Review of Innovation Trends in Peer Review of International Journal Articles: Postprint

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Abstract

[Purpose/Significance] This paper reviews innovative practices in peer review of foreign journal articles, aiming to provide references for domestic academic publishing.

[Method/Process] Through commentary and analysis of innovative practices in peer review of foreign journal articles, this study examines their advantages and challenges, and summarizes the overall trends of these innovative practices.

[Results/Conclusion] Preprints and post-publication peer review reflect expectations for more rapid peer review; non-selective peer review and registered reports reflect expectations for more objective peer review; open peer review and collaborative peer review reflect expectations for fairer peer review. These innovative practices each possess their respective advantages and challenges. Overall, innovative practices in peer review of foreign journal articles demonstrate trends toward accelerating publication speed, broadening the scope of publication, de-emphasizing journal-based evaluation of papers, promoting scientific democracy, and recognizing reviewer contributions.

Full Text

Preamble

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Review of Innovative Trends in International Journal Peer Review

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Abstract:
[**Purpose/Significance**] This paper reviews innovative practices in international journal peer review to provide references for domestic academic publishing. [**Method/Process**] Through a review and analysis of innovative practices in international journal peer review, we examine their advantages and challenges and summarize overall trends. [**Result/Conclusion**] Preprints and post-publication peer review reflect expectations for faster peer review, non-selective peer review and registered reports reflect demands for greater objectivity, while open and collaborative peer review demonstrate desires for enhanced fairness. Each innovation presents distinct advantages and challenges. Overall, international journal peer review innovations show trends toward accelerating publication speed, broadening publication scope, weakening journal-based evaluation, promoting scientific democracy, and recognizing reviewer contributions.

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Academic papers represent crucial manifestations of scholarly achievements and important vehicles for academic exchange. Peer review constitutes the core component of the academic publication process, with reviewers serving as vital academic "gatekeepers" [1]. As physicist and philosopher of science John Ziman stated in his 1968 book *Public Knowledge*, "Refereeing is the key upon which the whole scientific enterprise depends" [2]. However, since its establishment, the peer review system's fairness, consistency, and effectiveness have faced persistent criticism [3]. Issues such as slow review processes, high costs, substantial consumption of academic time, excessive subjectivity, susceptibility to bias, potential for abuse, and difficulty in detecting research flaws or misconduct have long troubled the academic community. Yet, in the absence of suitable alternatives, peer review remains considered the best available option in the current academic evaluation system [4]. A 2015 Wiley survey revealed that 93% of respondents disagreed that "peer review is unnecessary," 85% agreed that "peer review benefits academic exchange," and 83% concurred that "without peer review, things would get out of control" [5].

Addressing these challenges requires attention to technology-driven transformations in academic publishing and the development of peer review innovations that gain academic community acceptance. In recent years, with the emergence of preprint platforms, open access models, and new technologies such as artificial intelligence and blockchain, academic publication cycles have shortened while publication volumes have increased, presenting both opportunities and challenges for journal peer review. On one hand, information technology development and changing business models have prompted publishers to seek transformations in scholarly journal publishing [6]; on the other hand, the surging number of researchers and intensifying competition have diversified academic community expectations for peer review [7]. With technological support,

journal peer review models are evolving toward greater speed, objectivity, and transparency.

Compared to traditional pre-publication single-blind or double-blind highly selective peer review, recent international innovations include [6,8]: (1) changes in the timing of review and publication, such as preprints and post-publication peer review; (2) changes in review criteria, such as non-selective peer review and registered reports; and (3) changes in review anonymity and interactivity, such as triple-blind, open, and collaborative peer review. Each innovation addresses specific issues while raising new questions. This paper reviews journal peer review innovations since 1990. We first searched the SSCI database using "peer review" as the subject term, downloading bibliographic information from the "INFORMATION SCIENCE LIBRARY SCIENCE" and "MULTIDISCIPLINARY SCIENCES" categories published from 1990 to present. We then downloaded data from the SciVal database under the theme "T.3913 Reviewers; Research Peer Review; Manuscripts" from 2015 to present. After merging and deduplicating these datasets, we selected papers closely related to innovative journal peer review practices based on titles, downloaded and read the full texts, and supplemented additional important literature through reference tracking.

This paper examines recent international innovations in journal peer review, analyzing their pathways and models, assessing advantages and challenges, summarizing future development trends, and discussing implications for China's academic journal publishing, aiming to provide references for domestic journal peer review reform.

