinges on talent, and institutional innovation must focus on the bold selection and full utilization of outstanding young talent, supporting them to shoulder major responsibilities and assume leading roles. However, the journey from young talent to young scientific and technological leader and then to strategic scientist is not smooth or automatic. To help young researchers grow quickly and accelerate the cultivation of a strategic fulcrum for high-level scientific and technological talent, this article discusses both young researchers' self-improvement and the creation of a better growth environment for them.

Responsibilities and Mission of Innovative Talents in the New Era

Future national and industrial competition is increasingly concentrated in scientific and technological competition, which in turn focuses on competition for innovative talent. As innovative talents in the new era, research directions must closely align with the "Four Orientations" (orienting toward world scientific frontiers, toward major economic battlefields, toward significant national needs, and toward people's health and lives), addressing key issues in national industries and society. This both meets national needs and solves practical problems while fulfilling the missions of the new era—these are the responsibilities they should bear.

For example, in the face of current international competition and even "decoupling," ensuring the security of supply chains and industrial chains for critical mineral resources represents the mission and responsibility of innovative talents

in China's mineral resources field. Similarly, innovative talents in strategic scientific and technological fields must continuously track key national scientific and technological strategic issues, such as models for cultivating young talent and pathways for breakthroughs in "bottleneck" technologies. Innovative talents must also possess a strong sense of responsibility, being accountable to their institutions and their disciplines—this is the spiritual wealth passed down from older generations of scientists to young innovative talents.

Self-Cultivation Paths for Innovative Talents

Mental Preparation and Cultivation of Scientific Spirit

In reality, the path of scientific research is full of hardships and setbacks. Young people must be mentally prepared if they pursue this path. Scientists are forged through struggle, often bearing enormous pressure. Walking the streets of Zhongguancun at midnight, one can see many offices and laboratories in research institutes and universities still lit—while witnessing others' brilliant achievements, one must also clearly recognize that all this requires immense labor and sweat.

For young people to go further than others on the path of scientific research, they cannot succeed without the ideal of "realizing the great rejuvenation of the Chinese nation" and the determination to "sit on a cold bench for ten years." Therefore, young researchers should earnestly study the spirit of older generations of scientists and internalize it as their own code of conduct, living up to the times and their youth, and contributing to building China into a world scientific and technological powerhouse.

Persisting in the Right Direction and Doing What Should Be Done

Young researchers today are fortunate to live in a great era with many opportunities, but human energy is limited. First and foremost, they must maintain good health to have abundant energy, which provides the basic condition for struggle and allows them to concentrate limited energy on the most important matters.

To achieve their goals, young researchers need to eliminate various "distractions," persist in doing things in the right direction, and many things will then fall into place naturally. Simultaneously, young people must also distinguish which problems are truly important, which are secondary, and which seem important but are relatively minor—learning to let go when necessary. When young people encounter confusion, they should consult and discuss with seniors, listening more to their suggestions before making choices.

Joining a Reliable and Suitable Research Institution

Becoming an innovative talent in the new era through individual effort alone is unrealistic. Achieving the goals of "joining the ranks of innovative countries by

2030 and becoming a world leader in scientific and technological innovation by 2050" requires organized research support. Therefore, young researchers need to find a reliable research institution based on the characteristics of their disciplines and fields, and find their own differentiated working methods through dedicated work. This is essential for becoming a future leader in innovation.

When searching for positions, young researchers should not simply pursue the highest salary, best benefits, or highest rank. While meeting basic living needs, it is more important to find an institution with great undertakings and ideals, a leader who matches their research field, experimental conditions, provides a growth environment and development guidance, and has an evaluation system that aligns with the characteristics of different innovation fields.

Strengthening Exchanges, Especially International Exchanges

The report to the 20th Party Congress proposed "forming an open innovation ecosystem with global competitiveness." In the new era, both industry and scientific and technological development are trending toward globalization. Young researchers should understand national, social, and enterprise needs, share their research progress, and conduct innovative cooperation through exchanges. This not only provides more development opportunities but also offers opportunities for the transformation of scientific research achievements. When opportunities arise, young researchers should go abroad to understand top world universities and establish international cooperation networks.

Many young researchers today have overseas experience and mostly maintain contact with their original research groups after returning to China, thereby bringing research directions from foreign groups back home. Meanwhile, domestic fields such as big data and artificial intelligence are developing rapidly but also face many new problems that foreign teams are often very interested in, making international exchange and cooperation particularly necessary. Additionally, international exchanges can demonstrate China's openness and cultural charm, absorb advanced cultures, and promote scientific and technological innovation and innovative talent development.

When conducting international exchanges, in addition to scientific and technological exchanges themselves, there must also be exchange of thinking. For example, when writing scientific papers, one should use foreign thinking to showcase Chinese research content; when presenting and communicating with foreign audiences, one should use Chinese thinking to tell the "story" to foreigners. It is important to note that storytelling and writing are completely different concepts, requiring flexible application of different thinking modes in exchanges.

Guidance for Scientific Research and Career Development

The transition from learner to innovator represents a huge change for most young researchers. Especially since most potential innovative talents have overseas study backgrounds, they may not have understood the real practical needs

of the country and society in their previous environments and may have been unclear about directions. After returning to China, these potential innovative talents have much to learn, particularly understanding the relationship between their scientific work and national strategy—research abroad often involved free scientific exploration, whereas after returning, they must be problem-oriented and achieve the "Four Orientations." Therefore, if dedicated personnel can provide guidance and answer questions during the growth of these young researchers, they can help them enter their roles quickly, avoid detours, and have a greater chance of success.

