



# Open Science

and how to embrace it

**Aaron Johnson**

Department of Psychology, Concordia University.  
CRIR/Centre de Réadaptation Lethbridge-Layton-Mackay du CIUSSS du Centre-Ouest-de-l'Île-de-Montréal  
CRIR/Institut Nazareth et Louis-Braille du CISSS de la Montérégie-Centre

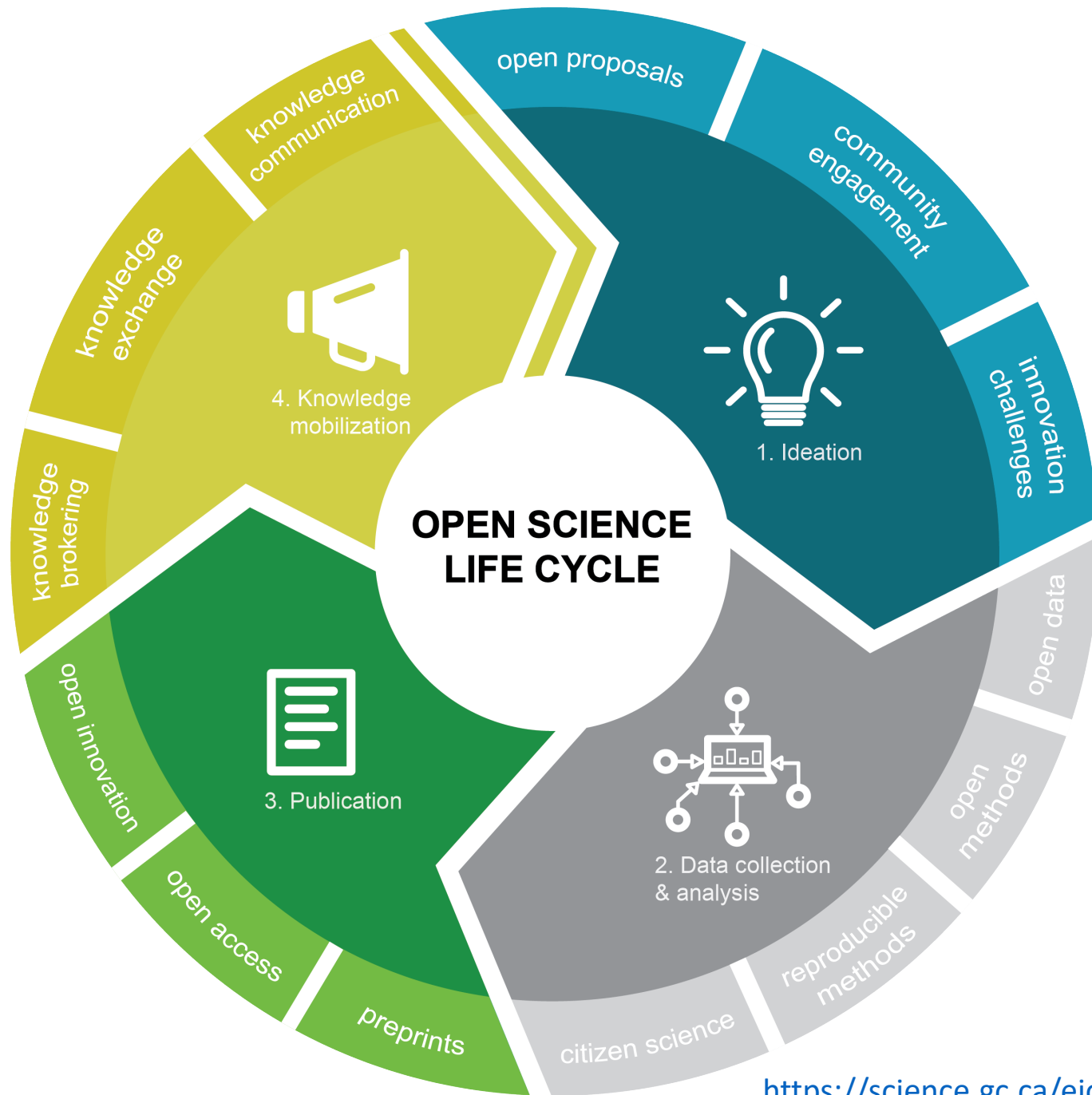


# What is Open Science?

Tradition, culture and incentives have created an environment where scientific inputs, outputs and processes are either closed, accessible for a fee, or only available to the researchers and/or collaborators.

