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The Selfish Reasons for Practicing Open Research

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Benefits of Open Research

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ABSTRACT

Champions and practitioners of open research and FAIR data practices are realizing significant benefits to their research along with the impactful bonus of making the whole research enterprise better for everyone. In addition to the ethical and moral reasons for adopting these best practices, data and results show that scientists who work in an open science framework will have increased productivity, more credit and recognition and longer scientific longevity to their work.

This is based on my talk at the Singapore Open Research Conference, hosted by Nanyang Technological University. The Google slides from the talk are here, in addition to the steps below.

Please feel free to use and adapt! It's all about promoting openness and reuse!

If you and extend/edit this or have suggestions, please do share the ideas or link to your versions in comments here. Also, you can "fork" this entire document, and build on it, then publishing back into this same workspace.

(Image: UNESCO Recommendation on Open Science, CC BY-SA 3.0 IGO)

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Introduction

1 Cancer Bio Reproducibility Project

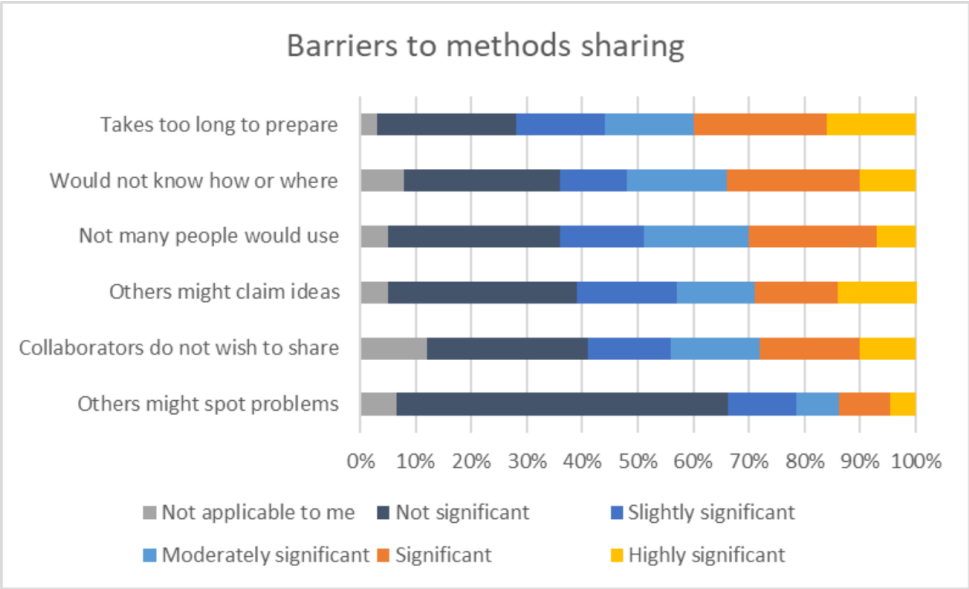
As part of the background on why we created protocols.io, we like to talk about the [Cancer Biology Reproducibility Project](), which was a $1.5 million dollar initiative coordinated by the Center for Open Science and by Science Exchange with the goal of trying to independently replicate almost 200 experiments from about 50 high-profile papers on cancer biology.

RPCB summary: https://www.cos.io/rpcb

2 Open Research sharing takes time

As much as open research is a public good, the truth is that sharing methods, data, code, and so on takes an effort. And time is one resource that all researchers lack. This is why it's important to highlight the many benefits of open science that apply directly to the research authors.

Respondents were also asked to rate the significance of certain barriers to publicly sharing detailed methods information. The modal response for all items was the response with the lowest Likert scale value, “Not significant.” The barriers rated as significant or highly significant by the largest proportion of respondents were “It takes too long to prepare detailed methods information in a way that would be useful for others” (n=378; 40%) and “I would not know how or where to publicly share detailed methods information” (n=332; 34%).



