Commentary

Publishing Test-Ready Hypotheses When Experiments Are Out of Reach

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Many promising ideas never reach experimentation, especially where access to laboratories, collaborators, or funding is scarce. This article proposes an editorial pathway for researchers in low- and middle-income countries (LMICs) or with limited infrastructure to publish robust, "test-ready" hypotheses. I argue that journals should make room for this contribution, and that a "test-ready" hypothesis should include: a clearly specified problem, grounding in the state of the art, falsifiable predictions, a viable experimental strategy for third parties, ethical appraisal, open licensing, a novelty scan, and a "reasons to be wrong" section. I describe a pathway that combines preprints (for priority and feedback) with defensive publication. Generative AI tools, used transparently and responsibly, can be crucial equalizing instruments, helping isolated researchers structure ideas and explore analogies. To avoid overloading the system, this modality requires clear editorial filters and rigorous peer review. Positioned upstream from formats such as Registered Reports, well-selected hypotheses can accelerate evidence generation, register precedence, and offer a credible path of contribution for resource-limited researchers.

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Introduction

In several fields, valuable ideas often stall before experimentation. Metascience has shown that, when researchers' careers depend heavily on publishing "positive" results, this ends up favoring studies with low statistical power and selective reporting, which distorts the body of evidence available in the literature [1][2][3]. This diagnosis contrasts with the way science is ideally conceived: in theory, science functions as a cumulative process in which each study—including negative or partial results—should

serve as a brick for building collective knowledge [4]. In practice, however, it is precisely this arrangement of incentives that makes editorial conventions continue to assign almost all credit and recognition to the "complete" empirical article with positive results, reinforcing the same pattern of distortion that metascience has been describing.

This dynamic creates an asymmetry: researchers with high conceptual capacity but limited resources—a common scenario in LMICs and smaller institutions—have difficulty converting theoretical work into citable publications. Preprints and open-science tools facilitate the circulation of ideas [5][6][7][8], but the dominant model still tends to subordinate hypotheses to empirical articles, rather than recognizing them as autonomous intellectual products.

Open, peer-reviewed publication is decisive for ideas that would otherwise remain dormant, determining whether a concept is lost in obscurity or evolves into a testable program. Scientific contribution transcends lab management. A researcher proficient in problem definition and hypothesis formulation can, in many cases, contribute more by generating clear, falsifiable ideas than by managing day-to-day operations—provided these ideas meet rigorous standards and are made available for others to test.

In light of this, this article proposes a conditional editorial pathway for "test-ready" hypotheses when immediate experimentation is out of reach, positioning this format upstream from initiatives such as Registered Reports [9]. In the following sections, I specify minimum rigor criteria for hypotheses without new data to be publishable, discuss defensive publication and open-licensing alternatives, examine equity implications in LMICs and challenges of review capacity, and assess the transparent use of generative AI as a conceptual support tool. I argue that journals can develop fit-for-purpose assessment instruments for idea-centered submissions while maintaining rigorous standards.

What Should Be Publishable Without New Data?

According to the logic presented here, an idea-centered article (without new data) should not be a promotional document, but rather a structured contribution. To this end, it needs to contain: (1) the clear specification of a problem or gap; (2) a plausible mechanism or rationale, anchored in the literature; (3) explicit, testable predictions, with defined falsification criteria; (4) one or more viable test designs that can be executed by third parties; (5) a brief assessment of risks and ethical considerations, including dual-use potential; (6) an explicit open license (such as CC BY), with time-stamped registration guaranteed by a DOI; and (7) a realistic assessment of novelty and translational plausibility, detailing how

the search for similar work was carried out (whether manually or AI-assisted) [10][11][12]. Additionally, authors should include a concise subsection on "reasons why this might be wrong," listing plausible modes of failure, boundary conditions, and key assumptions. The abstract should include a brief statement of the state of evidence (for example: "Hypothesis/Opinion; no primary data; proposed test design") to orient the reader, and peer review remains essential to avoid the proliferation of low-quality speculation.