**Open science is a movement away from this.**

Make scientific processes and practices, including research methodology and outputs, more open, transparent and accessible.



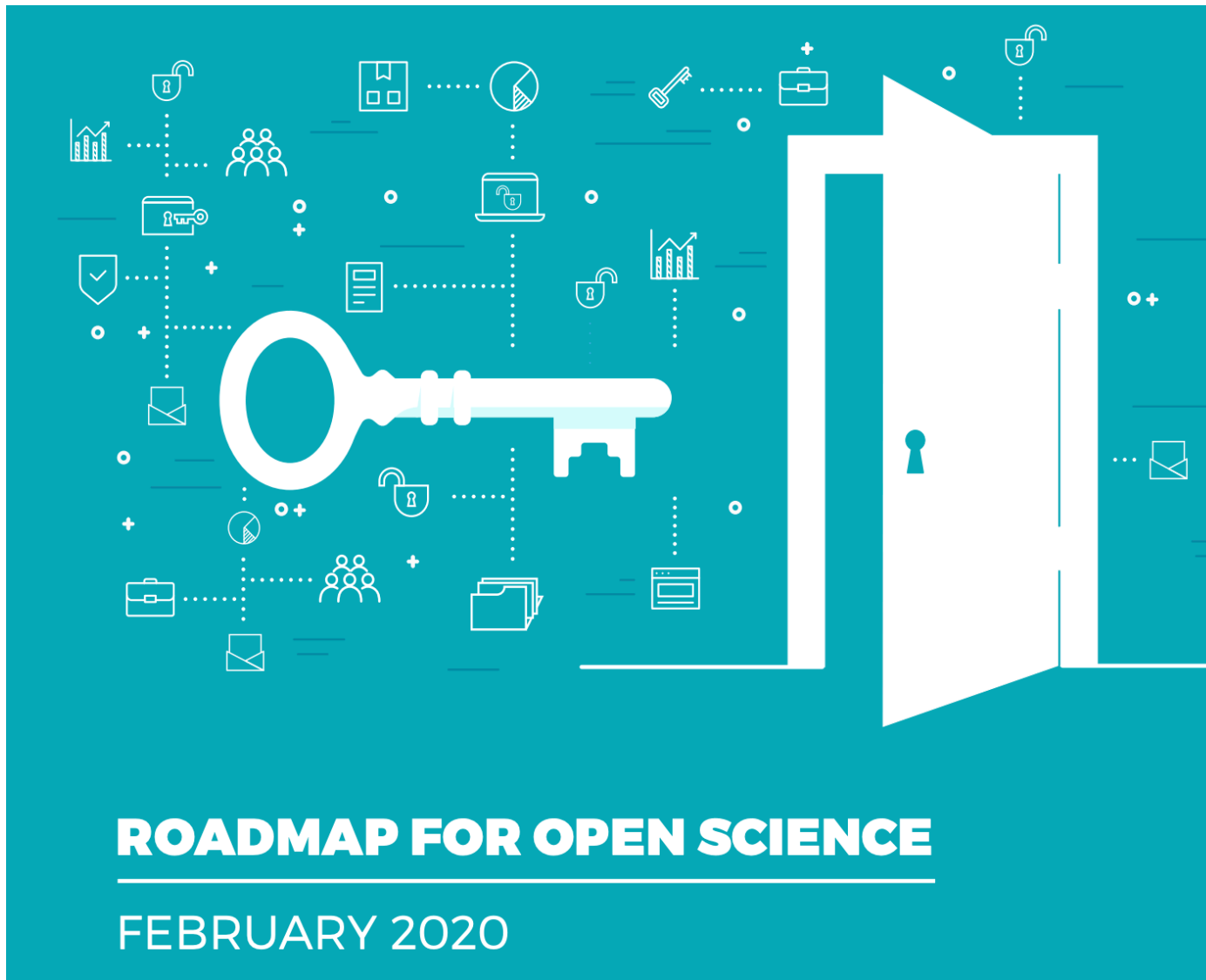


**THINK ABOUT IT**

- Tackling innovation challenges and engaging the community during ideation
- Encouraging citizen science and integrating open methods and open data during data collection and analysis
  - What if all method materials (in your field) were online?
  - What if all data (in your field) were available online?
  - What if all algorithms (in your field) were available online?
- Encouraging access to publications prior to peer review (preprints) as part of the publication process
- Using open access publications to exchange and communicate data and information during the final stage of knowledge mobilization

# Why should science be open?

- Ensuring Accountability
- Increasing Reproducibility
- Creating Open Engagement
- Reducing Duplication
- Creating Opportunities for Impact
- Leveraging Diversity and Inclusion
- Accelerating Knowledge Transfer
- Building Synergies with International and Domestic Open Science Movements



Funding agencies to implement FAIR open science requirements by 2025.

