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## Scientific Commons—A Decentralized Scientific Publishing Mechanism

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### Abstract

[Purpose] Introduce the “commons theory” into the field of scientific publishing, explore its potential value in promoting open sharing of scientific resources and optimizing scientific publishing workflows, and provide theoretical support and practical reference for constructing a high-level scientific journal system; [Methods] Integrate technologies such as decentralization, smart contracts, and incentive mechanisms to propose a systematic framework for “scientific commons,” establishing a scientific publishing mechanism governed by multiple roles including authors, reviewers, academic editors, and arbitration committees; [Results] Scientific commons mainly comprises a submission mechanism that synergizes preprints and complementary journals, a review mechanism that promotes diversification of participants, and a post-review mechanism that controls journal quality; scientific commons subverts the traditional scientific publishing model, transfers power from publishers to scientists, achieves true sharing of scientific resources, and reduces interference from non-scientific factors in the review process; [Conclusion] This innovative publishing model provides a reference for the sustainable development of the scientific publishing field and propels it toward a more open, fair, free, and democratic scientific publishing system.

### Full Text

## Scientific Commons: A Decentralized Scientific Publishing Mechanism

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## Abstract

**[Purposes]** This study introduces “commons theory” into the field of scientific publishing, exploring its potential value in promoting open sharing of scientific resources and optimizing scientific publishing processes, thereby providing theoretical support and practical reference for constructing a high-level scientific journal system.

**[Methods]** By integrating decentralization, smart contracts, incentive mechanisms, and other technologies, we propose a “scientific commons” framework—a scientific publishing mechanism governed by multiple stakeholders including authors, reviewers, academic editors, and arbitration committees.

**[Findings]** The scientific commons primarily comprises three components: a submission mechanism that coordinates preprints and journals complementarily, a review mechanism that promotes diversified participation, and a post-review mechanism that controls journal quality. This model subverts traditional scientific publishing by transferring power from publishers to scientists, achieving genuine sharing of scientific resources and reducing interference from non-scientific factors in the review process.

**[Conclusions]** This innovative publishing model provides a reference for sustainable development in scientific publishing, promoting progress toward a more open, fair, free, and democratic scientific publishing system.

**Keywords:** Scientific commons; Academic publishing; Decentralization; Open access; Preprints

**Author Contributions:** YAN Zhaoping: Drafted the manuscript, designed research ideas and framework, revised the paper; SHI Jin: Proposed research direction, designed research ideas, revised final version; SHAO Bo: Revised final version; XU Tianyi: Designed research ideas and scheme, participated in revision; CHU Haoyan: Designed research ideas and scheme, participated in revision.

## 1. Introduction

Globally, the scientific journal publishing industry has formed a monopolistic market dominated by a few large academic publishers. While this development trajectory has facilitated worldwide knowledge flow, its profit-maximization-oriented business model restricts the broad dissemination of scientific knowledge and equal academic exchange, resulting in underutilization of scientific resources. Journal subscription fees remain prohibitively high, placing enormous financial pressure on research institutions and scholars who struggle to access the latest scientific resources, thereby affecting the quality and efficiency of scientific production. Furthermore, the publisher-dominated centralized publishing system may cause high-quality research to be overlooked. Consequently, the existing scientific publishing model not only wastes academic resources but

also introduces numerous non-scientific factors into the processes of publication and review, creating a series of challenges for the entire academic ecosystem [1].

To address the ineffective utilization of scientific resources, researchers have proposed various solutions. Among these, open access is considered an effective approach to promoting resource sharing [2]. This model makes academic literature freely accessible to the public, lowering information access barriers and facilitating widespread dissemination of scientific knowledge. While open access has improved information accessibility to some extent, it has not fundamentally altered the commercial logic of resource acquisition—it merely shifts costs from readers to authors. Preprints enable rapid open-access dissemination, but the lack of rigorous peer review introduces uncertainty regarding paper quality [3][4]. This raises concerns among researchers about the credibility and reliability of papers. Therefore, although open access and preprints provide new avenues for broader dissemination of academic resources, they have not fundamentally achieved resource sharing or ensured sustainable, high-quality academic exchange.