Ethical and Dual-Use Assessment (example). This hypothesis article does not present primary data or materials. Potential risks include premature clinical extrapolation and dual-use misuse (such as exacerbating antimicrobial resistance). These risks are mitigated by (i) the explicit "hypothesis" label and the use of non-recommendation language; (ii) the omission of detailed enabling protocols or materials; (iii) the declaration of clear limits and plausible modes of failure; and (iv) alignment with applicable biosafety and regulatory norms.

Scope and Limits. This pathway is inadequate when: (a) immediate proprietary protection is essential and feasible; (b) high dual-use risks cannot be mitigated through non-enabling disclosure; or (c) the proposal lacks specificity and falsifiable predictions.

Assessment should prioritize internal coherence, evidential anchoring, and testability, rather than merely speculative impact. A plausible, clearly refutable hypothesis, even if addressing a modest gap, can be more valuable than a grandiose conjecture that is practically untestable—and, I would venture, in some cases more useful for the cumulative advancement of science than fragile or poorly contextualized empirical reports.

By requiring authors to make hypotheses, predictions, and failure conditions explicit before data collection, this format helps separate genuinely a priori reasoning from problematic practices such as HARKing (Hypothesizing After the Results are Known) and "satisficing" (stopping at the first plausible narrative) in hypothesis generation [13][14].

Reducing Friction for Testable Ideas

The open-access movement has reduced barriers to reading results; the challenge now is to reduce friction for access to testable ideas. The goal is to establish legitimate, indexable channels through which qualified teams can discover, credit, and test ideas that their originators cannot execute.

In this ecosystem, preprints with DOIs already play a vital role, concentrating attention and feedback in a citable venue and avoiding dispersion through personal websites or poorly indexed repositories. Evidence indicates that preprinted articles receive more attention and that their DOIs enhance tracking and subsequent publication [7][8]. Tools such as altmetrics offer complementary indicators of engagement [5] [6].

However, most preprints still adhere to the full-article format. An editorial pathway explicitly labeled as "idea-centered" would be the next step in reducing friction. For authors, it legitimizes the transformation of a mature hypothesis into a citable object. For readers and potential testers, it clearly signals that this is a conceptual sketch ready for validation, not a completed study. Large journals should explicitly include such formats in their scopes, with review criteria that emphasize plausibility, falsifiability, and implementability.

This pathway strategically uses preprints as a "Stage 0" to outline the hypothesis before peer review. Such contributions can feed preregistered protocols and global themes, functioning as conceptual incubators. Complementary open-science artifacts—such as dated research notes or preregistered protocols—can host methodological sketches, linking to the idea's DOI without exaggerating its evidential status. The final challenge is procedural: journals need clear triage criteria; authors need realistic expectations. Referentially, this flow can be seen as the cultivation of "forests of hypotheses" [15].

Public Domain vs. Proprietary: Defensive Publication as a Civic Option

Patents remain strategically important, but many innovators are not in a position to file or legally defend them. Defensive publication (also called "defensive disclosure") offers an ethical and practical alternative: disclosing sufficient technical detail for an idea to become part of the prior art, preserving freedom to operate and discouraging its exclusive appropriation. Historically, this role has been played by technical bulletins and, more recently, by digital repositories.

Unlike a patent, defensive publication does not generate royalties; its value lies in registering precedence, enabling broad implementation, and aligning with a public-interest ethos when patenting is unfeasible. By establishing the idea as prior art, it preserves freedom to operate—the possibility of using the concept without infringing future third-party patents—and, although it does not nullify rights already granted, it tends to prevent later blocking.

Practical checklist for defensive publication. The document should include: (i) a descriptive title with DOI and date; (ii) a clear structure that goes from the problem to the technical principle, to explicit predictions, and finally to viable tests for third parties; (iii) the main variants and parameter ranges that define the scope of the idea; (iv) limitations, the "reasons why this might be wrong" section, and a concise note on ethics and dual use; and (v) an open license (e.g., CC BY) and a non-recommendation disclaimer, where applicable.

Why Patent Primacy Can Stall Ideas Under Constraint

The patenting process demands significant time and resources. For groups with limited funding, maintaining secrecy while "waiting to patent" suppresses collaboration and interrupts research momentum. Even when granted, patents may expire or remain underexplored in the absence of resources for development and legal defense.