[https://science.gc.ca/eic/site/063.nsf/vwapj/Roadmap-for-Open-Science.pdf/\\$file/Roadmap-for-Open-Science.pdf](https://science.gc.ca/eic/site/063.nsf/vwapj/Roadmap-for-Open-Science.pdf/$file/Roadmap-for-Open-Science.pdf)

# Here in Québec...

The FRQ [Open access policy for the dissemination of research](#) requires that funding holders make any peer-reviewed publication that presents the results of their research available in open access no later than 12 months\* after it is published.

To meet this requirement, two options are accepted:

- selecting a journal that makes the publication available as open access (no later than 12 months\* after it is published), or;
- depositing the final publication in an institutional or disciplinary open access electronic repository (no later than 12 months\* after publication)

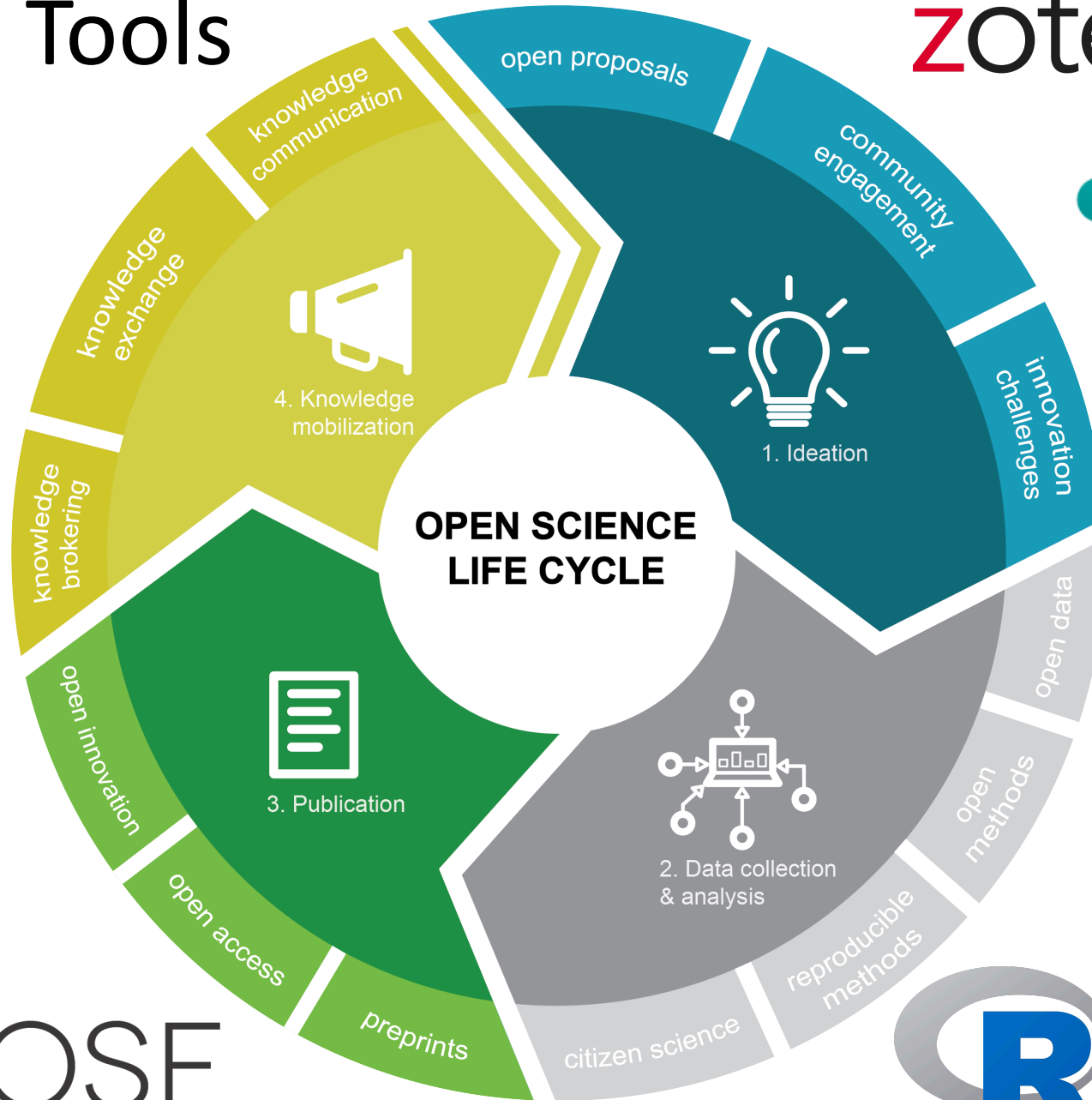
**\* from March 2023, no 12 month delay: must be immediate.**