Regarding the current state of China's scientific journals, their competitiveness is insufficient and international influence relatively low, leading to substantial outflow of valuable academic resources [5]. According to the *Blue Book of China's Scientific Journals Development (2022)*, Chinese-authored papers account for 27.40% of total SCI papers, yet fewer than 4.67% are published in domestic SCI journals [6]. This severe outflow of quality manuscripts not only threatens China's scientific literature security but also affects the independence and security of scientific information [7]. The *2022 China Scientific Papers Statistical Report* shows that China ranks first in high-quality international papers and second in highly-cited papers. Despite these high contributions and influence, China still lacks discourse power on the international academic stage [8]. Therefore, China urgently needs to break away from the Europe- and America-dominated academic, evaluation, and discourse systems to build a scientific publishing mechanism that meets its research capacity needs, promotes resource sharing, and ensures transparency.

In today's digital and information age, the rise of blockchain technology and the spread of decentralization ideas are fundamentally transforming industries such as finance, logistics, and healthcare [9]. The emergence of decentralized technologies offers possibilities for new scientific publishing mechanisms, creating novel paradigms for open, transparent, and efficient dissemination of academic research [10][11][12]. Under such mechanisms, academic review is no longer limited to a few editors or review groups but achieves consensus through broad participation, granting researchers greater autonomy and involvement. This decentralized scientific publishing mechanism promises to incentivize academic innovation, promote global academic exchange, and facilitate broader dissemination and sharing of research outcomes. Researchers both domestically and internationally have explored decentralized scientific publishing mechanisms. Tenorio-Fornés et al. designed a workflow for decentralized scientific

publishing [13]. Swan discussed blockchain applications in scientific publishing, emphasizing enhanced academic transparency and data immutability [14]. Domestic research has focused on blockchain's impact on traditional publishing models. Xu and Tian compared decentralized and traditional publishing mechanisms from a process perspective [15]. He and Teng discussed application frameworks for blockchain-based digital publishing platforms for scientific journals [16]. Zhi analyzed advantages of decentralized publishing platforms in peer review [17]. These analyses demonstrate that decentralized scientific publishing has attracted widespread scholarly interest, but domestic research currently remains limited to comparing existing platforms without in-depth theoretical exploration or empirical studies. Key issues such as effectively applying blockchain technology and decentralization ideas to improve scientific publishing, and establishing effective incentive and reputation systems, require further investigation.

Based on this analysis, this paper proposes the concept of Scientific Commons, integrating decentralized autonomous organization principles to establish a fair, free, open, and democratic scientific publishing ecosystem. In this system, key stakeholders—including authors, reviewers, academic editors, and arbitration committees—participate collectively in governance to advance scientific progress. The primary research objective is to construct a decentralized scientific publishing system through a decentralized autonomous organization model, achieving co-governance in scientific publishing. This paper focuses on: (1) Elaborating the connotation of Scientific Commons, detailing its concept and key nodes; (2) Constructing the system framework: designing a decentralized architecture including relevant technologies and functional modules; (3) Designing key process mechanisms: building upon existing publishing process deficiencies to enable collaborative management and decision-making among authors, reviewers, academic editors, and arbitration committees. The innovation lies in adopting a decentralized autonomous organization model that transfers power to scientists, achieving co-governance in scientific publishing. This model helps eliminate centralized authority in traditional publishing, optimize scientific resource allocation, improve decision-making transparency and fairness, promote broader dissemination and sharing of academic research, foster academic innovation and knowledge development, and thereby build a world-class scientific journal system with Chinese characteristics.