2. Innovations in Review and Publication Timing

Preprints and post-publication peer review have altered the traditional sequence between review and publication. Conventional peer review occurs between manuscript submission and publication, whereas preprints and post-publication review decouple publication from peer review, with the review process occurring after online publication.

2.1 Preprints

Lengthy review cycles pose a serious threat to authors' priority claims, particularly in STEM fields where academic priority determines awards and pioneering contributions, making it crucial for scholars' reputations. Scattered preprints emerged as early as the 1960s [9]. With the advent of the internet and digital technologies, large-scale manuscript storage and access became increasingly convenient and affordable, giving rise to preprint platforms. In 1991, the arXiv platform launched, allowing papers to be published online and made openly accessible without traditional peer review, with subsequent feedback from other researchers enabling authors to revise and improve their work. Initially covering physics, astronomy, and mathematics, arXiv now hosts over 1.69 million papers,

growing by more than 10,000 monthly [10]. Similar preprint platforms subsequently emerged in biology (BioRxiv), engineering (engrXiv), and psychology (psyarXiv) [11]. While preprints currently represent a small fraction of scientific literature and remain limited to certain fields, arXiv's emergence has diversified academic publishing models and challenged evaluation systems dominated by a few authoritative journals [12].

2.1.1 Advantages of Preprints Preprints' primary advantage lies in enabling faster access to cutting-edge research, protecting researchers' priority claims, and facilitating exchange of innovative findings within academic communities. Traditional review-before-publication processes can take approximately one year from submission to publication, hindering rapid exchange in frontier fields. Additionally, authors may undergo multiple rounds of revision across different journals, potentially allowing other scholars to publish similar results first, undermining priority protection. Research shows that papers previously posted as preprints receive more citations after journal acceptance compared to direct submissions [13-14]. In recent years, with the surge in preprint literature, preprints themselves have become a major channel for academic exchange, with many papers never being submitted to traditional journals after preprint posting [15].

2.1.2 Challenges of Preprints The main challenge facing preprints is inconsistent quality and lower credibility compared to peer-reviewed journals due to the lack of formal peer review. Consequently, many scholars recommend implementing some form of peer review on preprint platforms for quality control. A 2016 global survey of arXiv users showed that 58% believed arXiv should have a peer review system [16]. Some scholars have proposed a peer review model for arXiv based on mutual author evaluation that could automatically match reviewers with articles and rank and recommend users and articles [16]. Others suggest expanding arXiv to invite reviewers to write public comments attached to reviewed papers, then elevate those papers to "published" status [17]. A new journal type—overlay journals—has emerged, selecting a subset of preprints and adding a peer review layer to create a new collection. For example, the mathematics arXiv overlay journal *SIGMA* (Symmetry, Integrability and Geometry: Methods and Applications) does not accept direct submissions or maintain archives but simply adds its endorsement to arXiv papers in its field after peer review screening [18]. Similar examples include *The Open Journal* (theoj.org) and *Discrete Analysis* (discreteanalysisjournal.com). These overlay journals source manuscripts entirely from preprint platforms like arXiv, with papers remaining on the preprint servers while the overlay journal provides a link indicating that these papers have passed its peer review, thereby enhancing their credibility [19].

In summary, preprints accelerate academic exchange but lack quality control, making paper quality uneven and increasing the difficulty for scholars to identify excellent work. Supplementary peer review and the development of overlay

journals may help address these shortcomings.

2.2 Post-Publication Peer Review

Post-publication peer review involves papers being initially reviewed by journal editors, then published online before invited experts and the public provide comments, with review opinions, public comments, and author responses published alongside the paper [20]. Platforms such as RIO, PubPub, ScienceOpen, the Winnower, F1000Research, Peerage of Science, and RUBRIQ currently employ post-publication peer review [11]. A similar approach is two-stage peer review, where articles are published online as discussion papers after initial review while reviewers provide feedback to the journal and post comments on the platform during a several-month discussion period; authors then revise based on reviewer comments before the journal makes a final decision. In 1997, *Electronic Transactions on Artificial Intelligence* first used this two-stage peer review model [21].

