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The experiment continues: Arcadia publishing 2.0

Two years into our publishing experiment, we've learned a lot. We built internal processes that worked but inadvertently decreased scientists' agency and creativity. Now, we're minimizing process in an effort to empower our scientists to share their work how they see fit.

Contributors (A-Z)

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Purpose

We've been developing our open publishing model for the past two years and recently took a step back to reflect on how things were going. We realized that we'd become far too process-intensive, accidentally adding friction and sapping our scientists of ownership. What we observed in practice was that scientists simply weren't sharing their work as freely and creatively as we'd originally hoped. And ultimately, enabling scientists to act with agency was one of our main goals.

But the company has now established a solid foundation of understanding and culture around our open science mission. Therefore, we're now poised to try a drastically different and more ambitious approach.

In this pub, we introduce the next evolutionary stage of our open science experiment: a fully scientist-led publishing system. We want our scientists to decide when and how they share their work, putting the onus on them to grapple with issues surrounding these decisions. Our publishing and commercialization teams will continue to be available for strategic advice or support as needed. All scientists will, of course, need to consider how their decisions contribute to Arcadia's company goals, such as doing useful science, ensuring high-quality research, and enabling financial sustainability. But there are only two non-negotiable publishing rules. First, all byline contributors must sign off that the work is ready for release. Second, all data, code, or other material essential for reproducing the work must be available. With our scientists in the driver's seat, we hope to share more quickly and creatively, paving the way to more radical experimentation around publishing.

We're sharing this as an update for those following along with our publishing experiment or just stumbling upon it now. We hope other groups and individuals working to re-envision scientific publishing will find it useful in thinking about their own approaches. We're happy to discuss more — feel free to leave a public comment to start the conversation!

- This pub is part of the **project**, "Reimagining scientific publishing." Visit the project narrative for more background and context.

Lessons from our first 50 pubs

Two years ago, we embarked on an ambitious experiment to reimagine scientific publishing. Using PubPub, a free and open-source platform, we began sharing our research openly, iteratively, and collaboratively to accelerate scientific discovery and maximize the impact of our work. We're proud of what we've achieved in this first phase. Fifty publications — each accompanied by the data, code, protocols, and other materials necessary to replicate their findings — are now openly available. Reaching this milestone was a collaborative effort, with scientists, software engineers, and our publishing team working together to build a new model of scientific publishing.

As with any experiment, we've learned a great deal along the way. Our initial framework, while a positive step away from the shortfalls we identified in "The experiment begins: Arcadia publishing 1.0," **[1]** highlighted areas where we could improve. We encountered challenges in creating a streamlined and efficient internal publishing process that still maintained the high standards we set for our research.

Our multifaceted process — which included review from contributors, in addition to internal scientific, legal, software, and editorial review — seemed crucial to upholding our high sharing standards (Figure 1). In hindsight, we recognize that this approach, while thorough and helpful, hampered our ability to quickly disseminate our work. While avoiding pre-publication review through journals, we'd recapitulated a form of it internally. Ultimately, we replicated a common gatekeeping mechanism in scholarly dissemination that slows down progress, reduces iterative feedback, and gives the illusion that scientific work is ever "done." This is an unacceptable outcome. Like others experimenting in open science, we'd fallen into the trap of backsliding toward the system from which we tried to break free.

Further, our emphasis on collaboration, designed to promote team science and facilitate interdisciplinary work, sometimes made it difficult to balance collective effort with ownership over the pub. Having our publishing team lead engagement efforts, which we'd intended to relieve the burden of identifying and engaging interested readers, inadvertently limited individual scientists from taking a more proactive role in discussing their work with external audiences. Additionally, when our scientists did speak publicly about Arcadia's research, they sometimes struggled to do so with clarity and excitement because of their confusion around what might stand in the way of future commercialization.