## 2. Main Problems in Traditional Publishing Mechanisms

Current scientific publishing faces challenges that affect not only efficiency and quality but also hinder academic progress. Through synthesis of existing research, this paper identifies three primary issues: resource monopolization by large publishers, non-scientific factors in peer review, and a “credibility crisis” in published work. These issues involve key stages including publishing subscriptions, peer review, and post-review processes, collectively revealing deficiencies in traditional mechanisms.

## 2.1 Resource Monopolization by Large Publishers

The European and American scientific journal development model features monopolization by a few large academic publishers such as Elsevier, Springer, and Wiley. This business model's core characteristic is profit-maximization-oriented control and monopolization of journals. According to the *2022 Global OA Journals and APC Monitoring Report* from the Chinese Academy of Sciences' Documentation and Information Center, Chinese authors paid a total of \$650 million (approximately 4.3 billion RMB) in OA article processing charges in 2022. High journal subscription prices burden university libraries and other subscribers [18]. Research indicates these publishers own numerous high-impact journals, some with profit margins exceeding 30%, enabling them to monopolize substantial shares of the global scientific publishing market.

This business model has generated controversies including unreasonable pricing, privatization of academic resources, and misalignment with academic dissemination goals [19]. On one hand, publishers expect domain experts to spend considerable time reviewing articles without appropriate compensation. On the other hand, publishers may charge authors for publishing their work while universities pay subscription fees to access articles, yet most reviewers receive no proper recognition for their time and effort. Consequently, from the late 20th to early 21st century, scholars called for open access development to achieve free dissemination of academic knowledge [20]. Open access advocates argue that research outcomes should be disseminated in the most open, transparent, and efficient manner without prohibitive subscription fees [21]. Recently, organizations have begun resisting high subscription fees. On February 28, 2019, the University of California terminated subscriptions to Elsevier, the world's largest academic publisher. On April 20, 2022, the Chinese Academy of Sciences stopped using the CNKI database, ending a 14-year partnership. Calls for open science have resurged.

Open access aims to break publishers' monopoly and profiteering from academic research information. However, this model faces shortcomings and challenges. First, open access relies on authors or institutions paying publication fees, which may burden researchers with limited financial resources, and publishers merely shift revenue sources from readers to authors without changing the commercial logic of journal publishing. Second, existing for-profit publishers offer green or gold open access with significant price fluctuations and insufficient pricing transparency [5]. Additionally, "predatory journals" exist, seeking economic gain without rigorous peer review or academic standards, threatening academic integrity.

## 2.2 Non-Scientific Factors in Peer Review

Peer review is a common quality assurance mechanism in academic research, wherein domain experts evaluate submitted papers to ensure quality, originality, and suitability [22]. However, this mechanism has problems. First, peer

review may involve excessively long review periods. The process is complex and cumbersome, including expert review, author revision, and re-review, potentially consuming substantial time while awaiting results. In popular fields or busy journals, the review process may take months or even longer [23]. Second, peer review may be influenced by reviewers' subjective judgments [24]. Different reviewers may have varying perspectives on the same manuscript based on their academic backgrounds, viewpoints, and experiences. This subjectivity may lead to inconsistent results or bias. Furthermore, peer review may exhibit inherent conservatism and innovation suppression. Reviewers may tend to accept manuscripts conforming to conventional viewpoints or research directions while holding conservative attitudes toward breakthrough or disruptive perspectives, potentially inhibiting publication of innovative and novel research. Some studies may even be rejected due to inability to invite sufficient or appropriate reviewers.

In summary, while traditional peer review is crucial for ensuring academic quality, it has drawbacks including lengthy timelines, strong subjectivity, and high conservatism that require continuous improvement and exploration of new review mechanisms to address these deficiencies.

