PLOS Science Wednesday: Hi Reddit we're Lenny Teytelman and Hilda Bastian, and we're here to answer your questions about open access publishing and new tools and methods to facilitate collaboration between researchers – Ask Us Anything!

PLOSScienceWednesday [1] and r/Science AMAs[1]

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How did the error in microliters needed and incubation time in that single step affect your research? How did you recognize that there was an error?

Thank you.

stephlikesblue

[Lenny] I share the full and painful details here (scroll down to "the story behind this protocol" https://www.protocols.io/view/Fixation-of-yeast-cells-for-RNA-FISH-fbjbikn?guidelines).

In brief, I was doing research on gene expression in an interesting mutant yeast strain, using a single-cell microscopy technique to visualize RNA transcripts. When trying the technique on normal wild type yeast cells, everything worked beautifully and I saw beautiful spots representing individual molecules of RNA. However, when I would analyze the mutant strain that I was interested in, I saw nothing. This was puzzling as the yeast genetics lab that I collaborated with showed a lot of transcription happening in these cells, using a different classic technique (Norther Blot).

I first thought that the problem was me and I was making a mistake somewhere. In the end, it turned out that my cells responded to the stress by greatly expanding their cell wall. In order to do the microscopy, I needed to get probes with a dye into these cells to visualize the RNA. Because of the thick cell wall, my probes were simply failing to penetrate into the cells. I need more of the enzyme that digested the cell wall.

Finally, given my experience, I asked whether we were digesting the cell wall enough in our other experiment, in normal non-stressed strains and conditions. Turned out that we were only partially digesting the cells and our results were dramatically skewed by that.

Hi Hilda, I have a question within a thought I hope you can help smooth out.

Much of the scientific research conducted around the world relies on public funding. Funding can be obtained directly from the government, through their bodies or other agencies such as the EU. Instead of researcher budgets needing to pay extra to make an article open access - this has happened to my

wife's research -, can't an argument simply be made that these private journals must make all research obtained by public funds accessible to the public?

EuropoBob

[Hilda] I agree that the public has the right of access to the results of publicly funded research – and without the year-long embargoes that are common now. (I'm speaking personally here, of course.) This is a tough problem. Journals rely enormously on the publications of publicly-funded scientists - and the subscriptions paid by publicly-funded institutions, too. Academics want the freedom to decide where they publish. Private journals are free commerce, with the rights that entails. This creates colossal practical and legal knots. And it's an extremely important struggle of our times.

There are organizations like Creative Commons and SPARC advocating for legislation to address this, and even some whole countries trying to find a way to do it, in particular The Netherlands. And Joe Biden has been addressing open access to data and publications Cancer Moonshot, too.

Some funders are developing their own publishing channels, likeeLife and Wellcome Open Research, too. I think we're going to see more of that.

Do you have a web crawler pulling protocols from top tier papers, or is the site solely dependent upon publishers writing their own protocols - is there any vetting process? I have visited the site, but not yet made an account.

For example, Ideal temperatures for raising x species of mosquito have been known since the early 1900s, yet a great diversity in rearing methods exists (food, density, light) - it appears that only general standardizations exist. How to rectify multiple similar, but not necessarily equal methods?

An aside, PLOS related- As a researcher at an institution in Brazil it is incredibly disheartening to see undergrads and masters students pay publication fees out of pocket. Often the only recourse is to publish in a predatory journal or not publish at all; waived fees are nonexistent here. - granted, a large problem exists with Quality:Quantity.

Itapi

[Lenny] We are a crowdsourced platform and we rely on researchers to share their methods directly (before, during, or after they publish their paper).

Unfortunately, many if not most research papers, do not have detailed protocols included. Therefore crawling the materials and methods sections wouldn't really work. However, we are actively partnering with publishers so that they encourage authors to post their full protocols on protocols.io and then link to them from the methods sections. Examples: GigaScience - http://blogs.biomedcentral.com/gigablog/2016/06/03/reproducible-research-resources-researching-parasites/

Genetics - https://genestogenomes.org/more-than-just-a-checklist-protocols-io-and-genetics-breathe-new-life-into-methods/

Regarding OA publishing fees - I hear you. It is a maddening quirk in our publishing system that subscription papers averaging $5K/paper and unavailable to most seem cheaper than $1K-$2K of open access fees for papers that are then accessible to all. But it is absolutely true that the OA publication fee is a barrier to many researchers. In the long term, funders and publishers will figure out how to ensure that there is no penalty for publishing in OA journals (many working on that already).

Until we get to that point, I suggest posting your paper as a preprint on arXiv or bioRxiv. Then, even if it goes to a subscription journal, a free version is available.