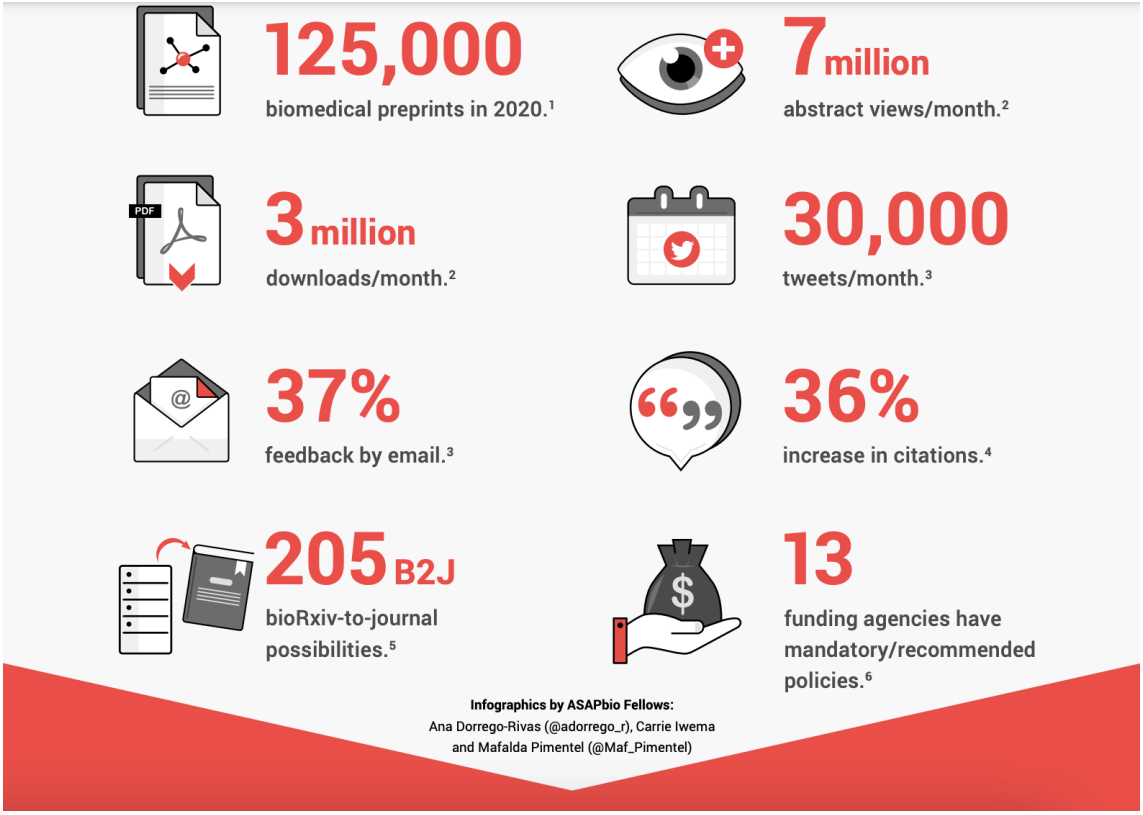
From: "A survey of researchers' methods sharing practices and priorities."

Figure from: LaFlamme, M., Harney, J., & Hrynaszkiewicz, I. (2022, October 14). A survey of researchers' methods sharing practices and priorities. https://doi.org/10.31222/osf.io/7jxav

"It takes too long to prepare detailed methods information in a way that would be useful for others."

Preprints

3 ASAPbio is a nonprofit promoting preprints. This superb graphic from them nicely captures the many helpful aspects of preprints (link).



