



Peer review in
the COVID era:
Searching for the
right questions





Second Virtual Session for the VI Brazilian Meeting on Research Integrity, Science
and Publication Ethics (VI BRISPE)

August 21, 2020

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First, let's
look at the
key terms

Conference theme: Open
science, research integrity,
and reliable research results
in times of COVID-19. What
does peer review mean now?

What do we mean by these
highlighted terms and how
are they related?

Open science means...

- ▶ Different groups define “open” differently (broad, narrow, practical, catchphrase, etc.).
- ▶ It isn't just about making science more open in order to improve science---it's also about improving access to science, improving collaboration, improving transparency, improving replicability, addressing social justice and moral issues, and more. Our motives and goals can be quite different.
- ▶ Open approaches, goals, attitudes and norms vary by field, region, institution, career stage, funder, etc.

As OSI noted in its open science recommendations paper, “open is simply a means to an end. We should be working together to achieve a better, more just, more harmonious society that open contributes to. This is not solely for science but for all kinds of research; not solely for the world's most privileged researchers but for all researchers and societies everywhere. Our focus must remain on building a future that is as rich, vibrant, accessible, equitable, sustainable and bold as it can possibly be. The specific solutions we employ to achieve open science should further these more noble objectives.”

Research integrity

The US National Institutes of Health defines “research integrity” as “the use of honest and verifiable methods in proposing, performing, and evaluating research; reporting research results with particular attention to adherence to rules, regulations, guidelines, and following commonly accepted professional codes or norms” (including espousing shared values such as honesty, accuracy, efficiency and objectivity). * So, for example:

- ▶ Transparency
- ▶ Proper analyses
- ▶ Objective conclusions
- ▶ No conflict or bias
- ▶ No p-hacking
- ▶ No plagiarism
- ▶ No fake data

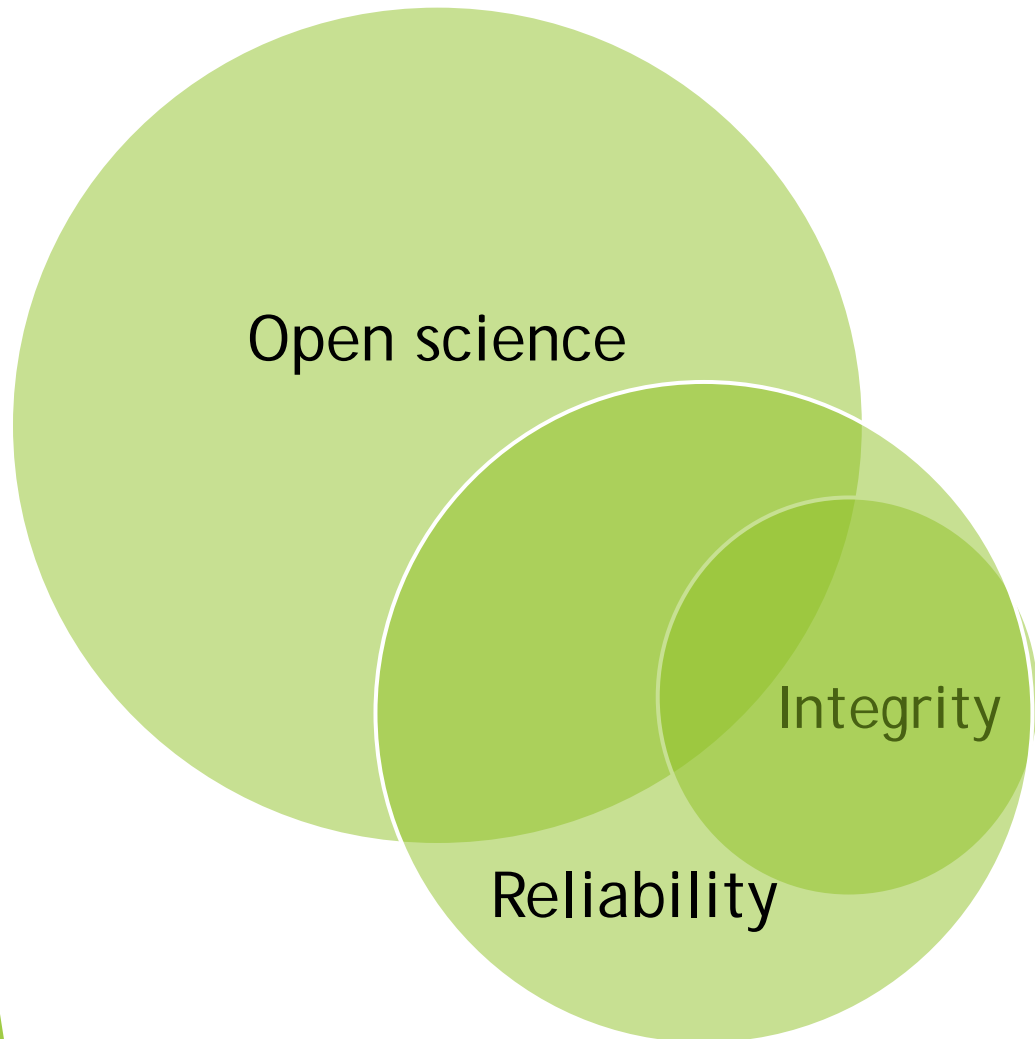
* https://grants.nih.gov/policy/research_integrity/what-is.htm