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Itapi

[Hilda] Answered your question about students, but in the wrong place, sorry: https://www.reddit.com/r/science/comments/59h5ke/plos_science_wednesday_hi_reddit_were_lenny/d98ploq/

Hilda & Lenny, a question we get at PLOS...what is the importance of making scientific articles open to EVERYONE since most of the reading public isn't capable of understanding the technical complexities of a standard scientific article?

PLOSReddit

[Lenny] Oh, how often I answer this question! (Usually, senior scientists and editors ask me this.)

First of all, there is a huge population of scientists who can understand and have to understand the papers for their research, but they do not have access. Not even the biggest and most well funded US research universities have access to every journal, and there are countless smaller schools whose libraries cannot afford subscriptions to most of the 25K-30K biomedical journals that exist. And when you move to poorer nations around the globe, they have talented scientists who are undermined and blocked from being productive simply because they cannot afford to access the published research.

Scientists aside, it is a misguided and elitist view that people without a PhD, outside of a research lab, do not need access to science papers. There are teachers in high schools, doctors, patients, journalists, and countless others who want, need, and would benefit from being able to access published papers. I think it is almost criminal that as a society we spend $10b a year on biomedical publishing, and the results are inaccessible to most.

There is a whole website actually devoted to answering this question: https://whoneedsaccess.org/.

Also, this brilliant classic video "Open Access Explained" presents a very clear, emotional, and convincing case for switching to full open access. https://www.youtube.com/watch?v=L5rVH1KGBCY

Hilda & Lenny, a question we get at PLOS...what is the importance of making scientific articles open to EVERYONE since most of the reading public isn't capable of understanding the technical complexities of a standard scientific article?

PLOSReddit

[Hilda] I agree strongly with the points Lenny made. But I think the argument people make about "capability" and the reading public misses the point. There are non-scientists who read articles that have a greater understanding of science than some of those publishing those articles, for a start. Whether it's journalists, people with a disease, or people advocating in an issue affected by science (like climate change), no one should underestimate our ability to get up to speed when we need to.

I used to be a consumer advocate in health. And there was no question that many patients, especially with rare conditions, were reading more science about the questions they faced than the doctors they

were seeing. There are studies showing that a doctor will look only a few minutes for an answer to question: a patient could spend days looking and reading, learning as they go. And the statistical literacy even of many scientists is highly over-estimated: that's part of why we are seeing crises around reproducibility.

That said, one of the arguments I made in my blog post this week is that "access" has to also mean "accessible". There are imperatives for scientists in that, too. Science is becoming increasingly inter-disciplinary, and work has to be understood by a range of people with different jargons.

Secondly, there are lots of ways that science is being disseminated - with plain language summaries in journals (frustratingly sometimes behind paywalls!), in the media, blog posts, and more. If you want extra detail - a number, say, that isn't specified in the plain language version - and you're really committed to it, you can dig it out if the article is open access. Information spreads through communities: each and every person doesn't have to have personally read an article for the information to reach them by other channels.

One of the most important of those ways is the Wikipedia. Wikipedia editors rely a lot on open access articles: partly because of their own access to them, and partly because citing them makes it easier for readers to verify what's in the Wikipedia article.

All that said, I think one of the obligations of the science community is to develop resources to help people understand their methods, their jargon, and the specifics of what they're doing. The public isn't going to be interested in everything of course: but I think there are more people under-estimating how much the public wants to read and understand than over-estimating it.

And then this oldie but goodie... when has OPEN ACCESS actually helped cure anyone or advance science in any meaningful way????

PLOSReddit

[Lenny] I say, "constantly, every day".

The reverse of this question is, "When did blocking someone from reading a research paper that they need help to speed up science and cures?"

There is also an enormous cost of subscription paywalls to society because of the inability of computer scientists to access the full body of literature automatically. Machine learning can tease out knowledge from papers, recommend relevant literature automatically to scientists, highlight reagents that are likely to work, and much more - all of this requires full access to all biomedical papers. Right now, companies doing the above are only sampling a fraction of total biomedical knowledge by analyzing PubMedCentral (papers from Open Access publishers like PLOS).

I know several scientists and companies that are using machine learning and relying on Open Access. So if you consider these efforts, OA is already helping to advance science in a meaningful way, but the power and utility of these would increase exponentially with full OA.

In terms of multi-discipline research, what are your prioritised field collaborations, if any?

hapaxlegomenonically

[Lenny] We have funding from the Gordon and Betty Moore Foundation with the explicit goal of encouraging sharing a collaboration in the marine biology community. So, a fair bit of our effort has been focused on that. However, as a crowdsourced method-oriented collaboration platform, we don't prioritize. We built protocols.io for collaboration, period. In fact, some of the most fruitful and important collaborations happen by chance between people with distinct non-overlapping expertise - we just want to enable and encourage more of these.