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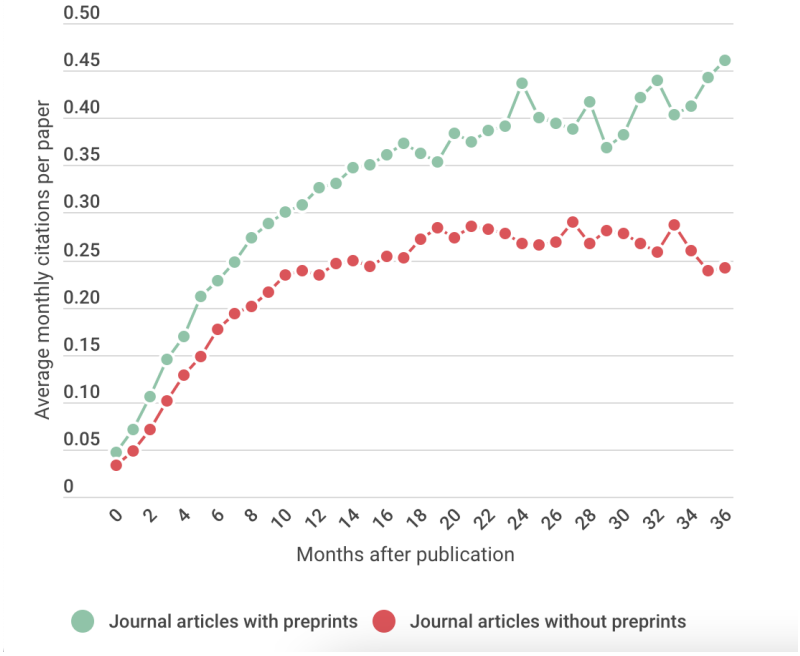
5 **Preprints boost article citations and mentions.**

Nature Index Link

Darwin Y Fu, Jacob J Hughey (2019) Meta-Research: Releasing a preprint is associated with more attention and citations for the peer-reviewed article eLife 8:e52646

Nicholas Fraser, Fakhri Momeni, Philipp Mayr, Isabella Peters; The relationship between bioRxiv preprints, citations and altmetrics. Quantitative Science Studies 2020; 1 (2): 618–638.

Journal articles that were uploaded as preprints before being published gather more citations in the long run than papers without a preprint version. The effect is immediate and long-lasting.



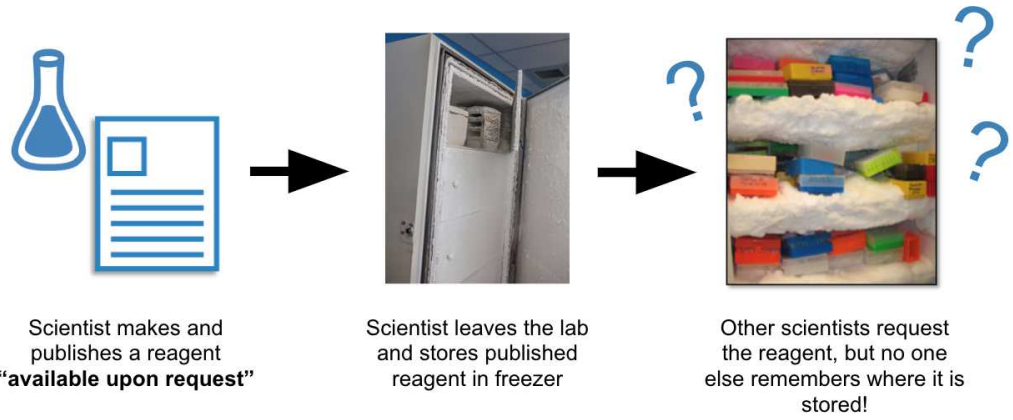
Reagent Repositories

6 “Repositories like the ones recommended by PLOS handle the logistics of material requests, letting the scientists focus on what’s important: doing research.”