2.2.1 Advantages of Post-Publication Peer Review Post-publication peer review retains preprints' advantage of rapid publication while overcoming their lack of quality control. Compared to traditional peer review, it helps correct publication bias and prevent reviewer misconduct. Some scholars argue [22] that as paper volumes surge, peer review should shift from a "gatekeeping" to a "screening" mechanism—reviewers should not block "irrelevant" or "difficult-to-evaluate" papers but simply direct appropriate literature to specific researchers. Traditional peer review often conservatively rejects papers that deviate from conventional paradigms, thereby suppressing innovative findings. Post-publication peer review can overcome this conservatism by reducing "excessive pre-publication scrutiny," facilitating publication of innovative results and correcting bias toward publishing positive findings [23]. Additionally, post-publication peer review enhances research integrity. Case studies show [7] that some researchers adjust their data or conclusions after rejection to produce positive results before resubmitting elsewhere—practices more easily identified under post-publication review. Finally, it helps prevent and detect reviewer misconduct, such as plagiarizing reviewed content or maliciously delaying reviews to gain competitive advantage.

2.2.2 Challenges of Post-Publication Peer Review Primary challenges include authors' potentially diminished motivation to respond to review comments, substantially increased editorial workload, and greater risks to journal reputation [20]. Since papers are already published online, authors may lack incentive to revise them as extensively as during traditional journal revisions. Similarly, reviewers may be less motivated to comment on published papers. With rapidly increasing submissions, journals already struggle to screen high-quality articles, and post-publication peer review places the entire publication decision burden on editors. If editors inadvertently allow low-quality articles to be published, the journal's academic reputation could suffer significantly.

Additionally, with relatively lower publication thresholds, the pressure to filter high-quality papers and assess credibility shifts from editors and reviewers to readers, increasing readers' costs in identifying and evaluating paper value. While readers can reference public comments, serious reviewers may be few without sufficient incentives, and commenters' expertise is difficult to assess, making comments less trustworthy than those from editor-selected reviewers and sometimes biased, requiring time to accumulate.

2.3 Review of Timing Innovations

Unlike the traditional review-revise-publish model, preprint papers are published without peer review, decoupling publication from review and offering rapid publication advantages but lacking gatekeeper quality control, resulting in uneven quality. Post-publication peer review retains preprints' rapid publication advantages while adding pre-publication initial review and post-publication peer review, providing some quality control. Both models challenge traditional journals' lengthy review cycles and reviewers' "inappropriate" gatekeeping, playing important roles in responding to emergent research events like COVID-19 and holding broad development prospects.

3. Changes in Review Criteria

The lack of uniform review criteria has long raised questions about peer review fairness, consistency, and effectiveness [3]. In high-level journals, traditional peer review systems serve as gatekeepers, but their overly subjective evaluations mean reviewers cannot always correctly assess scientific paper quality. As former *Lancet* editor S.T. Fox once said, "If I were to divide this week's submissions into two piles—one for publication and one for rejection—I wonder whether swapping these piles would make any substantive difference to the journal and its readers" [24]. K. Siler et al. analyzed peer review data and citation counts for 1,008 manuscripts submitted to three top medical journals (*Annals of Internal Medicine*, *British Medical Journal*, and *The Lancet*) between 2003-2004, finding that among 808 rejected manuscripts resubmitted elsewhere, many became highly cited, and the 14 most-cited papers were all resubmissions, highlighting peer review effectiveness issues [25]. With internet and large-scale database development enabling journals to publish virtually unlimited papers, new review criteria models have emerged, such as non-selective peer review and registered reports.

3.1 Non-Selective Peer Review

Non-selective peer review means reviewers do not judge research novelty, relevance, or importance—leaving these to readers and the broader academic community—while providing recommendations based solely on research methodology, results, and reporting soundness [26]. This model is also called objective peer review, light peer review, or soundness-only peer review [27]. Launched

in 2006, *PLOS ONE* first adopted this model, achieving enormous commercial success. *PLOS ONE* has grown rapidly, publishing over 240,000 papers to date, with more than 30,000 papers published annually during 2013-2015 (as queried on Web of Science on December 11, 2020). Subsequently, *Scientific Reports*, *BMC Medicine*, *BMJ Open*, *AIP Advances*, *SpringerPlus*, *PeerJ*, *SAGE Open*, *FEBS Open Bio*, and *IEEE Access* have also adopted this model. These high-volume, broad-discipline, open-access journals using non-selective peer review are called mega-journals [28].