# Open Science Success Stories

- Software: Linux, R, LaTeX, GIMP, etc.
- Numerous collaborative datasets (e.g., StatsCan, CLSA, COVID)
- Knowledge Translation
  - Publishers: PLoS, eLife, Scientific Reports, Frontiers in, etc.
  - pre-print repositories (bioRxiv, PsyArXiv, OSF, etc.)
  - Wikipedia, Scholarpedia.

# Open Science Tools





# Open Ideation

- Reference Management Shared Resources
  - Zotero: <https://www.zotero.org/>
  - Mendeley: <https://www.mendeley.com/>
- Reference Mapping
  - Connected Papers: <https://www.connectedpapers.com/>

Science mapping software tools: Review, analysis, and cooperative study among tools

Prior works

Derivative works

Sponsored by DagsHub

 [Expand](#)

**Origin paper**  
 Science mapping software tools: Review, analysis, and cooperative study among tools  
 M. Cobo, A. G. López-Herrera, E. Herrera-Viedma, F. Herrera 2011

**SciMAT: A new science mapping analysis software tool**  
 M. Cobo, A. G. López-Herrera, E. Herrera-Viedma, F. Herrera 2012

**An approach for detecting, quantifying, and visualizing the evolution of a research field: A practical application to th...**  
 M. Cobo, A. G. López-Herrera, E. Herrera-Viedma, F. Herrera 2011

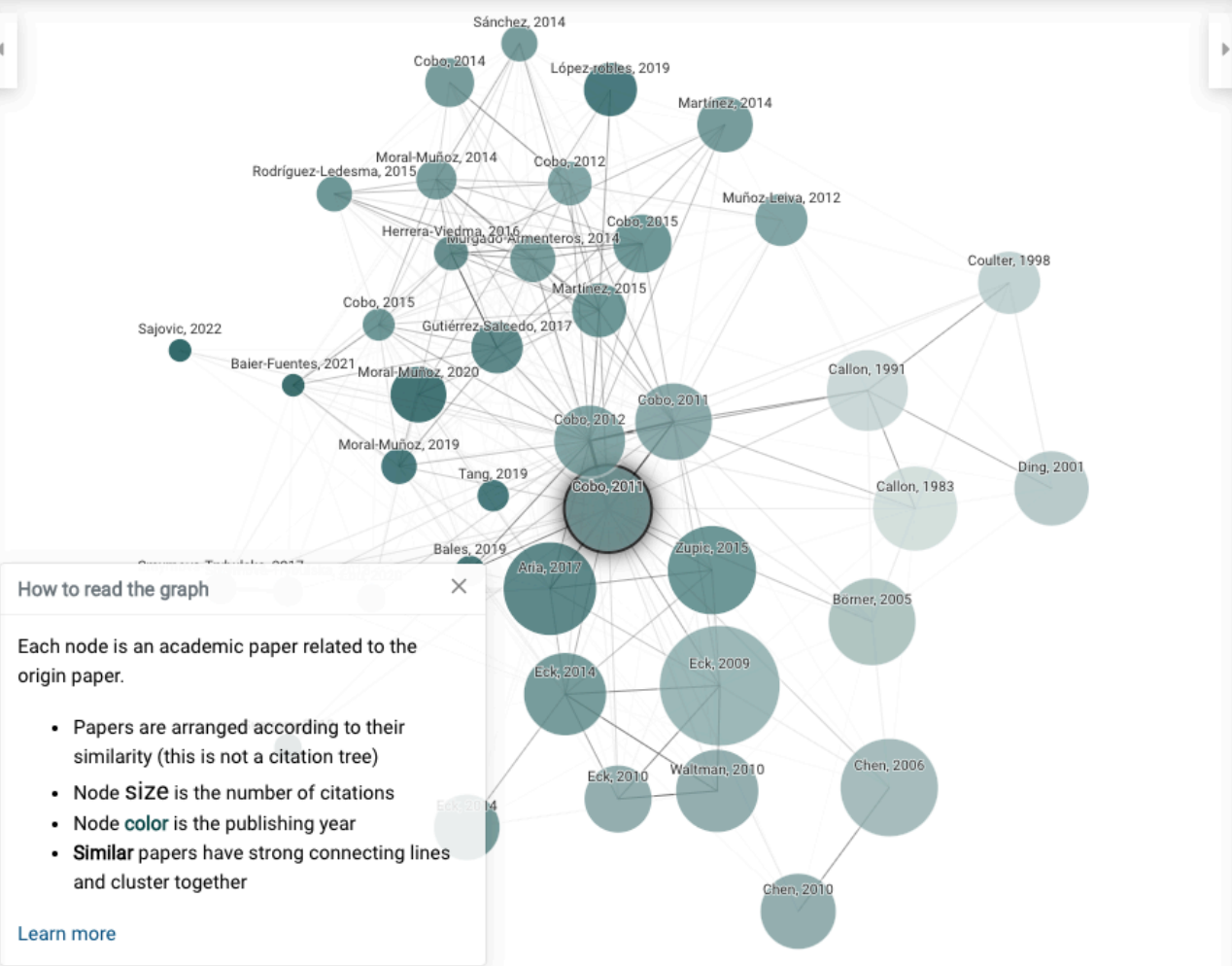
**Bibliometric Visualization and Analysis Software: State of the Art, Workflows, and Best Practices**  
 Michael E. Bales, Drew Wright, Peter Oxley, Terrie R. Wheeler 2019