“Saves authors the time and burden of shipping requested materials.”

https://theplosblog.plos.org/2019/05/depositing-and-reporting-of-reagents-accelerating-open-and-reproducible-science/

7



From: https://www.repro4everyone.org/

8

- Addgene
- ATCC (American Type Culture Collection)
- ABRC (Arabidopsis Biological Resource Center)
- Bloomington Drosophila Stock Center
- Caenorhabditis Genetics Center
- DSMZ
- European Conditional Mouse Mutagenesis Program
- European Mouse Mutant Archive
- Knockout Mouse Project
- Jackson Laboratory
- Mutant Mouse Regional Resource Centers
- PlasmID
- RIKEN Bioresource Centre
- Developmental Studies Hybridoma Bank
- EUROSCARF (S.Cerevisiae)
- National Xenopus Resource
- ZIRC (Zebrafish International Resource Center)

9 (From Addgene, https://www.addgene.org/deposit/benefits/)

Deposit Plasmids / Benefits of Depositing

Benefits of Depositing Plasmids at Addgene

Save Time and Money

Depositing plasmids at Addgene is like getting a free lab manager. There is no charge to deposit, and you will no longer have to find stocks, package materials, ship packages, and deal with MTAs. Addgene handles your plasmid requests, leaving you with more free time. In addition, you will earn Rewards Points from Addgene that can be redeemed for free plasmids.

Addgene creates a website for each depositing lab, and you can refer scientists requesting your plasmids to this page (see PI page example). A complete list of the scientists who have requested your plasmids is available through your Addgene account.

Peace of Mind

How many times have you tried in vain to find a plasmid created by a former member of the lab? To remember the cloning sites used to create a plasmid? Or worried about losing your stocks from a freezer meltdown?

Deposit plasmids at Addgene and relax. We will preserve your samples and the associated data for use by future members of your lab. Addgene stores samples in barcoded tubes on-site in Watertown, MA and off-site at a facility in Rockville, MD.

Data

10 As with preprinting, sharing data seems to increase citations of a given research article.

"We also find an association between articles that include statements that link to data in a repository and up to **25.36% (± 1.07%) higher citation impact** on average, using a citation prediction model. "

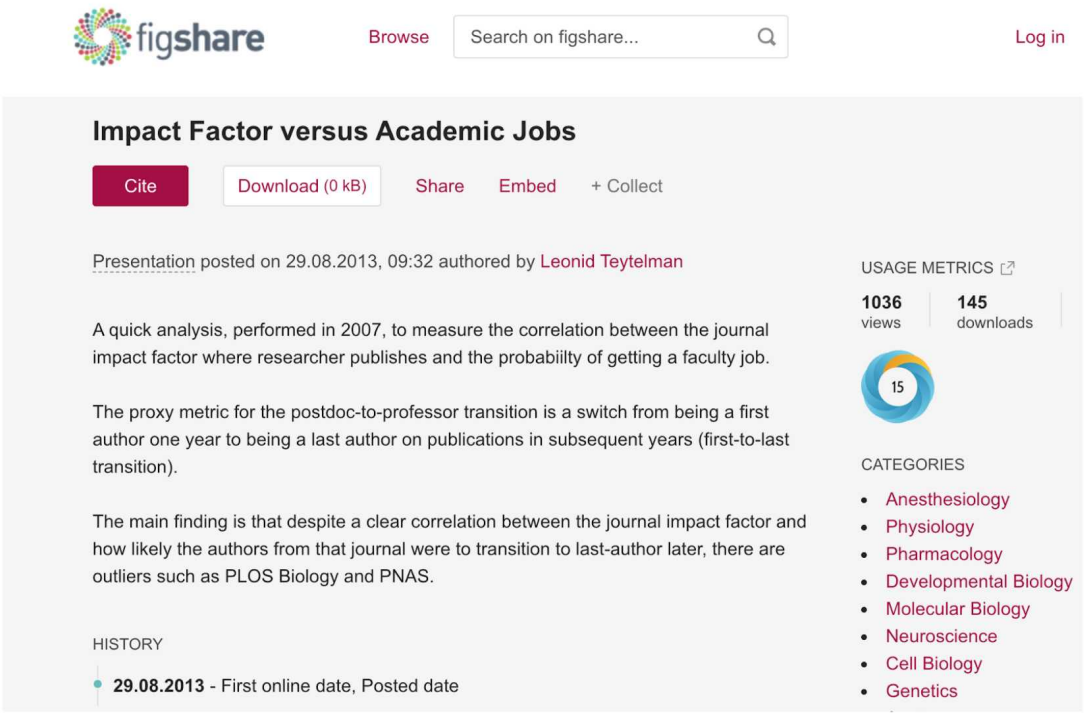
Colavizza G, Hrynaszkiewicz I, Staden I, Whitaker K, McGillivray B (2020) The citation advantage of linking publications to research data. PLoS ONE 15(4): e0230416. https://doi.org/10.1371/journal.pone.0230416