### 2.3 Credibility Crisis in Published Work

The credibility crisis in published work has become a major focus, with scholars proposing corresponding systems as foundations for reproducible research [25][26]. Scientists have found that many published results are not easily replicable, raising concerns within the research community about the authenticity and credibility of findings [27]. This issue involves research robustness and transparency in scientific practice, compelling us to consider how to ensure research reproducibility and verifiability to promote continuous knowledge accumulation.

According to a *Nature* survey of 1,576 scientists, over 70% of researchers could not reproduce other scientists' experiments [1]. Although 52% of respondents agreed that a significant "crisis" of reproducibility exists, fewer than 31% believed that failure to reproduce published results means the results are likely wrong, with most indicating they still trust published literature. It is estimated that pharmaceutical companies in the United States alone waste \$28 billion annually on irreproducible life science research. In 2016, the top ten biopharmaceutical companies spent \$63 billion on R&D [29].

This analysis demonstrates that beyond strictly controlling pre-publication submission and review processes, current urgent needs include strengthening validation of research results, replication experiments, and stricter experimental and data disclosure. This includes encouraging collaborative research to validate existing findings and strengthening quality control to ensure all research stages meet scientific standards. These measures help establish an open, transparent, and trustworthy academic environment and improve research quality and credibility.

### 3. Connotation, System Architecture, and Key Process Mechanisms of Scientific Commons

An ideal scientific publishing model should satisfy two important conditions. First, there should be no economic barriers to publishing, distributing, and accessing scientific publications. Scientists write research outcomes not for economic gain but to advance scientific progress. Second, appropriate incentives should exist for reviewers and authors to enable them to fully participate in the scientific publishing system, creating a virtuous cycle [30]. Decentralization technology can liberate scientific resources from current silos, eliminate heavy dependence on for-profit publishers and intermediaries, and address issues such as unreasonable pricing and opaque review processes [31]. Based on this, this paper proposes the concept of “Scientific Commons” and elaborates its connotation, system architecture, and key process mechanisms.

#### 3.1 Connotation of Scientific Commons

Commons theory has undergone multiple development stages. In 1968, American ecologist Garrett Hardin published “The Tragedy of the Commons” in *Science* [32], first coining the term. Hardin used overgrazing on common pastures to explore the contradiction between individual selfish behavior and overall resource sustainability in resource-sharing contexts. Subsequently, Nobel laureate Elinor Ostrom advanced Hardin’s research [33], extending commons issues from resource perspectives to social cooperation and governance dimensions, proposing that stakeholder co-governance of resources can resolve management and allocation dilemmas.

Increasingly, researchers have connected commons theory with social development, forming a unique research system [34]. As privatization and enclosure of scientific knowledge become more severe, commons theory has gradually entered the scientific domain [1]. Although scholars have begun considering commons theory’s application to journal publishing [13][36], effective solutions remain elusive regarding review quality, privacy protection, and copyright management. Therefore, this paper aims to combine decentralization technology with journal publishing to propose the Scientific Commons concept. Decentralization technology possesses characteristics including transparency, security, autonomy, openness, and scalability, giving it tremendous application potential in Scientific Commons.

The “Scientific Commons” proposed in this paper is a decentralized scientific publishing mechanism centered on scientists and co-governed by multiple stakeholders including authors, reviewers, editors, and arbitration committees. The concept is based on a core principle: scientific knowledge and research outcomes should be widely shared and freely accessible to all scientists and researchers. This philosophy advocates that scientific publishing processes should be open and transparent, ensuring scientists’ fair rights to publish, distribute, and access scientific publications. Unlike traditional publishing mechanisms, Scientific

Commons comprises four main nodes: authors, reviewers, academic editors, and arbitration committees, plus system maintenance personnel and copy editors.