3.1.1 Advantages of Non-Selective Peer Review The review criterion shifts from traditional "novelty, importance, relevance, soundness" to considering only "soundness." This innovation has positive aspects. First, it prevents reviewers' subjective assessments of novelty, importance, or relevance, making evaluation relatively more objective and helping all "sound" research get published, including replication studies and negative results. Replication studies use the same methods with different variables (e.g., subjects or contexts) to repeat previous research and test whether conclusions generalize across conditions. Replication helps identify correctness and ensure scientific reliability. However, most journals are biased against replication studies, often rejecting them for lack of innovation. Negative results include studies with negative directional findings [29], statistically non-significant results [30], or both [31-32]. Research shows reviewers tend to reject papers reporting negative results [33-34], leading to disproportionate publication of positive results, biasing subsequent meta-analyses and encouraging fraudulent "correction" of negative results into positive ones, contrary to disciplinary development goals [35-36]. Second, non-selective peer review helps prevent authors from exaggerating or conducting questionable research to meet "importance" and "novelty" criteria, thereby promoting scientific integrity at its source.

3.1.2 Challenges of Non-Selective Peer Review Non-selective peer review raises new issues. First, journals using this model struggle to reject methodologically sound but unimportant or non-innovative articles, flooding the literature with low-value papers, exacerbating information overload, and making it harder for researchers to find needed work. Statistics show journals using non-selective peer review have higher acceptance rates than traditional journals. For example, in 2015, *PLOS ONE* had a 69% acceptance rate, *BMJ Open* 60%, *Scientific Reports* 68%, *FEBS BioOpen* 51%, and *Biology Open* 51% [37], significantly higher than the 30% (business) to 46% (health) average acceptance rates among over 5,000 journals in five major fields [38], and far exceeding top journals' 5-10% rates [37]. Second, authors must pay high article processing charges (APCs) but may not receive expected manuscript improvements, while potentially jeopardizing their academic reputation. Some mega-journals using non-selective peer review have been criticized as "dumping grounds" where publishing constitutes "career suicide" [39]. Third, for publishers, long-term use of non-selective peer review inevitably leads to declining journal quality. For

instance, *PLOS ONE*'s impact factor dropped from 4.411 in 2010 to 2.740 in 2019, with its JCR ranking falling from Q1 to Q2. As an improvement, *PLOS ONE* now requires submissions to "have scientific value" and has added reviewers' assessment of "scientific value" [40]. Additionally, some predatory journals exploit non-selective peer review as a pretext, charging high APCs while publishing numerous scientifically unsound papers, tarnishing mega-journals' reputations [41]. Finally, with mega-journals' broader disciplinary scope and larger editorial teams than traditional journals, maintaining consistent acceptance standards presents a major challenge [42]. By 2014, *PLOS ONE* used over 70,000 reviewers, with median review time increasing substantially and fluctuating widely—from 30 days in December 2014 to 123 days in January 2015 [27].

3.2 Registered Reports

In 2013, *Cortex* became the first journal to adopt registered reports [43-44]. Registered reports involve two-stage submission and review: Stage 1 occurs after study design but before data collection, with reviewers deciding acceptance based solely on research questions and methodology. Stage 2 occurs after data collection and analysis, when authors add results and conclusions to the registered report, and reviewers assess consistency with Stage 1 and whether data support conclusions. This process resembles clinical trial registration, which was well-established long before registered reports [11]. Registered reports have been adopted by over 200 journals, primarily in medicine and psychology [45]. At the end of 2016, *BioMed Central (BMC) Psychology* further introduced "results-free review," completely omitting Stage 2 peer review [46]. In January 2020, *PLOS ONE* announced it would accept registered reports [47].

3.2.1 Advantages of Registered Reports Registered reports aim to ensure research reproducibility and shift peer review's screening and improvement functions earlier in the process. Traditional peer review favors positive results and suppresses negative ones, skewing the evidence base. Registered reports address this. First, once a study design is accepted, publication is likely regardless of results, preventing researchers from manipulating data or "burying" negative results to please reviewers. Second, since Stage 1 review assesses design quality rather than result novelty, it shifts focus from "telling the best story" to "conducting the most precise and objective research" [43]. Third, this model helps correct "confirmation bias" in peer review, where reviewers may reject submissions inconsistent with their own views while accepting those that align [48], thereby increasing negative results' publication likelihood. Finally, registered reports highlight the importance of research questions and design, which may inspire other researchers and accelerate scientific progress.

3.2.2 Challenges of Registered Reports Registered reports face many challenges. First, authors may overemphasize the decisive study design, resulting in final articles that are "top-heavy"—strong on background and design

but weak on results analysis and discussion. Second, while intended to eliminate positive-result bias, actual effectiveness remains to be verified. If authors inadvertently produce erroneous results, registered reports could erroneously "endorse" flawed research. Since registered reports are relatively new, further challenges will require time to emerge.