In Brazil, for example, initial filing costs may be manageable, but the technical data normally required for a robust definitive filing—especially for complex devices—often demand experiments and prototypes that are financially inaccessible.

The combination of an open idea article with defensive publication presents itself as a strategic alternative. This approach can move promising concepts into capable hands more quickly, preserving attribution to the original author and keeping future implementations in an open regime.

APC Inequalities, Reputational Control, and Gaps in Discovery

Article Processing Charges (APCs) and academic prestige hierarchies perpetuate global inequalities. Although there are waivers for LMICs, access to them is unequal and not very transparent [16][17]. Even when APCs are covered, reputational biases favor incremental work from established centers, reflecting the concentration of funding and output in high-income countries, while the burden of challenges is greater in other contexts [4][18].

Another barrier is discovery: ideas disseminated on platforms that are poorly indexed by researchers with limited infrastructure become invisible to potential implementers. Theoretical models of science show that highly competitive environments select methods that maximize apparent productivity, not veracity [19][3][20][21], marginalizing high-risk conceptual work originating in regions with little infrastructure.

As a practical response, it is proposed to combine preprints (as an initial deposit, with DOI and cost-free feedback) with the acceptance, by reputable journals, of rigorously reviewed hypothesis articles, ensuring indexing and discovery. Reforms such as the Leiden Manifesto and the Hong Kong Principles already advocate more responsible assessments [18][22]; a well-structured editorial pathway can complement them by recognizing conceptual work as a legitimate contribution.

To avoid reproducing inequalities, these pathways should integrate transparent APC waivers, incentives for submissions from underrepresented regions, and criteria that emphasize rigor and testability [4][18][22]. Crowdsourcing models suggest that well-defined ideas can focus distributed testing communities [23], but this requires recognition structures that reward both originators and implementers.

Effectiveness should be monitored using simple indicators: the proportion of accepted articles from LMICs, citations in empirical work, progression to Registered Reports, and the interval until the first test. Without such monitoring, discourse on equity remains rhetorical.

Generative AI as a Tool for Democratization (with Safety Barriers)

For isolated or resource-limited researchers, formulating and structuring robust hypotheses represents an additional significant challenge, aggravated by the lack of infrastructure and collaborative support. In this scenario, Large Language Models (LLMs) emerge as tools with great equalizing potential. They can drastically reduce the effort needed to transform preliminary intuitions into testable hypotheses, assisting in mapping analogies across fields, exploring conceptual variants, structuring outlines, and prioritizing ideas with greater testability—functions that promote equity.

The use of LLMs, however, introduces risks such as fabrication of references and dilution of responsibility [24][25]. Editorial guidelines are clear: AI cannot be an author, its use must be declared, and humans retain full responsibility for the content [26][27][28].

Within these limits, considering LLM suggestions for methodological alternatives can be valid, provided their viability is critically assessed. A practical approach involves consulting the models with specific questions, aggregating and calibrating their responses, and integrating this feedback into human reasoning, treating uncertainty explicitly.

To mitigate the risks of erroneous claims or bias amplification, four barriers are fundamental: (1) declaring the tools and versions used; (2) verifying all claims and references in primary sources; (3)

keeping human authorship explicit; and (4) never using AI to fill evidentiary gaps.

Recent work characterizes LLMs as “imperfect probabilistic experts” capable of accelerating hypothesis generation [29][25]. With these safeguards, generative AI can effectively contribute to democratizing systematic scientific exploration.

Role Specialization: The Conceptual Scientist Assisted by AI

Contemporary science already recognizes a diversity of specialized roles—theoretical, computational, or methodological [4]. Even so, hypothesis generation often remains implicit, tied to highly resourced laboratories. This causes researchers with conceptual aptitude but without access to such resources to see their contributions undervalued.