“Reliable”

- ▶ Science definition: Replicability (internal and external consistency; also, validity---how accurately are we measuring what we’re intending to measure)
- ▶ Colloquial definition: Research integrity plus some sort of “stamp of approval” ---typically publishing in a respected journal (which implies quality peer review). Other factors can also affect how we perceive the reliability of research, such as:
 - ▶ the reputation of the researcher,
 - ▶ the reputation of the institution,
 - ▶ the career stage of the researcher,
 - ▶ the researcher’s track record (grants, etc.),
 - ▶ how closely connected the research is to the researcher’s field of expertise (e.g., is this a physician writing about medicine or nuclear disarmament?),
 - ▶ how different the research conclusions are from current knowledge.

Michael will speak more about integrity and reliability in his presentation.

So, where are our concerns focused?



- Where we focus determines which issues we think are most important and which solutions we think are most needed.
- For the sake of argument, we'll focus on the intersection, which generally means, "this is how good research should be conducted"

What does peer review have to do with these concepts?

The general public understands peer review to be some sort of seal of approval or magic mechanism that is supposed to protect society from information chaos

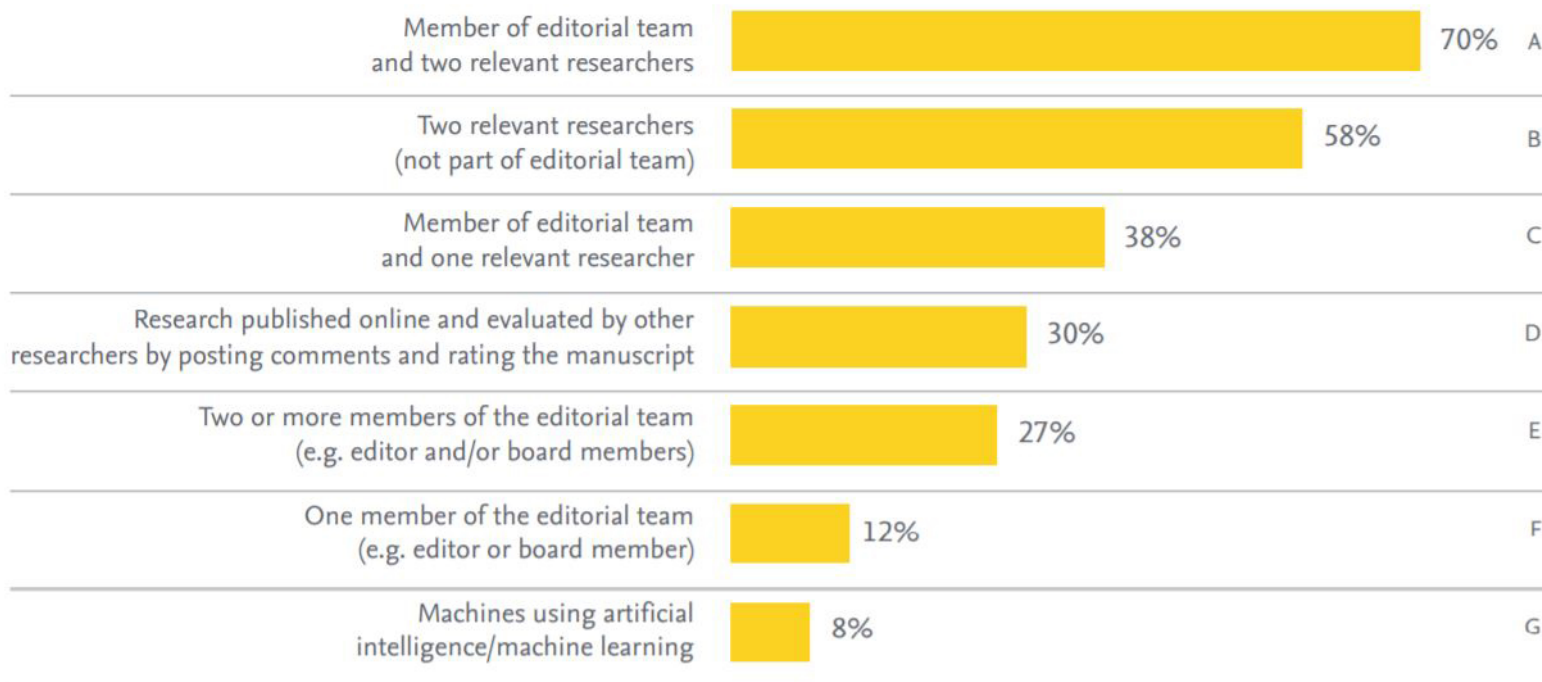
- ▶ “Essentially, *peer review* is an academic term for quality control.” American Public University System
- ▶ “If you use materials from peer-reviewed publications they have been vetted by scholars in your field for quality and importance. ” San Diego State University
- ▶ Peer review is “a tool for helping people make sense of science claims.” Elsevier and Sense About Science.

And science hasn't pushed back on this understanding, because peer review is:

- ▶ Valued by funders and institutions
- ▶ Viewed as being important to science (so volunteering to do peer review is an important responsibility)
- ▶ Almost universally highly regarded by scientists (despite complaints about time commitments)

To many scientists, then, peer review looks like this:

Which of the below qualifies as peer review; does it qualify when the evaluation of a research article is undertaken by:



Other peer review attributes

Average reviewers per paper: 3

Typical review time: Many months

Average time spent per paper: 6 hours

Average number of journal articles reviewed per year: 5? (not including book chapters, grant applications, etc.)*

Compensation/reward: Nothing extrinsic

On average, About 30% of papers rejected following peer review (an additional 20% are desk rejections)

Base: All respondents (n=3133)

Elsevier. 2019. Quality, trust & peer review: researchers' perspectives 10 years on.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4975196/#ref25>

* Various web estimates

The result has been an “accepted” understanding that peer review is supposed to:



Filter out bad science

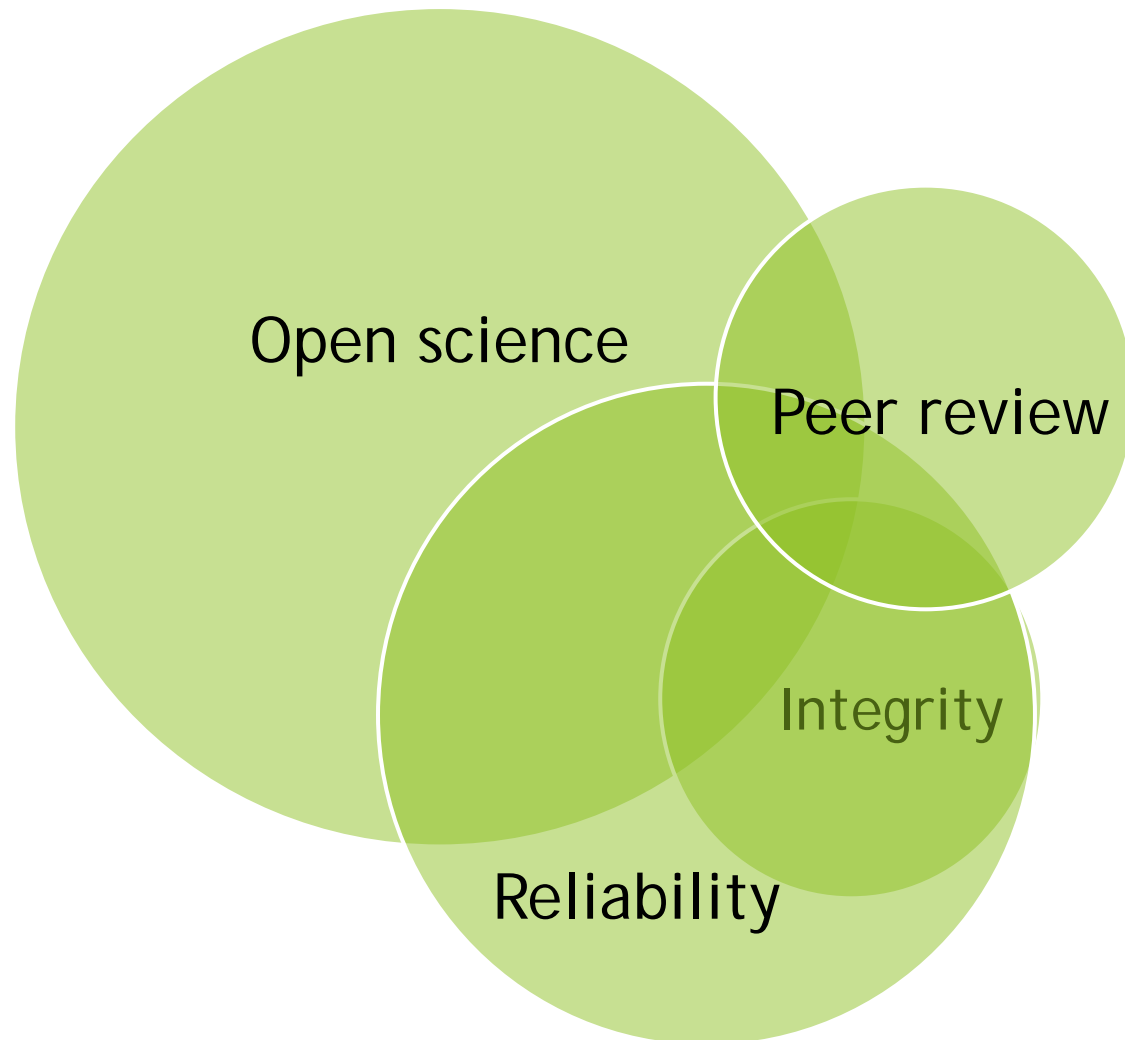


Assure quality



Check facts

So, where does this leave us? With this?



But....these four terms and the concerns they represent are not always related. We want them to be related, and so many of our reform arguments treat these terms like they are. But in fact, they are not 100% related in practice.

Enter COVID

- ▶ Lots of research happening, lots of papers getting published and shared
- ▶ Also, however:
 - ▶ Lots of research misdirection and waste;* retractions are also up
 - ▶ Lots of junk being published (an “infodemic” according to WHO)

And, lots of talk about how this is all heralding a new era for openness in research publishing.

* <https://www.wiley.com/network/archive/peer-review-quality-in-the-era-of-covid-19>

We hear things like, “COVID-era publishing shows that...”

- ▶ Research can be much more open
- ▶ Preprints play an important role in quickly sharing information
- ▶ Discovery can move faster with more information accessible
- ▶ The publishing process can move fast
- ▶ And more

But is this necessarily true?

COVID show that	Unless
Research can be much more open	There was never any doubt about this. The question has never been yes/no, but how. For example, all research can't be totally open, or immediately open. Even now with COVID research, vaccine development data and details are proprietary.
Preprints play an important role in quickly sharing information	Even during COVID, preprints are only a small fraction of published work (3%-ish).
Discovery can move faster with more information accessible	There's no doubt that quickly sharing information is important. But what if we're quickly sharing bad information?
The publishing process can move faster	No doubt. The question right now is whether this acceleration is sustainable---attention is being diverted from other issues, costs are high, etc.