3.3 Review of Criteria Innovations

In traditional peer review, reviewers evaluate manuscripts on "novelty, importance, relevance, and soundness," making it highly selective—a meaningful cost-saving approach in the print era. Technological advances have made strict quantity control less necessary, giving rise to non-selective peer review. Often accompanied by substantial commercial benefits, non-selective peer review has seen declining appeal as it reduces review dimensions. Predatory journals have also abused this model, turning academic publishing into a profitable "business." Registered reports shift peer review's screening and improvement functions to the design stage, with reviewers helping authors improve study design. Both non-selective peer review and registered reports help correct publication bias and improve reproducibility, offering important insights for Chinese academic journals.

4. Changes in Review Anonymity and Interactivity

Changes in review anonymity and interactivity respond to demands for greater fairness and transparency in peer review, embodying "scientific democratization." Fairness means reviewers evaluate submissions based solely on scientific merit, not authors' academic status, gender, institution, location, or publication record [49]. Bias occurs when evaluation is influenced by personal characteristics of authors, reviewers, or editors [3]. Traditional peer review forms include single-blind and double-blind review, plus triple-blind review used by a few journals like *Science Matters* (launched in 2016), where author identity is concealed from both reviewers and editors to minimize reputation, institutional, or geographic influences [11]. However, blind review cannot avoid the "black box" problem, and reviewers may exhibit unchecked bias and irresponsibility [51]. To increase fairness and transparency, some journals have adopted open peer review, which also enables collaborative peer review by allowing reviewers who typically work independently to exchange views and reach consensus, pooling wisdom and promoting understanding while providing unified feedback to authors.

4.1 Open Peer Review

In 1999, *BMJ* first disclosed reviewer names to authors [52], formally introducing and implementing open peer review. Generally, open peer review involves disclosing reviewer identities or comments [53]. Following *BMJ*, *BMC* journals began disclosing reviewer identities in 2000; *Biology Direct* disclosed reviewer

names and comments in 2006; *Nature* launched an open peer review trial in 2006; *Frontiers* disclosed reviewer names in 2007; *EMBO* disclosed review texts and editor names (but not reviewers) in 2010; *eLife* and *PeerJ* disclosed review reports and reviewer names at authors' and reviewers' discretion in 2010; *BMJ Open* disclosed both in 2011; and *F1000Research* disclosed reviewer names, reports, author responses, and public comments while also publishing submitted, under-review, and revised papers [11]. After more than 20 years, at least 617 journals from 38 publishers had adopted open peer review by December 2019 [54].

4.1.1 Advantages of Open Peer Review Open peer review enhances reviewer responsibility and quality while public oversight reduces plagiarism, malicious delays, or suppression of reviewed manuscripts, increasing fairness, reliability, effectiveness, and transparency. Studies show [55-56] that open peer review transparency significantly improves article quality and credibility. *BMJ*'s use of open peer review effectively prevents seriously flawed papers from being published [57]. J.T. Leek et al. found [58] that when reviewers know their comments will be public, they work more carefully, communicate more efficiently with authors, and increase error detection accuracy by over 11%. J. Nicholson et al. reported [59] that 79% of surveyed reviewers would change their comments to be more cautious under open peer review. Second, disclosing reviewer information or comments creates a dialogue platform among authors, reviewers, and the public, fostering discussion. Research comparing journals that publish review comments with those that do not found that journals publishing comments receive more public commentary and greater attention [60]. Third, open peer review recognizes reviewers' contributions, increasing motivation. Over 40 years ago, studies suggested supplementing existing review forms by allowing researchers to choose open review to demonstrate their contributions [61]. Finally, publishing review comments enables better utilization of this intellectual labor [62]. Review comments contain reviewers' wisdom and hold value for other researchers, yet are typically known only to editors and authors, reducing complex intellectual work to binary accept/reject decisions—a loss for academia. Platforms like *F1000Research* and *ScienceOpen* assign CrossRef DOIs and open licenses to published review comments, making them citable and recognizable like papers.

4.1.2 Challenges of Open Peer Review Despite ongoing discussion, academia remains cautious about open peer review. First, it may increase reviewer refusal rates and require more time to write comments, with uncertain effects on quality and reliability [63]. Wiley's survey [5] found that when asked about preferred review formats, only 13% chose open peer review, 47% said they would be less willing to review if authors knew their names, and only 26% believed open peer review could be efficient. Another study found only 17% considered it potentially efficient [64]. Attitudes also reflect generational differences, with younger reviewers more receptive than older ones

[65]. Second, open peer review loses protection for reviewers against retaliation from rejected authors [50] and the ability to downplay academic disagreements in public [66]. Third, author-reviewer communication may breed academic corruption. Finally, reviewers' more moderate tone may allow more low-quality manuscripts to be published [67].