A question thus arises: can a “conceptual scientist assisted by AI” be considered a scientist in the conventional sense? Under the norms proposed here, the answer is affirmative. If the outcome is a testable hypothesis, with explicit predictions and falsification criteria, anchored in the literature and subjected to peer review, this is a legitimate specialization. Idea-centered publication, with transparent use of AI as a drafting and conceptual exploration tool, could formalize this role, aligning with calls—including the one formulated in this very article—for hypothesis texts to be treated as serious contributions [10].

The goal is not to create a class of “armchair” thinkers, but to offer a legitimate pathway for periods of infrastructural scarcity or isolation. In these contexts, devoting time to the clear formulation of problems and testable hypotheses is a concrete way to keep the research agenda moving. Finally, these pathways should be understood as complementary—and not substitutes—to empirical research.

Incentives and Adoption: Why Would a Laboratory Test an Externally Originating Idea?

As established groups prioritize internal agendas, external adoption requires low friction and clear benefits. Well-structured hypotheses offer savings in conceptual effort, diversify the portfolio, and support funding proposals, serving as focal points for collaboration. Once made public in accessible channels, well-defined hypotheses can also act as focal points for tests via crowdsourcing [23].

To convert this potential into practice, two mechanisms are essential. The first is clear quality signals, provided by journals with sections dedicated to “Ideas” and rigorous triage. The second is assured credit, guaranteed by mandatory citation of the original hypothesis DOI and explicit recognition of testers—a logic compatible with Registered Reports.

To catalyze adoption, direct incentives are needed. Funding agencies can create specific lines for testing published hypotheses, and scientific societies can formally recognize these contributions. For originators, the model establishes clear expectations of attribution and the possibility of coauthorship. It is recognized, realistically, that many hypotheses will not be tested—and, among those that are, a significant share may yield negative results. The value of the pathway lies, therefore, in creating a structured route so that, when interests and capacities align, collaboration is feasible, fair, and productive.

Risks, Credit, and the Matthew Effect (with Spillovers)

A new article category can amplify academic inequalities, such as the Matthew Effect, through which already prestigious researchers and institutions accumulate disproportionate recognition [30]. This risk would materialize if journals prioritize manuscripts from established authors to the detriment of rigorous but less visible contributions [4][18]. Another danger is the misinterpretation of untested ideas as consolidated evidence.

To mitigate them, editorial safeguards are essential: (i) explicit labeling (e.g., “Hypothesis” or “Concept”) in the title and abstract; (ii) a clear statement of the state of evidence; (iii) non-prescriptive language; and (iv) guidelines for public communication that distinguish conjecture from fact.

However, with explicit equity policies, the effects can be positive. By turning private hypotheses into citable public goods, their silent appropriation is made more difficult. The hypothesis article guarantees a lasting record of precedence, even if greater prestige falls on subsequent empirical research. For this purpose, editors should monitor authorship patterns and actively seek diverse contributions [18][22]. Funding lines that reserve resources to test hypotheses from underrepresented regions can close the cycle, generating knowledge spillovers that benefit the entire community.

Capacity Constraints and Reviewer Availability

A serious objection to the proposal is that, by reducing friction for the publication of ideas, we could overload an already saturated review system. Reviewer availability is a growing concern, with reports of

greater scarcity and fatigue [31][32]. The advent of generative AI tools, by making manuscript drafting easier, may further intensify this submission flow.

Therefore, the criterion for accepting an article in this pathway needs to be exceptionally selective. To avoid an influx of low-quality speculation, journals can adopt measures such as requiring a concise structured abstract for rapid triage, establishing explicit and conservative criteria, and even piloting limited annual quotas [10].

The central point is that a truly testable, plausible, and novel idea is not "just another speculative manuscript." When a hypothesis meets these criteria and is articulated with due ethical and transparency care, an idea-centered article can be a high-return catalyst for peer-review capacity. Its social value lies in its potential to generate concrete tests and advance a field. The editorial challenge, therefore, is not to prevent the flow, but to implement effective filters to identify and prioritize these valuable contributions.

Registered Reports: Positioning Idea Articles as Stage 0

Registered Reports are an editorial format that submits theory and methods to peer review before data collection, with the manuscript accepted for publication regardless of the final result [9]. This model aims to correct incentives, combating problems such as selective reporting [1].