Taking the College of Engineering at Peking University as an example, the college assigns each newly hired young researcher a senior professor with very close disciplinary expertise to provide guidance on topic selection; simultaneously, another mentor is matched at the academic committee and leadership level to provide help and answer questions from the perspective of research evaluation—this is the Mentor system. Through such methods, more practical help is provided to young people on their growth path, making them feel less alone. The University of Chinese Academy of Sciences (UCAS) also has a Growth Advisory system: after young teachers join UCAS, the school invites renowned scholars to "pass on experience and provide guidance," leading young teachers to participate in discipline construction and talent cultivation, enabling them to grow quickly and become scientists.

For some special fields, such as geology, the work environment is very unique—not in offices or laboratories, but in deep mountains, deserts, oceans, plateaus, and other harsh areas. Often, the more remote the place, the more likely it is to have geological workers present. When young geological researchers work in the field, they often receive personal instruction from senior experts and even academicians—from "checking in" at each coordinate to "sampling" each sample, to later-stage work such as testing and analyzing each rock. This may all be a process of personal instruction, which is extremely valuable for young people's growth.

Building a Suitable Environment for Innovative Talent Growth

Providing Conditions for Independent Scientific Research

Innovative talents differ from ordinary researchers in that they require not only innovative awareness and capabilities but also free and independent development of individuality as a prerequisite for growth and development. Therefore, it is necessary to select the best among young researchers and match them with start-up funding and more resources.

Taking the Chinese Academy of Sciences (CAS) as an example, it provides a very good organizational platform for young researchers—the CAS Youth Innovation Promotion Association (YIPA). YIPA recruits outstanding young researchers

under 35 from CAS-affiliated units as members, breaking the traditional model where talent programs only provide project funding support. Through a "member mechanism + project support + platform exchange," it promotes capacity building and academic exchange and cooperation among young researchers. During the "member" project period, members receive certain special funding support. After the completion of the four-year "member" project, members with outstanding performance, strong innovation capabilities and development potential, good organizational skills, and the ability to conduct independent research can participate in the "Excellent Member" selection, and upon selection will receive continued project funding support.

Taking geology as an example, the greatest characteristic of geological research is the large work area, which can reach tens of thousands of square kilometers in places like Xinjiang and the Qinghai-Tibet Plateau. As a typical foundational industry, geology can provide young researchers with relatively independent and autonomous work projects and more opportunities to complete work independently. This is very conducive to the cultivation and growth of young researchers and can also rapidly enhance personal practical operation skills.

Providing Appropriate Evaluation for Innovative Talents

The evaluation system is, in a sense, the "commanding baton" for talent development. The scientific research work of young people needs recognition during their diligent efforts, and the positive 叠加 "Pygmalion effect" helps innovative talents stand out. The traditional "Four Only" evaluation method (sole emphasis on academic credentials, professional titles, papers, and awards) causes young researchers to unconsciously take papers, awards, and "hats" (titles) as their goals, leading to path dependence and fear of change, which suppresses innovative awareness.

It should be noted that this does not mean the "Four Only" approach is completely meaningless—when China's scientific research lagged significantly behind, encouraging young researchers to pursue papers, awards, and "hats" played a role like "spending a thousand pieces of gold to buy horse bones," inspiring more talent to devote themselves to strengthening China through science and technology, and greatly contributing to catching up with the world's scientific and technological frontiers. However, the evaluation system at each stage may be the overall result of social choice with the lowest cost at that stage. As Engels wrote in *Ludwig Feuerbach and the End of Classical German Philosophy*, "In the course of development, all that was previously real becomes unreal…; a new, vital reality will arise to replace the dying reality." In the new era, facing a new turning point, the previous system suddenly becomes too costly for society and must change; but the premise of change is that society has more resources and different needs.

For example, when evaluating fund applications, papers were previously reviewed, so young researchers were "paper-only"; when research support for

young researchers is no longer limited to funds, there may be another evaluation system. For instance, to develop local industries, Dongguan City gave the Songshan Lake Materials Laboratory a piece of land and a large investment, so the return needed is certainly not CNS papers , but tangible transformation of scientific research achievements. From this glimpse, innovative talents are those who solve practical problems. Therefore, their evaluation must be oriented toward different industrial chains and stages, based on disciplinary fields and industrial needs, and provide differentiated evaluation criteria.

Taking the geological industry as an example, young researchers engage in different directions such as geology, ore deposits, testing, evaluation, and resource economics. Their work nature, content, and methods vary greatly, and the forms of achievements and effects are also different—how can they be evaluated with the same system? Currently, the country has been promoting reform of the scientific research evaluation system, and we look forward to more detailed and targeted evaluation systems for different disciplines and directions in the future.

In the new era, the country has pushed young people onto the historical stage, and the field of science and technology may be the closest to the center of world science and technology. This era has endowed young people with many missions, expecting young researchers to delve deeply into science with rigorous thinking, understand industry with an open mindset, achieve a better self, and ultimately grow into innovative talents for the new era.

Refers to papers published in the three internationally renowned journals: *Cell*, *Nature*, and *Science*.

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Note: Figure translations are in progress. See original paper for figures.