4.2 Collaborative Peer Review

In 2011, *eLife* pioneered collaborative peer review to improve fairness, speed, and transparency [68]. Collaborative peer review involves introducing communication into the review process, allowing reviewers and editors to exchange comments through the review system to ultimately form a unified opinion [68]. In 2013, *Frontiers* adopted collaborative peer review, enabling authors and reviewers to discuss papers thoroughly in online forums until reaching consensus on revision plans [26,69]. Additionally, *EMBO* uses cross peer review, sending review comments to other reviewers the day before final decisions to encourage mutual review of comments [70].

4.2.1 Advantages of Collaborative Peer Review Collaborative peer review overcomes previous communication barriers through the internet. Beyond inheriting open peer review's advantages, it offers: First, superior service to authors. Consolidated review comments save authors time in revising papers and responding to reviews, eliminating contradictory revision requests and proving highly helpful [71]. Second, through intellectual collision among editors and reviewers (and sometimes authors), it helps approach truth. As truth emerges through debate, targeted exchange and information sharing broaden participants' perspectives, eliminate blind spots, and produce higher-quality papers.

4.2.2 Challenges of Collaborative Peer Review First, collaborative peer review faces high operational costs. It requires building first-rate editorial teams, posing high technical and financial barriers many journals cannot meet [71]. Second, it increases reviewer burden by expanding independent review to include independent review plus collaborative discussion, requiring persuasion or perspective changes when disagreements arise—additional burden for already unmotivated reviewers. Third, it increases editorial workload and pressure to control review timelines. Finally, collaborative mechanisms may lead to deference to authority, silencing less senior scholars.

4.3 Review of Anonymity and Interactivity Innovations

Traditional peer review's black box problem has long been criticized. Open peer review increases transparency but, while enhancing oversight and recognizing reviewer contributions, also increases reviewers' "retaliation" concerns and potential for academic corruption. Building on open peer review, collaborative peer review further overcomes inconsistent reviewer opinions but faces high costs

and potential authority deference issues, with its profit model requiring further exploration.

5. Overall Trends in Journal Peer Review

From recent developments, we can identify six innovative practices (see Table 1). These reflect overall trends: accelerating publication speed, broadening publication scope, weakening journal-based evaluation, promoting scientific democracy, and recognizing reviewer contributions. Internet development enables these innovations by eliminating print-era volume constraints, accelerating exchange while lowering publication thresholds. It also facilitates public commenting, open review reports, and collaborative review, diversifying peer review models. Meanwhile, surging submissions create enormous review burdens, making reviewer incentives and contribution recognition imperative.

Table 1. Advantages and Disadvantages of Innovative Journal Peer Review Practices

Innovation Model	Description	Advantages	Disadvantages	Representative Cases
Preprint	Authors upload manuscripts for public access; can revise based on received comments	Accelerates frontier field exchange; protects priority claims	Lacks formal peer review; quality can be addressed through resubmission to journals or overlay journals	arXiv (1991), BioRxiv, engrXiv, psyarxiv
Post-publication peer review	Papers published online after initial review; experts and public comment; reviews, comments, and author responses published simultaneously	Accelerates knowledge dissemination; protects priority; helps correct publication bias; enhances integrity	Authors lack response motivation; increased editorial workload; journal reputation risk; high reviewer refusal rates; increases readers' evaluation burden	F1000Research (2012), ScienceOpen (2013)

Innovation Model	Description	Advantages	Disadvantages	Representative Cases
Non-selective peer review	Reviewers assess only soundness, not novelty, relevance, or importance	Prevents subjective assessment; encourages replication studies; enhances integrity	Floods literature with low-value papers; information overload; journals struggle to maintain reputation and uniform standards	PLOS ONE (2006), Scientific Reports (2011)
Registered reports	Two-stage submission: Stage 1 includes only research question and methodology; Stage 2 adds results and conclusions	Emphasizes background and methodology; corrects publication and confirmation bias; enhances integrity; highlights question and method importance	May produce top-heavy articles; actual bias-correction effects unverified; may endorse flawed research	Cortex (2013), PLOS ONE (2020)

