Postprint: A Study on the Rule of Law Guarantee for Implementing the Large-Scale Science Popularization Strategy

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Abstract

The law-based construction of science popularization serves as an important guarantee for implementing the "Two-Wings Theory" regarding "scientific and technological innovation" and "science popularization," and for executing the comprehensive science popularization strategy. Through systematic review, this article explores the developmental trajectory, current status, and existing shortcomings in the legal and institutional construction of science and technology popularization (hereinafter referred to as "science popularization") in China, and analyzes the new situations and challenges currently confronted. Under the guidance of the "Two-Wings Theory," the article puts forward relevant recommendations for strengthening the law-based construction of science popularization, aiming to consolidate legal safeguards for the implementation of the comprehensive science popularization strategy and national science popularization capacity building.

Full Text

Research on Legal Guarantees for Implementing the Broad Science Popularization Strategy

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Abstract

The construction of the rule of law in science popularization serves as a critical guarantee for implementing General Secretary Xi Jinping's "Two-Wings Theory" regarding "scientific and technological innovation" and "science popularization," as well as for executing the Broad Science Popularization Strategy. Through systematic review, this paper examines the evolution, current status, and deficiencies of China's science popularization legislation and institutional development, and analyzes the new circumstances and challenges confronting the field. Guided by the Two-Wings Theory, the study proposes recommendations for strengthening the rule of law in science popularization, aiming to solidify the legal foundation for implementing the Broad Science Popularization Strategy and enhancing national science popularization capacity.

Keywords: science popularization; Two-Wings Theory; Broad Science Popularization Strategy; rule of law in science popularization; science popularization capacity

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The Consistent Philosophy Connecting the Two-Wings Theory, Broad Science Popularization Strategy, Capacity Building, and Rule of Law

The Two-Wings Theory represents the theoretical crystallization of General Secretary Xi Jinping's profound understanding of the extreme importance of science popularization. Grounded in China's national realities, General Secretary Xi proposed that "scientific and technological innovation and science popularization are the two wings of innovative development, and science popularization should be placed on an equally important footing as scientific and technological innovation," thereby elucidating their complementary and indispensable relationship. The Broad Science Popularization Strategy refers to the comprehensive approach that, under the guidance of the Two-Wings Theory and the principle of "equal importance," integrates "scientific and technological innovation" and "science popularization" into the overall planning, deployment, and implementation of innovative development under Party leadership, creating a new paradigm of science popularization work involving whole-society, whole-industry, and whole-media engagement. National science popularization capacity represents a country's comprehensive strength in providing science popularization products and services to the public, encompassing infrastructure, grassroots services, popularization works, activities, talent pools, industries, and international exchange. The rule of law in science popularization constitutes the legalization of governance in this domain, with its core content centered on upholding a people-centered approach, regulating the science popularization activities of various actors and innovation entities, safeguarding their legitimate rights and interests, and thereby guaranteeing citizens' rights to scientific culture.

These four elements—Two-Wings Theory, Broad Science Popularization Strat-

egy, science popularization capacity building, and rule of law construction—demonstrate strong consistency in values and objectives. At the conceptual level, the Two-Wings Theory adheres to the central tenet of "science and technology for the people, delivering science to the people," emphasizing that building a modern socialist power requires elevating citizens' scientific literacy and fostering an innovative atmosphere and culture. Only by treating "scientific and technological innovation" and "science popularization" as equally important "two wings" and advancing them in parallel can the wisdom, knowledge, and technical capabilities of the workforce be integrated to fully unleash the innovative potential inherent in hundreds of millions of people. The Broad Science Popularization Strategy, capacity building, and rule of law construction similarly uphold a people-centered philosophy, responding to public expectations for scientific endeavors, safeguarding citizens' rights to scientific culture, and encouraging public participation in science. These four elements are highly consistent in value and logically coherent in core rationale, forming a "three-dimensional parallel" relationship of theory-practice-institution in advancing China's science popularization cause [Figure 1: see original paper]. The theoretical dimension takes the Two-Wings Theory as overall guidance, the practical dimension follows the Broad Science Popularization Strategy with capacity building as concrete action, and the institutional dimension provides systemic guarantees through rule of law construction. These three dimensions complement each other, jointly promoting the goal of "coordinating scientific and technological innovation with science popularization, improving citizens' scientific literacy, promoting comprehensive human development, and achieving human modernization."