We also hear that rapid science without traditional peer review might be the wave of the future and that review can be “community managed.” Is this true?

- ▶ The answer really depends on:
 - ▶ What we think about the intersection of business and science: Is “community management” alone enough to promote and safeguard the goals of open science, reliability and integrity? That is, can scientists by themselves, working as a volunteer network of reviewers, evolve the details and goals of open science, self-police the reliability and integrity of research work (sustainably at scale), and also coordinate the evolution of review into the future?
 - ▶ What we think about peer review: Do we think that volunteer community review alone will be sufficient to replace all the services that editorial offices currently provide (and there are a great many---most of this work, though, is “hidden” from public view)?

Finding the right balance point between open science, research integrity, reliability, and peer review in the time of COVID

Good publishing practices and peer review can play an important role in maintaining research integrity and reliability



Pressure to publish findings quickly



Research integrity and reliability

Sloppy publishing practices (including but not limited to sloppy open) or peer review can enable the wrong kinds of outcomes

With regard to peer review, we need change. But what change? Peer review is not a good tool for ensuring integrity and reliability, and it has an awkward fit with “open” science

- ▶ Peer review is a poorly defined process. Who is a peer? Who is an expert? What do we mean by review? What are the methods and goals?(1)
- ▶ The typical process is closed (blinded and unpublished)
- ▶ The process can be exceedingly slow (months), expensive (in terms of economic cost), biased (author nationality, prestige of institutional affiliation, reviewer and nationality, gender, research discipline, confirmation bias and publication bias, all affect reviewer impartiality in various ways), inconsistent, and ineffective at detecting errors (there is an element of trust in this process--- data are not typically reviewed). (2)
- ▶ Also, different kinds of peer review are more or less effective at detecting fraud and errors and reducing retractions---not all peer review is created equal. (3)

1. Smith, Richard. 2006. “Peer review: a flawed process at the heart of science and journals.” *Journal of the Royal Society of Medicine* vol. 99,4 (2006): 178-82.
doi:10.1258/jrsm.99.4.178

2. * Tennant, J.P., Ross-Hellauer, T. The limitations to our understanding of peer review. *Res Integr Peer Rev* 5, 6 (2020).
<https://doi.org/10.1186/s41073-020-00092-1>

3. Horbach, S.P.J.M., Halfman, W. The ability of different peer review procedures to flag problematic publications. *Scientometrics* **118**, 3 39–373 (2019).

<https://doi.org/10.1007/s11192-018-2969-2>

In fact, long before COVID, peer review has been under pressure to change, with debates over:

- ▶ The enormous time commitments involved
- ▶ The lack of academic credit for peer review work
- ▶ Blind vs. not blind pros and cons; signed vs. not signed; etc.
- ▶ The effectiveness of review
- ▶ Faked and sub-optimal review (especially in predatory journals)
- ▶ And evolving options, like:
 - ▶ Registered reports (pre-review)
 - ▶ Rapid review (the MDPI model)
 - ▶ Post-publication review (the F1000 and emerging preprint model)

Peer review SWOT

Strengths

- Relies on trust/goodwill. Trusted by researchers
- Peer review adds value
- Provides some level of validation by experts
- Mostly trusted by most research communities
- Imperfect, but the best system we have to date
- It does work within its limits
- Voluntary/free
- Encourages care and rigor
- Filters for a target audience
- Expert scrutiny
- Often leads to improvements or discovers flaws
- Adds credibility to published works
- Can sometimes spot flaws
- Improves papers when it works properly
- Improves science and stimulates thinking
- Sets criteria for acceptance, thereby motivating authors to improve quality
- Favors discussion and feedback
- Tried and tested
- Careful reading is a benefit