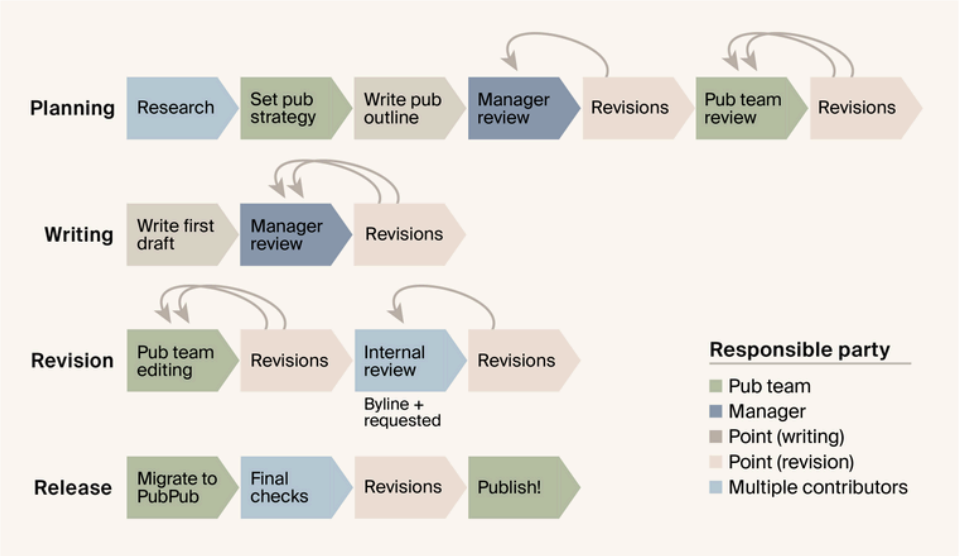

Figure 1

Our most extensive publishing process.

While we had lighter tracks for pubs and contributors with different needs, this had become our default approach. The complexity and number of hand-offs make coordinating a process like this time-intensive, even if the individual tasks are straightforward. Not included but formerly part of our default process were code review, figure development, IP check, and engagement strategy.

Arrows represent rounds of revision, where two arrows indicate that multiple rounds are typical.

We also realized that our standardized publishing process could benefit from increased flexibility. This one-size-fits-all approach didn't fully accommodate the diverse needs and working styles of our scientists. It hindered efficiency and creativity for some, while stretching the publishing team too thin to provide timely and deeply thoughtful help to others.

Finally, relying heavily on our publishing team for shepherding all stages made the process operationally expensive. It's important to us that other scientists external to Arcadia can apply any solutions we find, and our prior system would be difficult to replicate without multiple staff members dedicated to publishing. While this may seem acceptable for well-funded research groups, it's more difficult to extend such a

practice to individuals, companies, or leaner organizations that want to share their science. We want our model to be accessible to everyone.

In general, our scientists are biased towards being comprehensive and careful not to make mistakes. But this conscientiousness can sometimes backfire when their well-intended reliance on a manager, the publishing team, or others for added input diminishes their sense of ownership over a pub. Some of our more collaborative pubs have suffered when individual contributors only reviewed their own sections — they've lacked cohesion and we've had cases where we nearly missed obvious errors. While we're okay with making mistakes (and would be delighted for readers to point them out to us!), we want to help our scientists continue to take pride in and responsibility for their work.

What's not going to change

The speed and collaborative nature of modern science demands a more open and agile approach to sharing research. We thus launched our publishing experiment hoping to maximize three key qualities that benefit our science as a company: speed, utility, and rigor.

As we transition to publishing version 2.0, these fundamental features will remain unchanged. We're as committed as ever to:

- **Openly sharing a broad range of research outputs**: We share most of our work. Not just exciting results and tools, but negative data (check out our icebox), pre-experimentation ideas, open questions to the community, and more. The norm for biotech companies is not to share early-stage research, and we're proud to have released so many pubs already. We'll continue releasing science we think might benefit other scientists or that we'd like feedback on.
- **Embracing community feedback and public review**: The traditional model of closed peer review is too slow and doesn't scale with the growth of modern science. Soliciting feedback from a broad range of experts and making those comments public to benefit readers, not just authors, leads to more rigorous research and scientific discussion. Our publications will continue to be living documents, openly evolving and incorporating insights from the wider scientific community.