In Scientific Commons, scientists are responsible for content generation and quality control. To achieve the ideal publishing model, they must receive appropriate incentives in a self-regulating market. As shown in Figure 1 [Figure 1: see original paper], Scientific Commons centers on four nodes—authors, reviewers, academic editors, and arbitration committees. Compared to traditional publishing mechanisms, the publisher node is redefined; publishing processes can be managed by academic communities, research institutions, academic societies, or specialized non-profit organizations. (1) **Authors**: Authors register to join the organization. New users receive initial points for subsequent submissions, and authors earn reward points for publishing articles, participating in community reviews, and conducting peer reviews. (2) **Reviewers**: Reviewers join voluntarily or through platform recommendations. Reviewer points correlate with review quantity and quality. Higher points increase likelihood of receiving new review assignments. (3) **Academic Editors**: Academic editors emerge from reviewers and are elected through smart contracts. They receive rewards based on workload and quality, and as “scientific curators” can earn points by writing editorials contextualizing publications and performing other tasks that help organize scientific information flow. (4) **Arbitration Committees**: Committees are elected through voting among reviewers and academic editors, with identities kept confidential to prevent collusion. Committee size must be defined in smart contracts or dynamically set as a fixed proportion of stakeholders.

### 3.2 System Architecture of Scientific Commons

#### Figure 1 Traditional Scientific Publishing Model vs. Decentralized Scientific Publishing Model

This paper divides the Scientific Commons system architecture into six layers: storage layer, network layer, governance layer, incentive layer, operation layer, and application layer. Figure 2 [Figure 2: see original paper] details this six-layer architecture. At the bottom, the storage layer is responsible for storing all publication metadata and vast amounts of data generated during paper review. This layer integrates blockchain gateways and databases, wherein blockchain gateways verify and format data while databases utilize distributed storage technologies like IPFS or Swarm for decentralization. As the system core, the network layer includes P2P networks, smart contracts, consensus mechanisms, and asymmetric encryption technologies that ensure publishing process transparency and data immutability. Smart contracts execute business logic and automated operations for publishing management. The governance layer comprises governance frameworks and strategies, including academic editor elections and community participation activities. The incentive layer consists of incentive strategies encompassing point issuance, distribution, reward, and security mechanisms. The operation layer includes distributed autonomous task planning, scheduling, storage, management, and control. At the top, the application layer provides rich

user interfaces and interaction tools for uploading, publishing, reading, and commenting on publications, plus key functions including reviewer assignment, paper retrieval, point calculation, and review evaluation.

### 3.3 Key Process Mechanisms of Scientific Commons

#### Figure 2 Scientific Commons System Architecture

This section explores characteristics of Scientific Commons process mechanisms through three aspects: (1) a coordinated preprint-journal complementary submission mechanism; (2) a review mechanism promoting diversified participation; (3) a post-review mechanism controlling journal quality.

**3.3.1 Coordinated Preprint-Journal Complementary Submission Mechanism** In existing journal review systems, post-peer-review rejection commonly extends publication cycles. Consequently, some research institutions have launched preprint systems, yet these platforms lack quality control and cannot guarantee paper credibility and reliability [4][36]. To address this, this paper proposes a coordinated preprint-journal complementary submission mechanism to promote research production and reduce resource waste.

Figure 3 [Figure 3: see original paper] details the coordinated submission process (with peer review discussed in the next subsection). After completing a manuscript, authors may submit to a journal or first submit a preprint. Author identification will be based on the Ethereum wallet address executing the submission transaction or a blockchain-based identification system. Once a preprint is submitted, the platform conducts preliminary review to ensure format compliance. After approval, the preprint is published as a publicly accessible resource that authors can revise and update. The platform also opens community review, returning public review comments when the paper is submitted to a journal.

If authors choose journal submission, the system recommends suitable journals before delivery by analyzing title, keywords, and abstract fields to calculate manuscript-journal matching scores. The system collects open review comments to accompany manuscript submission to journal editors. If the paper receives valuable review comments, editors may consider independent public review outside the journal, providing final decisions and returning public comments to authors for revision. Otherwise, editors organize a complete peer review process. This approach reduces duplicate peer reviews, accelerates publication, and enables all researchers to participate in preprint peer review, diversifying the reviewer pool.