"In a multivariate regression on 10,555 studies that created gene expression microarray data, we found that studies that made data available in a public repository received **9% (95% confidence interval: 5% to 13%) more citations than similar studies for which the data was not made available**."

Piwowar HA, Vision TJ. 2013. Data reuse and the open data citation advantage. PeerJ 1:e175

https://doi.org/10.7717/peerj.175

11 In Sept. 2022, I was asked to share scripts from a 2007 analysis. Good thing I uploaded it to figshare; there's no way I'd find the laptop from 2007. No cost, 10 seconds to find with Google.



https://figshare.com/articles/presentation/Impact_Factor_versus_Academic_Jobs/783894, https://figshare.com/articles/dataset/Detailed_documentation_and_scripts_for_FTL_analysis/783897

12 Repositories

Re3data.org - Re3data is a global registry of research data repositories

General repositories:

- Figshare (free up to 20GB total)
- Zenodo (free; 50GB per dataset)
- OSF from the Center for Open Science (5GB private for free, 50GB for public)

Don't wait until the publication date!

Publication may happen months or years after completion of the research, so collecting together all the research artefacts at that stage to publish openly is often challenging. Zenodo therefore offers the possibility to house closed and restricted content, so that artefacts can be captured and stored safely whilst the research is ongoing, such that nothing is missing when they are openly shared later in the research workflow.

Additionally, to help publishing, research materials for the review process can be safely uploaded to Zenodo in restricted records and then protected links can be shared with the reviewers. Content can also be embargoed and automatically opened when the associated paper is published.

https://about.zenodo.org/

Preregistration

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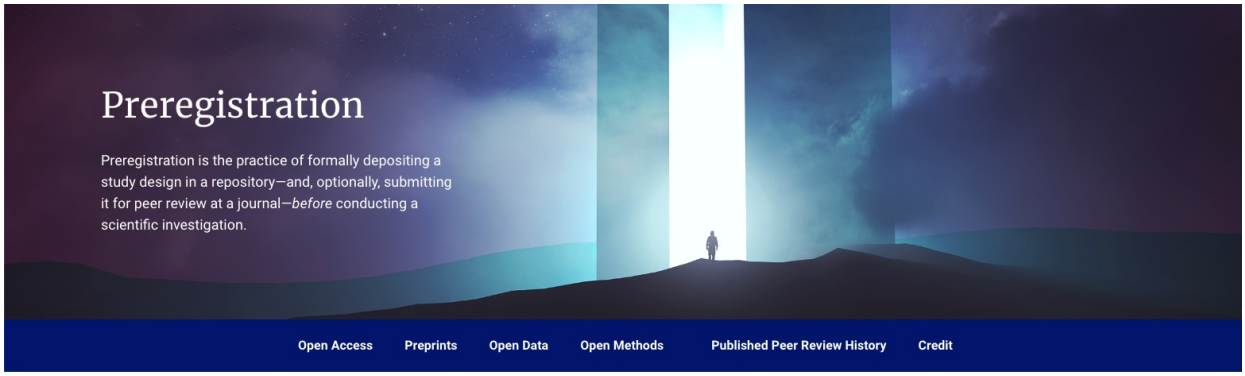