- **Prioritizing team science and collaborative authorship**: The interdisciplinary nature of science, especially our work at Arcadia, demands a collaborative approach. We'll continue to champion team science, accelerating our work and ensuring that all contributors receive clear and appropriate credit for their diverse expertise and contributions.
- **Focusing on utility and impact**: Publishing 1.0 mandated the release of all data, code, protocols, and other materials necessary to reproduce and build upon our findings. We'll continue doing this, striving to make our work as accessible and usable as we can, maximizing the chance of making a meaningful difference for the broader community.

We're doubling down on these core principles while providing our scientists with additional operational freedom to truly experiment with and push the boundaries of these ideals.

Our new approach

To address the shortcomings articulated above, we've developed a vision for the next iteration of our experiment. Version 2.0 of our publishing strategy focuses on empowering scientists and streamlining our workflows. The central change is to try and catalyze a shift toward **fully scientist-driven publishing**, where researchers will take a more active role in managing their publications. The overriding assumption is that science will indeed be released. This is a big shift for us. And it will feel uncomfortable at times. But we're excited to see what comes of it.

Our hypothesis is that by allowing scientists to choose the process, timeline, and format that best suit their individual projects and working styles, we will see greater ownership and a wider range of formats and approaches instigated by scientists themselves. We also hope this increases utility and engagement with others.

While scientists will still be expected to contribute to Arcadia's scientific and commercial goals, the choice of publishing will sit squarely in their hands. One bottleneck we foresee is our scientists worrying about how their choices may impact Arcadia's commercialization opportunities. We're still thinking through the various solutions that can address this — it's certainly a challenging and interesting part of our experiment and we'll provide more updates on this soon.

This shift will take deliberate effort, as it's not just operational but also cultural. To facilitate, we're streamlining our workflows and introducing new support mechanisms. Standing meetings and previously required steps, such as a kickoff meeting with the publishing team, will be replaced with on-demand consultations, offering greater flexibility and efficiency for both scientists and the publishing team. Ultimately, a successful shift is in the hands of the scientists themselves.

We've whittled our process down to just two core publishing requirements. A pub can go out if:

> All byline contributors approve release.

> All code, data, or other materials necessary to replicate or reuse the work are available in FAIR repositories.

These requirements ensure that we maintain our commitment to open science and collaborative accountability while allowing for greater freedom and ownership at the individual level.

As we make these changes, the publishing team will focus on developing more sophisticated resources and providing enhanced, targeted support to our scientists. This includes exploring the development of tools like AI-assisted text generation and editing, further streamlining the publication process. This pub itself benefited from a more creative approach — we generated a first draft using AI to transcribe and summarize a live, in-person, internal company presentation given just last week. Having this starting point helped us get activated quickly, editing and filling in the gaps over just a few days.

Next steps

This updated vision is not a final product nor a condemnation of our original approach, but rather a continued evolution of our experiment that we feel lucky to iterate on. As we move toward a more agile and scientist-driven model, we expect to encounter new challenges and learn from them. This approach lets us refine our process and make

sure our publishing model stays adaptable, effective, and replicable. As before, we'll assess this new path to see how it plays out and continue to adapt.

Increased flexibility might lead to some variation in publication quality, longer release times for some pubs, or accidental release of potentially commercializable insights as we adjust to the new system. However, we believe that scientists having more agency to publish as they see fit will expand our experimentation, foster a stronger commitment to quality in the long term, and allow them to realize the promise of openness to accelerate and improve their science.

In version 2.0 of our publishing approach, our scientists will take the lead with the ultimate goal of creating a more replicable and impactful model for sharing science.

Methods

We used Google's Gemini 1.5 Pro model (via Google AI Studio) to analyze a video recording of an internal presentation where Prachee Avasthi described this new version of Arcadia's publishing experiment. We included this video and the original text of "The experiment begins: Arcadia publishing 1.0," then prompted the model to turn the presentation into a pub that could serve as a follow-up to the original, asking it to write in a similar style and voice. We then wrote additional text to expand its output and edited the text to better reflect our thoughts.

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Competing interests

Prachee is also the head of open science at Astera Institute.

References

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