Reviewing the Development, Status, Effectiveness, and Problems of China's Science Popularization Rule of Law

(1) Pioneering science popularization legislation demonstrated the Party Central Committee and State Council's high regard for science popularization work. Using legislation to guarantee science popularization work was an innovative initiative responding to society's urgent need for science, technology, and high-quality workers against the backdrop of developing a socialist market economy. In 1994, the State Council's "Several Opinions on Strengthening Science and Technology Popularization Work" proposed that the state would formulate special regulations and implementation rules based on the general requirements of "popularizing science and technology" in the Constitution and the Law on Scientific and Technological Progress, thereby advancing the institutionalization and legalization of China's science popularization work. In 2002, the world's first law in the field of science popularization—the Law of the People's Republic of China on Science and Technology Popularization (hereinafter referred to as the "Science Popularization Law")—was enacted, legally establishing science popularization as a "common task of the whole society," clarifying its nature, content, and methods, and proposing corresponding rights, obligations, and safeguard measures, thus marking China's science popularization work's formal entry onto the legal track.

(2) China has established a science popularization legal system combining central legislation, local regulations, and departmental rules. Following the enactment of the Science Popularization Law, the progress and level of rule of law construction in China's science popularization field have improved significantly. Guided by the legislative concepts and institutional design of the Science Popularization Law, local science popularization regulations or implementation measures have been successively revised or formulated. As of February 2023, 26 provincial-level administrative regions have formulated "Science and Technology Popularization Regulations," while three provinces (Zhejiang, Shanxi, and Liaoning) have formulated relevant implementation measures for the Science Popularization Law. China has essentially achieved initial integration of basic legal systems in the science popularization field, with relevant systems extensively covering central legislation, local regulations, departmental rules, and administrative regulations, forming the "four beams and eight columns" of the science popularization legal system framework.

(3) Rule of law construction in science popularization has provided strong guarantees for steadily advancing capacity building, significantly improving basic conditions, and rapidly enhancing citizens' scientific literacy. In 2006, China's science popularization funding amounted to RMB 4.683 billion, which grew to RMB 18.907 billion in 2021. Science popularization infrastructure construction has continued to advance, with the number of science and technology museums and related institutions increasing from 519 in 2006 to 1,677 in 2021. The talent pool has steadily expanded and its structure continuously optimized, with the number of full-time and part-time science popularization personnel growing from 1.6239 million in 2006 to 1.8275 million in 2021. Among them, personnel with intermediate or higher professional titles or bachelor's degrees or above increased approximately 6.5-fold compared to 2006 data. Science popularization activities have achieved remarkable results: in 2021, various institutions organized 1.0382 million online and offline science popularization lectures, attracting 3.38 billion participants—about 22.8 times the audience size in 2006. The science popularization capacity development index rose steadily from 1.00 in 2006 to 2.84 in 2020. In 2020, the proportion of Chinese citizens with scientific literacy achieved a leap from 1.60% in 2005 to 10.56%.

(4) The current science popularization legal system has numerous deficiencies in ensuring the "equal importance" of the "two wings." More than two decades have passed since the promulgation of the Science Popularization Law, and some policy and regulatory systems and provisions can no longer meet the requirements of science popularization development in the new era or the people's scientific needs. Some areas in science popularization still lack legislation, and supervision and incentive mechanisms for science popularization work remain imperfect. The current science popularization legal system is not sufficiently connected with laws in education, culture, and news dissemination, with some legal norms exhibiting "conflicts." The lack of top-level design and incomplete supporting systems and mechanisms make it difficult to effec-

tively guarantee the coordinated development of "scientific and technological innovation" and "science popularization." Moreover, many norms created by government departments have strong administrative characteristics and departmental consciousness; some regulations that meet legislative conditions cannot be promulgated in a timely manner, while some outdated science popularization norms cannot be abolished promptly. In economic and social development plans and government performance assessments, evaluation of science popularization work is often absent—all issues requiring urgent resolution and improvement.