"Test-ready" hypothesis articles function as a Stage 0 in this pipeline: they offer an initial testable formulation that an implementing team can adopt to develop a Stage 1 Registered Report. This flow—summarized in Figure 1—establishes falsification criteria from the outset and mitigates publication bias. In addition to feeding individual protocols, such articles can seed "forests of hypotheses" [15], articulating multiple research possibilities from a common conceptual core.

Examples

The publication of testable hypotheses as autonomous contributions has its historical value attested by examples ranging from broad theories—such as the endosymbiotic theory [33] and the operon model [34] —to more focused proposals, such as Strachan's on hygiene and allergies [35] and Smith's "macrophage theory of depression" [36], which generated robust lines of investigation [37][38].

In contemporary science, one observes the emergence of a more structured workflow. The work of Kass, Friedman, and collaborators serves as an illustration: a preprint outlining the idea and test plans for biodiversity monitoring [39] was followed by peer-reviewed publications that consolidated the conceptual

proposal [40][41]. This sequence—preprint, publication, adoption for testing by other groups—approaches the flow proposed here. Other recent examples, such as AI models that generate hypotheses (e.g., C2S-Scale), also follow this logic of formalization and availability for external validation [42][25].

I have deliberately structured prototypes—such as a microbubble system for infectious therapy and a platform for in situ cultivation [43][44]—following this "test-ready hypothesis" format.

Therefore, examples are not lacking. The challenge is to create an explicit and equitable editorial infrastructure that channels and formalizes these contributions into an accessible and fair pathway.

Policy Suggestions for Journals and Peer-Review Venues

Journals and peer-review venues could (i) recognize idea-first submissions when in-house or collaborative experimentation is not viable, requiring at least the core elements previously defined for "test-ready" hypotheses; (ii) offer an optional pathway for depositing defensive publications in recognized prior-art repositories; (iii) support lightweight community signals, after deposit, that help indicate plausibility before full review; (iv) adopt differentiated, fit-for-purpose quality assessment instruments, avoiding overinterpretation of altmetrics as direct substitutes for scientific quality [5][6][7][8][18][22]; (v) encourage standardized labeling (for example, using "Hypothesis" or "Concept" in titles and including clear statements on the status of evidence in abstracts); (vi) invite funding agencies and career-progression bodies to recognize idea DOIs, preregistrations, and defensive publications as legitimate, citable research outputs; (vii) reduce access barriers through progressive fee policies and waivers for authors from LMICs and early-career researchers [16][17]; (viii) publish AI-use policies in machine-readable format, including automated checks to identify unverifiable claims and citations [26][27][28][45]; and (ix) broaden editorial scope so that reputable journals welcome hypothesis/concept work under rigorous review, with guaranteed good retrievability, indexing, and visibility.

Conclusion

For scientists working under persistent constraints, there is moral and practical value in formulating and publishing testable hypotheses through the proposed workflow. Disseminating a "test-ready" concept transforms a private intuition into a public good: it guarantees precedence, allows verification by others, and increases the likelihood of contributing to knowledge. Although it does not solve all the problems of scientific communication, idea-centered pathways—provided they are supported by rigorous editorial

filters, ethical safeguards, and aligned incentives—can convert dormant hypotheses into citable, trackable projects. Therefore, devoting effort to this elaboration when direct experimentation is unfeasible constitutes both an act of altruism and a legitimate and necessary path of scientific contribution.