Weaknesses

- Lack of openness hides bias. Biased with regard to gender, affiliation, country, discipline, which interfere with objectivity and empower certain views and/or paradigms
- Not transparent – biases go uncovered
- Susceptible to conflicts of interest (amongst reviewers, editors)
- Single-blind peer review allows reviewers to veil criticism behind anonymity
- Not ‘blind’ enough
- Unintentionally promotes conservatism (especially grants, but that’s a different conference perhaps...)
- Doesn’t promote innovation
- Negative/inconclusive papers not published
- Dependent on trust and goodwill, which is eroding
- Perceived credibility
- No credit for reviewing
- Not designed to identify (and doesn’t protect from) fraud and misconduct
- Data in supplementary material often overlooked
- Complex methods in multidisciplinary papers
- Review of only one research object (article) at one time period
- Little training for peer reviewers
- Increasingly difficult to find reviewers; open access journals may not attract quality reviewers
- Reviewers review for journals and editors, not for their peers
- Element of chance – only 2 or 3 reviewers out of many potential opinions
- No independent scrutiny and analysis
- Too few eyes
- The longest part of the publication process – can be time-consuming, slow – which delays publication. This might mean that important data is withheld from public/researchers. Reviewers at some journals delay publication by imposing burdensome/non-critical demands on authors
- Scooping
- Unwieldy system for managing is cost- and resource-intensive
- Peer review stops on publication
- Doesn’t add value

Opportunities

- Pre- and/or post-publication review could be a new model. Fully transparent post-publication review for journals
- Fully transparent pre-publication review for books
- Becoming more public
- Open, post-publication peer review
- Credit/recognition for reviewers an essential part of scholarly ecosystem
- Cascade review can reduce inefficiency
- Automation/de-skilling of some elements—leave it to people to judge results
- Quality/science/impact
- Better tools for matching qualified reviewers to content
- In an online environment it is possible to make peer review more of an ongoing process
- Open review promotes transparency
- Portable peer review
- Remove shackles of print/mail and develop existing system for digital world

Threats

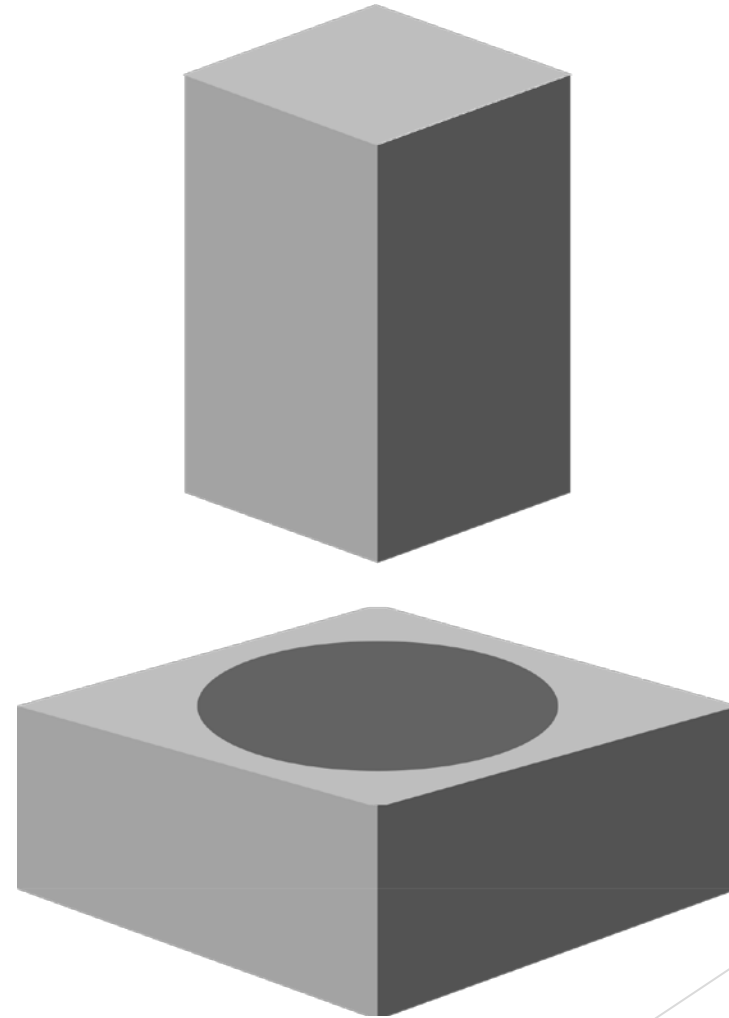
- Peer review is an attention portal that adds value, so changing it could be threatening. It is unclear whether researchers will continue devoting time to peer review if they are not incentivized to do so
- If not done by the journal where does that leave the journal? Does it matter?
- “Managing peer review” becomes commercial product
- People thinking it’s fixed
- Novel ideas and emerging subjects disadvantaged
- Throw everything online and hope for the best leads to lots of shoddy information
- Flawed research still gets published (e.g., STAP, Benveniste, etc.)
- Closing the scientific mind
- Gaming/fraud/cheating
- Bias
- Corruption
- Time (waste of extensive amount of time finding reviewers)