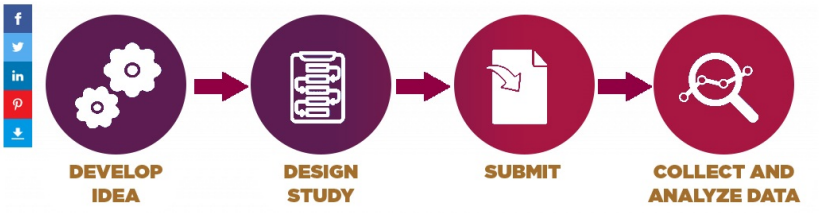

https://plos.org/open-science/preregistration/

Benefits of preregistration

Depositing your study design in a repository is a way of holding yourself to the highest standards of research integrity, while at the same time ensuring that your work will be reproducible in the future. Submitting your study design to a journal brings two additional benefits: expert peer review feedback to ensure the best possible methodological and analytical approach, and an editorial decision based solely on the quality of the research and the important of the research question–not the results.

At PLOS, we see preregistration as an important step towards a more open and transparent peer review process – one that brings with it tremendous benefits for both individual authors and the broader scientific community.

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Demonstrated credibility

Depositing a study design before experimentation and data collection showcases the underlying validity of the research.

Lasting reproducibility

Safely storing a detailed study design in a repository helps ensure that the resulting work will be reproducible, even years in the future—even if you lose files, move to a different institution, or change the focus of your research, your methods are safe.

Constructive review

When peer review takes place before you conduct your investigation, the focus of review shifts from evaluating journal fit and significance of advance to actionable, productive feedback aimed at ensuring the best study design possible. Reviewers will no longer request additional experiments after your article is complete!

Increased likelihood of acceptance

Publishing your study design or obtaining a provisional accept decision from a journal helps ensure that your research outcomes will go on to be publishable, even if you disprove your hypotheses.

A more complete scientific record

Editorial decision-making driven by the importance of the research question and the rigor of the study design helps to reduce publication bias, confirmation bias, and impact bias to influence the scientific record. That means a more complete and accurate scientific record, and more efficient use of resources system-wide.

Keeps your options open

Choosing to preregister a confirmatory study doesn't prevent you from conducting related exploratory research or post-hoc analysis. You reap the benefits of increased trust and reproducibility, with no risks or limitations to your future research.

https://plos.org/open-science/preregistration/

Methods

16 (You're reading this on protocols.io; of course we are going to mention methods!)

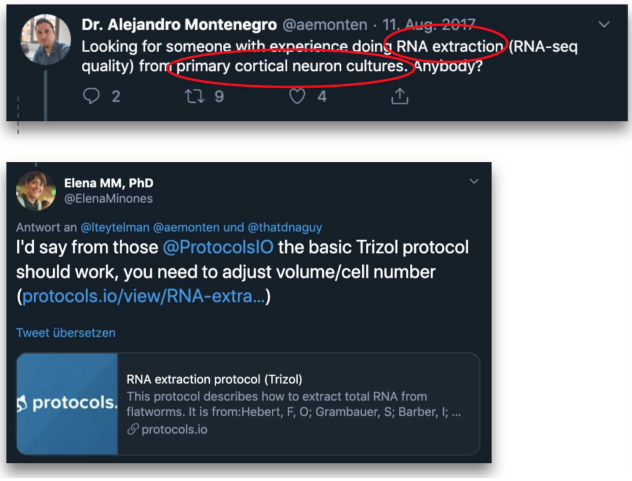
Public sharing on protocols.io is always open access, **free** to read and publish.

Mission: Make it easy to share method details before, during, and after publication.

protocols.io

And a huge part of our goal is to increase the credit for and recognition of the work of method development.

17 Your methods on protocols.io are more discoverable. In the example below, if the protocol was shared only as a supplement of the research paper, no way people outside that field would find it.



https://gigascience.biomedcentral.com/articles/10.1186/s13742-016-0128-3,
https://twitter.com/aemonten/status/895798957569388544

18 Increased Collaborations

"80% of my recent collaborations have been a direct result of sharing our protocols publicly on protocols.io"

Luciano G. Martelotto
Professor, University of Adelaide

https://www.protocols.io/researchers/luciano-martelotto/protocols

19 protocols.io also has a partnership with PLOS ONE, helping to turn protocols into peer-reviewed publications.