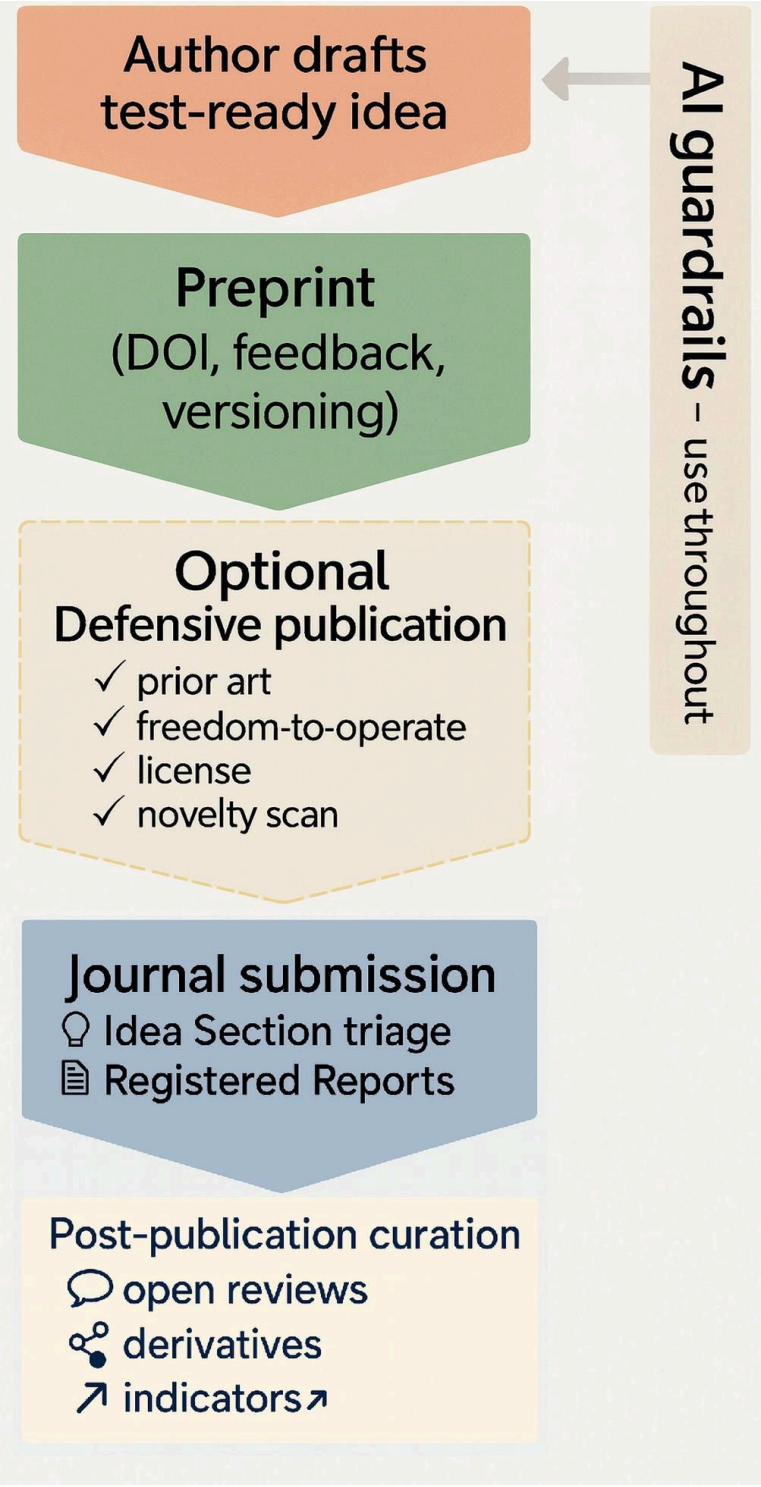

Figure 1. Open-idea workflow: Draft → Preprint (DOI, feedback, versioning) → [Optional] Defensive publication → Journal submission → Post-publication curation (open reviews, derivations, limited indicators).

Statements and Declarations

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The author declares no conflict of interest.

Ethics Statement

Not applicable (no human participants, animals, or proprietary datasets).

Data and Materials Availability

Not applicable. All sources mentioned are publicly accessible.

AI-Assistance Statement

Large language models—used under the author's direction for literature organization, reference searching, drafting assistance, language editing, consistency checks, and assistance in generating the figure—included ChatGPT-5 Thinking, Gemini 2.5, Grok-4, and DeepSeek V3.1. All conceptual content was verified by the author.

Author Contributions

MAA conceived the viewpoint; integrated literature and community practices; wrote the manuscript with AI assistance for literature organization, drafting, textual connections, and language editing; edited and approved the final version.

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Declarations

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