**3.3.2 Review Mechanism Promoting Diversified Participation** **Figure 3 Coordinated Preprint-Journal Complementary Submission Mechanism**

Journal academic editors and reviewers primarily participate in the peer review process. This paper improves reviewer recommendation mechanisms and review

processes to enhance publishing efficiency. Diversified reviewer recommendation mechanisms can address insufficient reviewers and review bias, enhancing comprehensive and diverse paper evaluation.

As shown in Figure 4 [Figure 4: see original paper], editors first conduct preliminary manuscript review. Second, editors select reviewers from the reviewer pool through: (1) **Random selection**: Readers register as potential reviewers, storing interests and expertise on the blockchain. Editors match article topics with reviewer expertise and randomly select from the reviewer pool; (2) **Author recommendation**: Authors may recommend reviewers with justification when submitting manuscripts for editorial reference; (3) **Third-party platform recommendation**: The system may integrate Web of Science, PubMed, and Google Scholar to parse titles, keywords, and abstracts and recommend potential reviewers. After review, the system records reviewer behavior for evaluation, calculating reputation scores, acceptance rates, and author ratings. Reviewers' past experience and contributions affect their selection opportunities.

Simultaneously, journals introduce incentive mechanisms encouraging community reader participation in reviewing. Community members receive rewards for reviewing, attracting more reviewers and addressing reviewer shortages in some fields. Additionally, editors may invite community members such as domain researchers, scholars, or interested readers to provide feedback and suggestions without being formal reviewers. Editors can compare community opinions with expert reviewer reports to identify potential differences or consensus. Finally, editors can decide whether to accept articles or provide revision opportunities based on this information.

### 3.3.3 Post-Review Mechanism for Journal Quality Control Figure 4 Enhanced Review Mechanism Promoting Diversified Participation

In decentralized publishing mechanisms, arbitration committees resolve disputes, ensure publication quality, and guarantee process legitimacy and transparency.

Before article acceptance, arbitration committees resolve disagreements and disputes between authors and reviewers, assisting with inconsistent review reports or other issues. Committees also establish and manage procedures for resolving disputes. Decentralized publishing mechanisms advocate open access and sharing, making intellectual property and copyright issues particularly important. Arbitration committees assist in resolving IP and copyright issues to protect all stakeholders' rights. Through smart contract technology, creators can set usage rules and authorization conditions for their works. When rules are violated, the system automatically executes corresponding penalties. When copyright disputes arise, arbitration committees act as neutral third parties to mediate and help parties reach settlement. If mediation fails, committees can make rulings based on relevant laws and blockchain evidence, using blockchain technology

to enforce results such as freezing infringers' assets or removing them from the system.

Additionally, this study introduces a post-review module. As shown in Figure 5 [Figure 5: see original paper], after article acceptance, authors must submit final manuscripts, data, and code. After relevant data is shared with the community, community readers can review papers and validate code. Readers can publicly comment on, flag, or send opinions about published results to journal editors. Editors relay feedback to authors and complainants. If complainants are unsatisfied with author responses, they may request committee arbitration. If serious problems exist, the platform penalizes authors and reviewers while rewarding complainants, thereby inhibiting academic misconduct to some extent.

#### 4. Discussion and Analysis

##### Figure 5 Post-Review Mechanism for Journal Quality Control

Consistent with Scientific Commons principles, scholars worldwide have launched numerous preprint platforms to promote open sharing of research resources. Notable foreign platforms include arXiv, BioRxiv, FigShare, and PeerJ Preprints; domestic platforms include ChinaXiv and China Science Paper Online. Most preprint platforms aim to provide open academic exchange platforms for rapid research dissemination, but their quality lacks rigorous review. ChinaXiv, as a major domestic preprint platform, includes open review functions allowing authors to widely solicit peer opinions for manuscript revision. However, its subsequent submission, review, and publication processes still follow traditional scientific publishing models, failing to alleviate researchers' time and economic pressures or eliminate non-scientific factors in peer review. Moreover, ChinaXiv only provides open access to pre-submission or in-submission manuscript versions, while final versions still require subscription from publishers, failing to achieve genuine resource sharing. While ChinaXiv has promoted academic exchange to some extent, it has not fundamentally broken traditional publishing models.