Peer review research priorities

Topic	Highest priority areas where research is needed
Role of editors in peer review	Justifications for editorial decisions
	Factors that affect editorial quality, impartiality and their impact
	Editorial competencies and motivations for decisions
	Impact of decisions on epistemic diversity
	Editorial conflicts of interest and relationships with other parties
	Extent of editorial misconduct
Role of reviewers in peer review	Factors that affect reviewer impartiality and their impact
	Reviewer competencies and motivations
	Extent of peer review misconduct
	Expectations for reviewers
Functionality and quality of peer review	What peer review actually is and does
	How does peer review impact scientific discourse
	Reproducibility of peer review
	The development and impact of peer review standards
Social and epistemic impacts of peer review	Homogeneity and centralisation of reviewer pools
	Epistemic diversity of peer review
	Impact of peer review on innovation or conservatism
	Peer review as a vehicle for disseminating prestige
Type of peer review	Factors influencing the choice of peer review type
	Influence of peer review type on quality of review and potential misconduct
	Researcher attitudes towards OPR
	The impact of OPR on participant diversity
	The impact of blinding on biases and review quality
	Impact of open review reports

From Tennant, J.P., Ross-Hellauer, T. The limitations to our understanding of peer review. *Res Integr Peer Rev* 5, 6 (2020). <https://doi.org/10.1186/s41073-020-00092-1>

In short, traditional peer review really isn't what we've accepted it to be, and by itself isn't going to help us meet the COVID-era "infodemic" challenge



How did this happen? In part, because “peer review” is new. We used to have editorial review and occasional “refereeing.”*

* See Baldwin, Melinda. 2018. Scientific Autonomy, Public Accountability, and the Rise of “Peer Review” in the Cold War United States. Isis, volume 109, number 3.

Peer review is not used to bestow credibility; most journals and grant organizations have unsystematic or non-existent refereeing processes. Journal editors are responsible for “refereeing” articles---for vetting quality and only occasionally seeking outside opinions as needed.

Refereeing standards begin to develop but most articles still not refereed

Massive increase in research spending in US leads to increased calls for accountability (mostly in NIH). Also, editors need help to cope with volumes.

Under pressure from politicians trying to ensure greater accountability for government spending, “refereeing” is renamed “peer review” and its influence and importance increase and are systematized in order to portray this review process as the best, most trusted way of evaluating scientific quality. Other countries gradually adopt US standard (English journals first) by late 1980s.

A huge gap between what we now expect from peer review, and what refereeing was originally meant to do

Peer review process and expectations

Before 1900

1920s-30s

1950s-60s

1970s-80s

Today



So, what now?

- ▶ Redefine peer review (again)?
- ▶ Reinvent peer review?
- ▶ Figure out some other way to protect science?

Step one is to try to figure out if are there more “precise” questions we can ask about what the COVID era might mean for peer review.

For example,
what if we ask
questions like
these?

- ▶ What gatekeeping and referee mechanisms will work best for the future of research (let's not call these "peer review" so we can think outside the box)?
- ▶ How can we share large quantities of information more effectively (and faster as needed)?
- ▶ How can we improve "reliability" in science?

These questions aren't necessarily related to each other, and aren't necessarily related to COVID or peer review. The COVID era has highlighted defects in the current publishing system, but it didn't create them, and the solution may not be to "do the same thing only better."