Innovation Model	Description	Advantages	Disadvantages	Representative Cases
Open peer review	Reviewer identities or comments disclosed	Increases reviewer accountability; enables oversight; promotes discussion; recognizes contributions; shares review intelligence	Increases reviewer refusal and retaliation risks; may soften critiques; potential for corruption	BMJ, BMC (around 2000)
Collaborative peer review	Editors and reviewers (sometimes authors) exchange views to reach consensus	Transparent; provides quality service; discussion helps approach truth	High reviewer burden and editorial workload; technical and financial barriers; discussion may defer to authority	eLife (2011), Frontiers (2013)

5.1 Accelerating Publication Speed

The review stage is typically the most time-consuming peer review component. Preprint platforms allow papers to bypass peer review for immediate public release, while post-publication peer review, non-selective peer review, and registered reports accelerate the process through post-publication review, reduced review dimensions, and pre-research review, respectively. Additionally, auxiliary technologies like plagiarism detection, statistical method detection, and image manipulation detection, along with auxiliary roles such as statistical reviewers, methodology reviewers, and third-party reviewers, expedite manuscript processing. Cascading peer review and portable peer review reduce duplicate reviewing when papers are resubmitted after rejection, saving time [72]. In summary, technological advances continue to accelerate paper publication.

5.2 Broadening Publication Scope

Print-era space constraints required highly selective review. Reviewers tended to accept research aligning with their own perspectives while disliking theoretically divergent, non-mainstream, interdisciplinary, or transformative research. As disciplines deeply integrate, interdisciplinary achievements multiply, and journals continuously broaden their scope. Additionally, under preprint, post-publication peer review, and non-selective peer review models, replication studies and negative-result papers that were difficult to publish under traditional peer review can now appear in academic journals, helping correct publication bias. These practices transform journals from collections of established knowledge into broader repositories of research reports and scientific evidence, benefiting subsequent systematic reviews and meta-analyses and facilitating scientific evidence accumulation and correction.

5.3 Weakening Journal-Based Evaluation

As Bradford's Law reveals literature's scattered distribution, traditional journals form a pyramid hierarchy: top interdisciplinary journals at the apex, various selective professional journals in the middle, and numerous narrow, regional, non-selective journals at the base [73]. Previously, journal reputation often indicated article quality, but today's mega-journals publish large volumes with highly variable article quality, making journal-based evaluation untenable. Meanwhile, preprints and post-publication peer review enable many major innovative papers to be rapidly published online, gaining swift academic attention and shifting focus from journal to content. With technological development and policy guidance, journal-based evaluation will further weaken, replaced by stronger emphasis on individual paper evaluation complementary to peer review. For example, cognitive computing can evaluate papers from semantic content perspectives, integrating paper content, references, and citing literature to consider knowledge units' positions in knowledge genealogies, offering new perspectives for individual paper evaluation [74]. Altmetrics indicators like views, downloads, and comments reflect societal impact and accumulate faster than citations, becoming a research hotspot for individual paper evaluation. Public scoring and commenting, applied on platforms like Amazon and Reddit, could migrate to academic paper evaluation [11]. Considering general readers' varying expertise, *F1000Biology* and *F1000Medicine* select thousands of experts to systematically recommend and comment on excellent papers in their fields, providing valuable references for single-paper evaluation and helping researchers identify important work [75]. These technological trends will further weaken journal-based evaluation, focusing academic communities on papers' scientific value.

5.4 Promoting Scientific Democracy

A major problem with blind review is that allowing anonymous individuals to make important decisions about others' work seems wrong [52]. High publica-

tion demand and low acceptance rates place journal editors and reviewers in powerful positions. Reviewers influence not only publication decisions but also disciplinary development directions [76]. Open science practices like preprints, open peer review, and collaborative peer review break traditional peer review's "autonomous" characteristics, enabling public participation in academic publication discussion and oversight, supplementing editorial internal standards and self-regulation with public opinion and thus advancing scientific democracy. Peer review's history shows its functions are not static but change with science's public status [77]. Although open peer review has many problems, disclosing reviewer identities and reports opens the traditional peer review "black box," increasing transparency and promoting scientific democracy.

5.5 Recognizing Reviewer Contributions

Since 2012, the *Publons* platform has provided reviewer contribution certification services [82]. The platform comprehensively displays researchers' academic impact, including papers, citations, peer review records, and editorial positions, semi-automatically recognizing review work and ranking reviewers by quality and quantity [11]. ORCID provides persistent researcher identifiers, rapidly becoming essential infrastructure for open peer review and enabling reviewers to receive contribution recognition [83]. However, contribution recognition requires ultimate acceptance by the academic community to truly motivate reviewers.