New Situations and Challenges Facing China's Science Popularization Rule of Law Construction

(1) The goal of "enhancing citizens' scientific literacy and promoting comprehensive human development" imposes higher requirements on rule of law construction in science popularization. Comprehensive human development, or the all-around improvement of human quality, is a prerequisite for social development. The enhancement of scientific literacy among all citizens brings higher social attention to scientific and technological innovation and policy, and drives the public to more actively understand science and participate in scientific decision-making. In this context, science popularization, as a crucial intersection between science and technology and society, has become even more important. This requires rule of law construction in science popularization to focus on safeguarding citizens' rights to participate in scientific affairs, further promoting their scientific literacy and ensuring the democracy of scientific decision-making, thereby supporting healthy, sustainable development through positive interaction between science and society.

(2) New environments and requirements endow rule of law construction in science popularization with new connotations, extensions, and objectives. The new round of scientific and technological revolution and industrial transformation has greatly accelerated the updating of scientific knowledge and transformed research paradigms and learning methods. The public and decision-makers no longer satisfy their science popularization needs with knowledge and practical technology alone, but demand deeper popularization of scientific methods, thinking, and spirit. Meanwhile, an increasing number of scientific issues have become public hotspots, requiring science popularization to facilitate effective dialogue between the public and the scientific community and promote modernization of the science and technology governance system. These new trends and requirements have endowed rule of law construction in science popularization with new connotations and objectives, necessitating further analysis of how to legally clarify the new nature, content, and methods of science popularization work, and clearly define the legal obligations and responsibilities of relevant actors.

(3) New phenomena, problems, and risks have increased the complexity and uncertainty of rule of law construction in science popularization. In recent years, as the interaction between science, technology,

and society has deepened, scientific issues have increasingly become hot topics of public concern. Meanwhile, the proliferation of the internet and social media has greatly increased the difficulty of information gatekeeping. Facing scientific hot topics, everyone has a "microphone" to express opinions, and under the "attention economy," online scientific information has become increasingly mixed, with misinformation and disinformation rampant. A 2016 survey by the Social Investigation Center of China Youth Daily showed that scientific rumors were the most prominent type of rumor news. Meanwhile, from the "genetically modified food safety incident" and "gene-edited babies incident" to the recent "Paperclip incident," these controversial hot topics have revealed that China's scientific and media communities have responded slowly and inadequately to relevant scientific issues. The initial absence of authoritative scientific information has made it difficult for the public to distinguish truth from falsehood in the flood of online information, even breeding irrational voices that seriously hinder the enhancement of scientific credibility and the widespread application of scientific and technological achievements. These problems have increased the complexity and uncertainty of rule of law construction in science popularization.

(4) Implementing the Broad Science Popularization Strategy and national capacity building requires science popularization legislation to reflect holism and contemporaneity. The proposal of the Broad Science Popularization Strategy has significantly elevated the strategic status and expanded the strategic scope of science popularization work, making it an important interface for multiple fields and actors. Consequently, "focusing on overall economic and social development and promoting multi-agent collaborative legislation" has become a new trend in science popularization legislation. This requires, on one hand, that China's science popularization legislation reflect holism by gradually developing multi-department and multi-field collaborative legislation to overcome the limitations of traditional departmental legislation. On the other hand, it requires science popularization legislation to reflect contemporaneity—that is, to emphasize science popularization's role in promoting comprehensive, high-quality economic and social development and population quality in response to the new era's requirement of "achieving human modernization," and to transform the philosophy of rule of law construction in science popularization from "promoting science popularization development" to "science popularization promoting development."

Recommendations for Strengthening Science Popularization Rule of Law to Guarantee the Broad Science Popularization Strategy

Facing the long-term goal of building a modern socialist power by the mid-21st century, science popularization work in the new era must deeply comprehend the important thought of the Two-Wings Theory. Under its guidance, and in response to new situations and challenges, rule of law construction in science popularization should guarantee the smooth implementation of the Broad Science Popularization Strategy and national capacity building, thereby laying a

solid scientific foundation for achieving the historic great rejuvenation of the Chinese nation.

(1) Take "adhering to people-centered development and safeguarding citizens' scientific rights" as the starting point. China's science popularization legal system construction should adhere to a people-centered approach, ensuring that science popularization development serves the people and safeguards citizens' scientific rights as stipulated in the Constitution, including rights to expression, participation, protection, and equality, with the fundamental purpose of promoting comprehensive human development. Simultaneously, standards should be established to guarantee these rights, requiring that effective science popularization facilities, products, and services be provided fairly to all citizens in sufficient quantities, and that these offerings be measured for scientific value to ensure the delivery of high-quality scientific information, opinions, and services.