Do you run into a lot of resistance from companies claiming IP or trade secrets? I ask because I wrote a paper, but my company wouldn't allow me to publish. I wish there was more exchange of ideas that weren't tied up due to legal reasons. How would you go about convincing a big pharma company to share protocols! (US here). Also has the U.K. Seen a big increase in funding for cell therapies? Is that the next generation for wound healing?

diamondhurt

[Lenny] Of course, biotechs and pharmaceuticals cannot simply disclose what they are working on by making their active protocols public. So, we have private secured groups where industry and academic scientists can collaborate without being forced to share their techniques with competitors.

We try to gently encourage the private sector to share their protocols: public groups are free, but private groups have a user fee (unless academic or nonprofit). Also, once a company publishes their research results, the methods are no longer a secret...

Lenny, Hilda - What are the primary roadblocks you hear about from researchers that keep them from publishing OA? How do you advise them to overcome those hurdles?

PLOSReddit

[Lenny] This is a tough one. You can see one of these roadblocks in the question here - having to pay article-publishing charges. Another key block is the pressure to publish in high-impact factor journals that are not OA.

Journals like PLOS Biology and eLife help to provide OA alternatives to the high profile work. Personally, I think the more important but harder shift is to move away from the obsession with the impact factor and the name of the journal where we publish. Some more thoughts and advice for academics who want to publish open access but are not in the position to do so: "What academics can do to reach 100% open access" http://thespectroscope.com/read/what-academics-can-do-to-reach-100-open-access-by-lenny-teytelman-341

Lenny, Hilda - What are the primary roadblocks you hear about from researchers that keep them from publishing OA? How do you advise them to overcome those hurdles?

PLOSReddit

[Hilda] I agree about the prestigious journals barrier, and the charges. I'd also add co-authors to this list explicitly, even though that's embedded in the "must be in one of these journals" problem.

And I'd add misconceptions about OA, too. From misconceptions that feed people's prejudices, to misconceptions about research impact, and even misconceptions that this or that is "OA" when it's only free to read.

Thank you Lenny and Hilda. I am an aspiring graduate student applying to programs for next fall, and one of my long-term goals is to contribute to open-access knowledge. One of the ways to do that would be to make my own future research data and articles freely available. What else would the both of you recommend to be a good step towards this reality, in terms of helping the community move towards open access knowledge?

snowbabiez

[Lenny] Thank you for your support of open access!

I think one of the best ways to promote open access is to talk to your colleagues and labmates. Have conversations and share why you find it important. Listen to the responses (some of them dismissive like "everyone who needs access already has it), and learn how to answer them.

Because of people like you, I have absolute confidence that we will reach full open access in the not-too-distant future.

Thank you Lenny and Hilda. I am an aspiring graduate student applying to programs for next fall, and one of my long-term goals is to contribute to open-access knowledge. One of the ways to do that would be to make my own future research data and articles freely available. What else would the both of you recommend to be a good step towards this reality, in terms of helping the community move towards open access knowledge?

snowbabiez

[Hilda] That's cool - I wish you much luck! One of the hardest things about all this is all of those co-authors etc who aren't equally committed. There's still a lot of activism needed. I think at least getting to know the open access movement is enormously helpful. At some point, you're going to need arguments to convince others - be it individuals you're working with, or for a policy perhaps. Knowing where to find data, policy papers, or just plain compelling writing in a hurry when you need it could really come in handy. This week is a good time to see who's out there and find organizations that suit your personal style. We need you!

I think where you make your data etc available matters too: here's a good recent article about this. One of those is storing information in open (non-proprietary) formats. And I believe that it's better to lean towards towards public platforms when you can: I've been around long enough to see things disappear or end up behind paywalls when they weren't to start with. Frustrating. We have to be in this for the long haul.

Then there are all the other ways you contribute to the knowledge development process. Where you put your peer reviewing effort, for example. That includes post-publication, where you don't have to wait to be asked, and can develop skills - as well as encourage people who are publishing openly.

I think blogging is another part of opening access to knowledge - anything that improves your ability to communicate with people, really. Share knowledge across spaces in your life and community.

Most of all, I strongly encourage becoming a Wikipedian, if you're not already. I think all of us should be "knowledge philanthropists" at the Wikipedia in the areas where we have expertise.

Given the well documented issue of low quality and scam open access journals Do you know of any free high quality white-lists?

geniice

[Lenny] Take a look at the Directory of Open Access Journals. https://doaj.org/

Another useful site for avoiding the scammers is Think.Check.Submit http://thinkchecksubmit.org/.

Futurecast anyone? How do each of you imagine the state of open access scientific publishing for Open Access Week 2025?