5.6 Review of Innovation Pathways

Based on the above analysis, journal peer review innovation pathways fall into three categories: (1) Timing innovations. The 1991 preprint emerged to address traditional peer review's lengthy cycles that failed to protect priority claims and delayed exchange. Lacking peer review, preprint quality is uneven, preventing full academic community recognition. In response, post-publication peer review emerged in 2012, retaining rapid publication while adding community gatekeeping—an important future trend. (2) Criteria innovations. The 2006 non-selective peer review addressed traditional peer review's low validity and excessive subjectivity in evaluating innovation and importance, assessing only methodological soundness. This led mega-journals like *PLOS ONE* to publish many low-innovation papers, with predatory journals 混入其中, negatively impacting journal and author reputations. The 2013 registered reports model shifted peer review improvement to the design stage, enhancing integrity and partially correcting publication bias. (3) Anonymity and interactivity innovations. Beginning in 1999, open peer review addressed transparency issues. The traditional system's black box and unrecognized reviewer work prompted open peer review adoption. The 2011 collaborative peer review pools wisdom and consolidates comments to provide better service, but has not yet become widespread due to cultural and cost issues.

6. Implications for Chinese Academic Journals

China first introduced peer review through the National Natural Science Foundation in 1982 [84]. In the 1990s, *Chinese Social Sciences Quarterly* first introduced journal peer review [85]. Similar to international situations, Chinese journal peer review faces many practical problems, such as insufficient reviewer motivation, manuscript delays, and questionable review validity and rationality. "Stones from other hills can polish jade." By examining international innovations and domestic challenges, we recommend Chinese journals consider the following:

6.1 Develop Chinese Preprint Platforms

Preprint platforms can accelerate academic exchange and better protect authors' priority claims. In Chinese academic practice, some authors' priority claims are not effectively protected, especially in humanities and social sciences where new research perspectives can be easily plagiarized. Developing Chinese preprints would help protect priority claims. Additionally, Chinese academic journals generally suffer from lengthy review cycles. If slower than international journals, Chinese journals will be less attractive to Chinese scholars, harming domestic academic community development. Encouraging platforms like China Science Paper Online would greatly improve this situation.

6.2 Establish Chinese Post-Publication Peer Review Journals

We recommend establishing Chinese post-publication peer review journals to accelerate Chinese academic exchange and discussion. Such journals publish relatively quickly while providing gatekeeping, enabling effective academic community recognition and advancing Chinese academic journals.

6.3 Trial Open Peer Review Models

Reports indicate 97% of Chinese academic journals use blind review [86]. While blind review, especially double-blind, promotes fairness, it may also create "shadow experts"—reviewers who delegate to students or review carelessly [85]. Learning from international journals that disclose reviewer names or comments would clarify gatekeeping responsibilities, increase reviewer accountability, and provide some recognition for reviewer contributions.

6.4 Explore Reviewer Contribution Recognition Systems

In China, reviewers juggle heavy teaching and research loads, often prioritizing review work last. Thoroughly reviewing a manuscript requires substantial time and effort to understand authors' research and provide constructive suggestions, but this work is rarely recognized. Therefore, exploring a contribution recognition system suited to Chinese culture is urgent and challenging. International surveys show reviewers most value recognition of academic contributions

rather than financial compensation. Reviewer work is not effectively reflected in China's academic evaluation, title review, or talent recruitment systems. We recommend learning from international innovations in recognizing reviewer contributions to develop a system appropriate for China's national conditions.

Open science and technological innovation represent future trends for academic communities worldwide. The peer review system is the core mechanism for ensuring journal paper quality. Facing challenges from growing scientific innovation and academic communities' demands for accelerated discovery, new peer review models continue emerging. Based on China's national conditions, learning from international preprint and post-publication peer review models can accelerate Chinese academic exchange and promote healthy academic community development. Moving toward open peer review requires cautious adaptation to China's cultural and institutional context. Establishing a reviewer contribution recognition system would greatly enhance reviewer responsibility, ensure review quality, and provide commensurate returns for reviewers' academic contributions, significantly benefiting China's healthy academic ecosystem development.

Finally, peer review innovation must keep pace with the times. Under rapid information technology and social media platform development, we should explore effective integration with Web 2.0 technologies and social media platforms to address practical peer review dilemmas, seeking inspiration from community forums, e-commerce sites, Wikipedia, blockchain, and other platforms and technologies. Fully leveraging new systems and technologies to enhance review transparency and quality without burdening reviewers and providing greater recognition for their contributions represents an important future direction for journal peer review.

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On the Innovative Practice of Editorial Peer Review Abroad

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