Gatekeeping

CHANGES HAPPENING NOW

- ▶ Improved screening of preprints (both internally and via social media mechanisms *)
- ▶ More efficiencies emerging in peer review processes (as well as more scientists volunteering to help with peer review). Are these changes sustainable? Affordable?

WHAT'S NEEDED

- ▶ A better understanding of what we really value and need from gatekeeping and refereeing
- ▶ A hard look at whether COVID-era review speed is sustainable or affordable
- ▶ A look at other gatekeeping ideas (e.g., submission fees?)

Sharing

CHANGES HAPPENING NOW

- ▶ Many ad-hoc efforts and collaborations have cropped up to daylight needed information (OASPA, Elsevier, CZI, others). Which efforts will have permanent influence?
- ▶ Continued pressure via transformative agreements and other open science initiatives to make more information freely accessible

WHAT'S NEEDED

- ▶ Systems to help us understand what information to pay attention to
- ▶ Better access to underlying data. Seeing more journal article metadata isn't solving any research problems.
- ▶ A better understanding of the sharing needs that are unique to each discipline. Is speed more important than quality (knowing that a few hurried and bad studies can be very damaging to the broader goals of science)*

*<https://www.insidehighered.com/news/2020/06/08/fast-pace-scientific-publishing-covid-comes-problems>

Reliability

CHANGES HAPPENING NOW (AND ALSO BEFORE COVID)

- ▶ A leveling off of retractions (1) (EXCEPT with regard to COVID research)
- ▶ An improved understanding of the need to avoid sensationalizing results (although the public is still susceptible to this)
- ▶ A increasing focus on reliability-related reforms, like registered reports, improved transparency, DORA, FAIR data, etc.

WHAT'S NEEDED

- ▶ A better understanding of the limits of reliability (2). Reliability has much more to do with experimental design and statistical analysis than peer review.
- ▶ A reduction of publish or perish pressures in academia. Sensational results mean more attention, which is good for both researchers and universities. But the pressure to produce sensational results can mean hiding negative findings, misinterpreting data, only studying “high profile” topics (and less often, the topics of greater import to people in developing countries, for example)
- ▶ Continued focus on understanding the threats to reliability and the best practices researchers can adopt to screen work and improve reliability.

1. <https://bit.ly/321wEY3>
2. Daniela Witten, <https://www.youtube.com/watch?v=sxVSJft49oU>

We don't need to wait for change. The scholarly research community is already working on, and making progress thinking about:

- ▶ The role of research journals in society (what is their highest, best function, what is the impact and importance, etc.)
- ▶ Different (and evolving) models of sharing and publishing research
- ▶ Different (and evolving) ideas about open, impact, gatekeeping, authorship, data, peer review, and more (it's all connected).

Recommendations for peer review reform

1. THINK STRATEGICALLY


What do we want and need with regard to peer review? Editorial accuracy? Transparency? Fact checking? Gatekeeping? Government oversight? Ensuring the quality of grant disbursements? Controlling the trajectory of science? Something else? Let's identify our goals first. What's happening in the COVID era of publishing is interesting, but it's also a reaction and suboptimal. What kinds of outcomes would we like to see, and what are our options?

2. UNDERSTAND

We need a more sophisticated understanding of what researchers "need" in the publishing process---not just peer review, but formatting, fact-checking, connection with other research, distribution, archiving, and so on. Is this a disaggregated process or a one-stop-shop process? And how important is peer review in all of this (in whatever form)? We also need a better understanding of what types of review (whatever we call it) work best.

3. WELCOME CHANGE

There are a wide variety of options evolving in the marketplace. Peer review is just one change among several. Whether the market is able to "fix" these deficiencies depends in large part on whether universities and funders will let them be fixed, and whether researchers will accept these new systems. There is nothing sacred about peer review as it currently exists---it should be encouraged to evolve.

A vibrant, stylized pattern of tropical leaves and plants in shades of green, brown, and red, filling the left side of the slide.

And now,
more detail
from our
other
presenters...

Questions? Email Glenn Hampson @
ghampson@nationalscience.org