(2) Take "clarifying science popularization obligations of all parties and establishing a science popularization responsibility system" as the fundamental point. Defining the science popularization obligations of various actors forms another cornerstone of legal system construction. The state is the primary obligor in safeguarding citizens' scientific rights, bearing obligations to fulfill, respect, and protect these rights, including establishing and developing science popularization institutions, promoting citizens' equitable access to scientific benefits, monitoring technological risks and informing the public promptly, encouraging and strengthening international cooperation in science communication, providing opportunities for public participation in scientific decision-making, offering effective science curricula at all levels of the education system, and cultivating citizens' research skills. Enterprises and market sectors' obligations mainly include promoting scientific progress and sustainable human development through science popularization. The scientific community's primary obligation is to conduct responsible scientific innovation and development, raise awareness of the meaning of citizens' scientific rights, and participate in clarifying these rights to demonstrate commitment.

(3) Take "promoting integrated development and collaborative governance of scientific and technological innovation and science popularization" as the foothold. Leveraging the advantages of legislation with Chinese characteristics, the Law on Scientific and Technological Progress and the Science Popularization Law should serve as guiding statutes to establish a framework for national science popularization legislation. National legislation should focus on: upholding the Two-Wings Theory as guidance, adopting a "broad science popularization, high quality" mindset, building a modern science and technology governance system that integrates innovation and popularization, and forming a new pattern of integrated, ecological development between innovation and popularization. First, in legislative techniques, existing techniques should be enhanced to adapt to new trends in modern science popularization, with recommendations to redefine the concept of science popularization, reposi-

tion its functions, and address shortcomings. Second, in legislative philosophy, a "broad science popularization perspective" should be adopted to elevate existing legislative concepts to meet the basic requirements of modernized science popularization. Third, in the legislative system, effective connections should be strengthened between current science popularization laws and systems and laws in science, education, culture, health, and press and publication.

(4) Take "emphasizing local legislation, precise policy implementation, and pragmatic efficiency" as the entry point. Science popularization legislation should implement classified guidance based on regional and industrial innovation characteristics, adopting laws and policies that conform to the laws of scientific innovation and popularization to gradually enhance overall innovation development efficiency and ensure pragmatic and effective advancement of scientific innovation and popularization work. Improving local regulations and highlighting their regional characteristics and innovation is a necessary path to perfecting the science popularization rule of law system. Looking ahead, local science popularization legislation must consider how to achieve balance between openness and management—gradually opening local science popularization industries to private capital to stimulate market vitality while scientifically managing the industry to ensure that science popularization's social function of benefiting the people is realized.

(5) Take "improving supporting plans, systems, and policies in the science popularization field" as the supporting point. Rule of law construction in science popularization cannot rely solely on legislation but also requires supporting policies and plans. It is recommended to launch medium- and long-term planning and outline formulation work for the Broad Science Popularization Strategy toward 2035, comprehensively planning the long-term development of "scientific and technological innovation" and "science popularization." It is also recommended to systematically review the implementation of the 2007 "Several Opinions on Strengthening the Construction of National Science Popularization Capacity," formulate new relevant opinions and implementation details based on the new development stage, deepen and refine the "National Scheme for Scientific Literacy (2021–2035)," improve coordination mechanisms, comprehensively promote outline implementation, and ensure the realization of the 2035 long-term goal of basically achieving socialist modernization. It is further recommended to strengthen policy support and guidance for science popularization, guarantee factor supply, and secure funding from multiple channels. Accelerate the building of a high-level science popularization talent pool encompassing creators, volunteers, and full-time and part-time personnel to strengthen human resource support for the science popularization cause. Further strengthen science popularization infrastructure construction and accelerate the development of science popularization bases. Establish and improve science popularization policies in key fields to promote the integration of science popularization and research. Improve policies for enhancing science communication capabilities across all media. Establish policies for promoting the construction of a national emergency science popularization system. Strengthen

horizontal policy coordination to give full play to the role of the National Science Popularization Work Joint Conference. Enhance vertical policy coordination to strengthen guidance for local and grassroots science popularization work. Improve monitoring and evaluation policies and strengthen supervision and inspection to promote policy implementation.

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