Benefits of Published Protocols

Peer-review of protocols supports rigorous, high-quality research, while publication increases discoverability, supports reproducibility, and recognizes the importance of the scientific work.

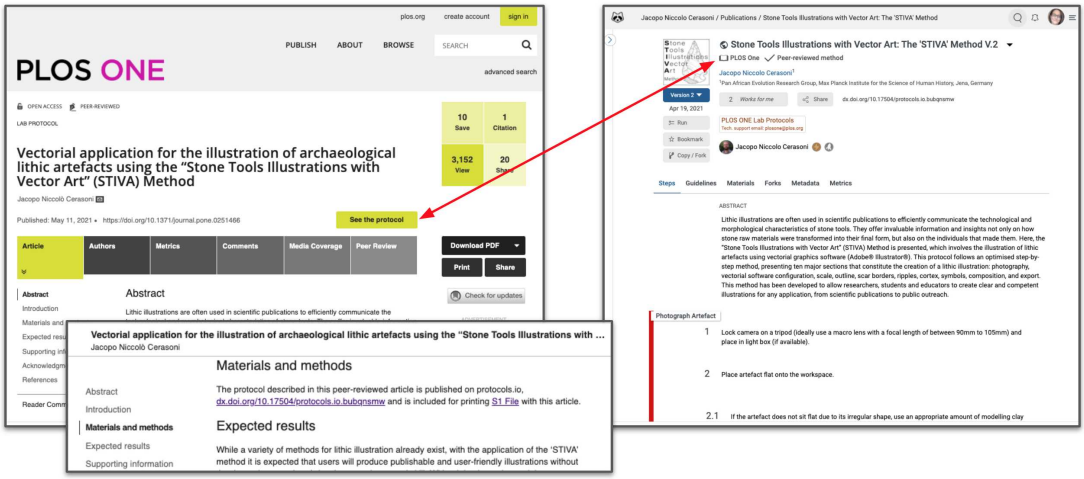
Improve **your approach**
Expert peer review feedback can help to refine and shape your protocol, promoting usability and efficiency.

Earn readers' *trust*
It's difficult to reproduce results—or even confirm the question a study is designed to answer—based on a research article alone. Protocols show that you did what you set out to do, and how you went about it.

Expand your *publication record*
Protocols take time and thought to develop; claim academic credit for your efforts through formal publication.

Help your field move *faster* Published protocols are discoverable and accessible, enabling other researchers to adapt and build upon your accomplishments.

https://plos.org/protocols/



https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0251466,
https://www.protocols.io/view/stone-tools-illustrations-with-vector-art-the-39-s-4r3l248j3g1y/v2

20 Publishing Protocols: Lab Protocols in PLOS ONE

Professor Monica Trujillo

“I am from a small country in Latin America. This made me famous in my country.”

PLOS ONE

LAB PROTOCOL

Protocol for safe, affordable, and reproducible isolation and quantitation of SARS-CoV-2 RNA from wastewater

Dr. Jacopo Cerasoni
Super Excited to share my first ever author AND solo peer-reviewed paper!

PLOS ONE

LAB PROTOCOL

Vectorial application for the illustration of archaeological lithic artefacts using the “Stone Tools Illustrations with Vector Art” (STIVA) Method

Dr. Simon Tröder

“My first paper as a senior author”

PLOS ONE

LAB PROTOCOL

A simple and economic protocol for efficient *in vitro* fertilization using cryopreserved mouse sperm

Acknowledgements

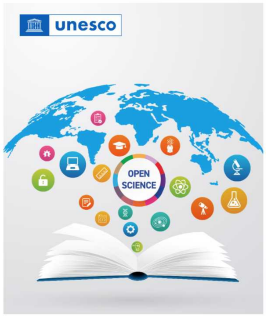
21 More and more funders now require preprints, open data, methods, code. Many mandating immediate Open Access. There is a major shift from governments and funders, and adopting open practices now strengthens your future position. https://en.unesco.org/science-sustainable-future/open-science/recommendation, https://www.nature.com/articles/d41586-022-00402-1

The US National Institutes of Health is located in Bethesda, Maryland.