PLOSReddit

I think that at least 50% of research will be published instantly open access (hopefully even more).

The use of preprints will continue to grow, and even for papers that are still published in subscription

journals, we will often be able to find an open access preprint version.

The PLOS Data Policy will be increasingly adopted by other journals and publishers as part of the effort to improve reproducibility, and it will be expected that data are shared openly upon publication in repositories like DataDryad.

There will also be a massive increase in the number of journals that adopt the F1000/PeerJ/BMJ/EMBOJ model of opening peer reviews.

Futurecast anyone? How do each of you imagine the state of open access scientific publishing for Open Access Week 2025?

PLOSReddit

[Hilda] Hmmm. When I think how wrong I would have been in 2005 predicting 10 years ahead, I shouldn't touch this question with a barge pole! I think open peer review being common is a pretty safe bet. I think post-publication peer review will be more common, too. And universities and funders will be more directly publishing. I think several countries will change the landscape with legislation.

There havebeen mixed messages on Reproducible Research. How can reproducibility be addressed in sharing protocols? Could you ELIAR, Explain Like I'm A Robot?

LearnedGuy

[Hilda] The situation for students worries me, too. I think institutions have a responsibility, here. They can – and should - negotiate cheaper rates with publishers. I don't know if any then waive the fees completely for students who get manuscripts accepted. Does anyone know examples like that?

Some universities are developing their own journals, like University of California. With the cost of setting up journals coming down thanks to open source editorial management options, that's something more might do.

Another option is publishing a preprint. Some of those are going to get picked up by publishers, and it seems likely that more overlay journals are going to appear - groups of scholars who reduce the cost and effort of publishing by piggybacking on the infrastructure of a repository. Academics and others are putting a vast amount of energy into providing editorial services at journals: I think we'll see more of them banding together to go down routes that don't require author charges. That's the road that the scholars behind the linguistics journal, Lingua, went down.

Author charges won't be the only OA model in the future. Already we're seeing funders develop their own publishing channels, like Wellcome Open Research. And there's the "sign-up for life for one fee" model at PeerJ: if co-authors sign up too, that makes it more affordable.

And then there are several models where institutional libraries, instead of paying high subscription charges, band together to cover the costs of a publishing enterprise. That's how the Stanford Encyclopedia of Philosophy works, and the Open Library of Humanities too.

"Predatory" journals aren't free either, of course – it's the author fees they're "preying" on. A wider range of lower-cost models with sound editorial and academic credentials is going to help – as well as, hopefully, driving down author charges. Scholars could choose to exercise their market power, too, in a variety of ways, which would benefit students.

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LearnedGuy

[Hilda] Well, I don't know about explaining like a robot, but I'll give the question a go from my point of view in clinical research. Back in the 1970s, researchers starting publishing protocols of their clinical trials as separate publications, and in the 1990s, that started happening with systematic reviews, too. Registries with some minimum protocol elements became mandatory for trials in the remit of the U.S. FDA, too.

Publishing protocols has had several repercussions. That whole area of p-hacking and coincidences have led us into a lot of unreproducible potholes. (I've written a bit about that here.) Pre-specifying the analyses you're going to make and rely on, makes us more likely to stick to the script – and at least it makes it clearer to others when researchers veer off their initial path.

Then there's the issue of being able to try to reproduce someone's results – or even of using the results of research for practical purposes, like health care decisions. (A group of us have written about that here.) For that, you need a lot of detail. It takes a lot of discipline to keep enough detail going in real-time, so that you can reconstruct it later for "a publication". Although it can be an enormous amount of work, it's worth it in the end. See Florian Markowetz's, Five selfish reasons to work reproducibly.

On the robot side: not what you asked, but I think we all have to get better at working to be understood by, and visible to, machines. That's everything from getting your ORCID so that you can be picked out from everyone else who has the same (sur)name/initials as you, through to open data and standardizing and including precise data the robots need. (I've done a cartoon about that, with my post here.)

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LearnedGuy

[Lenny] The reproducibility issue is indeed a very complex one. Some of the factors contributing to irreproducible research include: bad incentives, poor training, incomplete methods, missing data, messy biology, small sample sizes, variability in reagents/equipment, inappropriate application of statistics and p-hacking.

Obviously, no one effort can magically solve all issues with reproducibility. Changing our publishing culture so that we share the full details of the methods and make all of the data openly available - these can help a lot.

I am also a big fan of technical solutions that allow scientists to correct mistakes long after a paper has been published. More thoughts: "We can and should improve reproducibility. But it's not a crisis, so can do it without panic." (http://www.thespectroscope.com/read/we-can-and-should-improve-reproducibility-but-its-not-a-by-lenny-teytelman-309)