Scientific Commons practice provides a new solution for preprint platforms and open review. In Scientific Commons, preprint functions and open review mechanisms are tightly integrated. Review comments feed directly to journal editors, who choose between peer review or journal-independent review based on comments. This improvement saves substantial review time, and post-publication sharing in academic communities further promotes open resource sharing.

Currently, some foreign researchers have proposed decentralized scientific publishing platforms such as Scienceroot, Orvium, and Pluto Network. Scienceroot integrates funding, publishing, and academic evaluation, but its high registration fees contradict its public welfare intentions. Orvium and Pluto Network emphasize review transparency and incentive mechanisms supporting academic activities, but they only use blockchain to trace paper review processes. Academic editor selection and paper acceptance decisions remain opaque, failing

to achieve true decentralization. Moreover, these platforms lack post-review mechanisms and reputation systems to regulate and constrain user behavior.

Comparing Scientific Commons with existing domestic and foreign platforms reveals its unique advantages in promoting open research resource sharing, improving review quality and efficiency, and ensuring research credibility. While well-known preprint platforms have advanced academic exchange, they remain constrained by traditional publishing models and have not thoroughly resolved resource sharing and review transparency issues. Although foreign decentralized platforms propose using blockchain for review transparency and traceability, they still have deficiencies in academic editor transparency, post-review mechanisms, and user behavior constraints. This paper compares and summarizes advantages and disadvantages of traditional and decentralized scientific publishing mechanisms. As shown in Figure 6 [Figure 6: see original paper], Scientific Commons advantages include: (1) **Promoting open resource sharing:** Traditional mechanisms control and monopolize knowledge through publishers, while Scientific Commons weakens the publisher role through self-governance by authors, reviewers, academic editors, and arbitration committees, facilitating academic resource sharing and scholarly collaboration. (2) **Improving review quality and efficiency:** Blockchain's anonymity and decentralization enhance review objectivity and diversity, reducing non-scientific factors. Coordinated preprint-journal complementary submission mechanisms substantially reduce review time and significantly improve efficiency. Open community review leverages collective intelligence for academic supervision, reducing individual opinion dominance and improving review quality. (3) **Ensuring research credibility:** Current journal publishing systems cannot adequately guarantee credibility and reliability. This study's post-review mechanism incentivizes readers to verify publication reliability, ensuring reusability of published results and addressing academic misconduct.

### Figure 6 Comparative Analysis of Different Publishing Mechanisms

This study first proposes the Scientific Commons concept and elaborates its key process mechanisms. Theoretically, Scientific Commons broadens research perspectives on scientific publishing mechanisms. On one hand, it introduces commons theory to encourage open resource sharing and self-governance; on the other hand, it combines decentralization technology to optimize information technology and traditional publishing processes, effectively addressing difficulties in resource access and low review quality and efficiency. Practically, Scientific Commons lowers information access barriers, supports rapid preprint release, enabling researchers to share results more quickly. Additionally, it encourages diversified academic publishing practices, including establishing academic community platforms that bring new ideas and possibilities to academic publishing, promoting innovation and adaptability. Although this paper proposes the Scientific Commons concept and key process mechanisms, limitations remain regarding further refinement of reputation point calculation and academic performance metrics. Future research will further explore and improve

incentive and security mechanisms in Scientific Commons and build a decentralized scientific publishing system to safeguard China's scientific literature security and enhance its cultural soft power.

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