NIH ISSUES A SEISMIC MANDATE: SHARE DATA PUBLICLY

asap
Aligning Science Across Parkinson's

Alex's Lemonade Stand
Foundation for Childhood Cancer



UNESCO Recommendation on Open Science

Importance of an early start

22 For data, methods, code - planning early is key. If you think of sharing them only when submitting a paper, it’s a lot of extra work to share a good dataset at that point. But if you think of a Data Management Plan and make early plans and use tools like protocols.io and GitHub, then sharing

the methods and code is super easy at the time of publication.

Don't wait until the publication date!

Publication may happen months or years after completion of the research, so collecting together all the research artefacts at that stage to publish openly is often challenging. Zenodo therefore offers the possibility to house closed and restricted content, so that artefacts can be captured and stored safely whilst the research is ongoing, such that nothing is missing when they are openly shared later in the research workflow.

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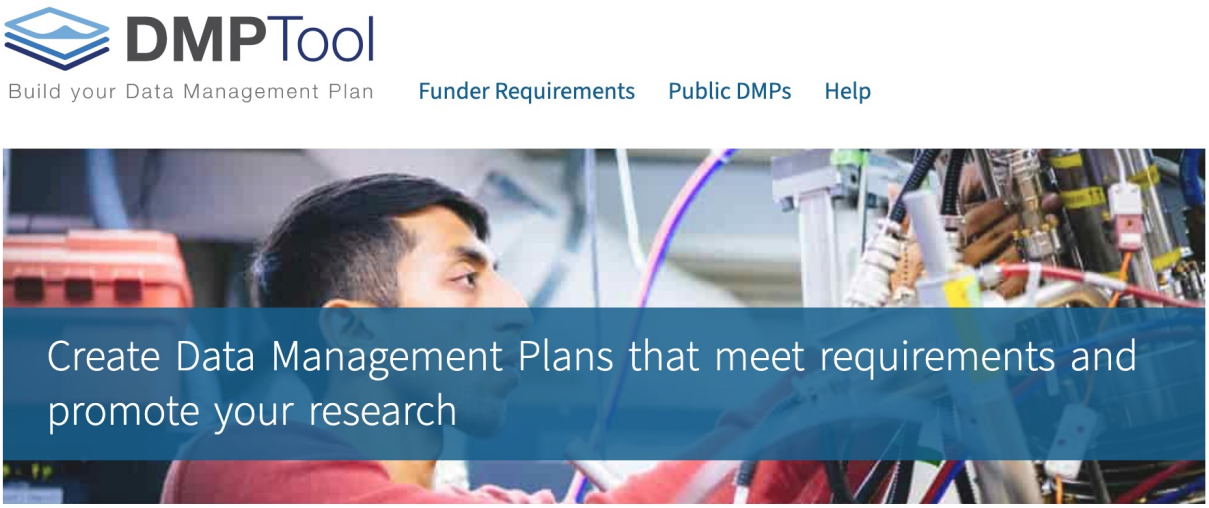
23



https://dmptool.org/

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24


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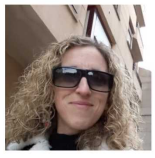
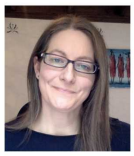
Dr. Carly Strasser SZI Science


Yuyun Wirawati, NTU


Dr. Veronique Kiermer, PLOS


Dr. Iratxe Puebla, ASAPBio


Dr. Emma Ganley, protocols.io


Dr. Gabriel Gasque protocols.io


Dr. Sonya Dumanis, ASAP