**bibliometrix: An R-tool for comprehensive science mapping analysis**  
 M. Aria, C. Cuccurullo 2017

**Analyzing the Scientific Evolution of Social Work Using Science Mapping**  
 M. Martínez, M. Cobo, Manuel Herrera, E. Herrera-Viedma 2015

**Software survey: VOSviewer, a computer program for bibliometric mapping**  
 Nees Jan van Eck, L. Waltman 2009

**Bibliometric Methods in Management and Organization**



**How to read the graph**

Each node is an academic paper related to the origin paper.

- Papers are arranged according to their similarity (this is not a citation tree)
- Node **SIZE** is the number of citations
- Node **COLOR** is the publishing year
- **Similar** papers have strong connecting lines and cluster together

[Learn more](#)

Created on [Apr 25 2022](#)

1983 2022

Science mapping software tools: Review, analysis, and cooperative study among tools

M. Cobo + 2 authors F. Herrera  
 2011, J. Assoc. Inf. Sci. Technol.

973 Citations, 103 References

Open in:

Science mapping aims to build bibliometric maps that describe how specific disciplines, scientific domains, or research fields are conceptually, intellectually, and socially structured. Different techniques and software tools have been proposed to carry out science mapping analysis. The aim of this article is to review, analyze, and compare some of these software tools, taking into account aspects such as the bibliometric techniques available and the different kinds of analysis. © 2011 Wiley Periodicals, Inc.

# Open Methods



- Documenting and sharing Methods
  - Sharing code and tools to allow others to reproduce work
- Better understanding/evaluation of Methods used



# How-to share methods

Document everything from the outset

- Keep detailed lab notes - word files to photos.
- Decide on a good data organization method.

Publish all experimental procedures (code, notes, etc.)

- Easy to publish everything (code, manuscript, data, notes) on OSF.io

Open source software in standardized format preferred

# Open Data Collection



PsychoPy  
Now running studies online



Galaxy  
PROJECT



NavonTask.psyexp - PsychoPy Builder (v2021.2.0)

File Edit View Tools Experiment Demos Pavlovia.org Window Help

Routines: feedback instrMain instrPractice thanks **trial** x

Components: Favorites (Keyboard, Code, Image, Polygon, Sound, Textbox), Stimuli, Responses, Custom, EEG, Eyetracking, I/O

Flow: instrPractice → trial (9.00s) → feedback (1.00s) → instrMain → trial (9.00s) → thanks (2.00s). Loops: practiceTrials (1x16 random), trials (4x16 random).

Component	Start (sec)	End (sec)
fixate	1.0	2.0
stimulus	2.0	2.2
mask	2.2	7.2
resp	2.2	8.0

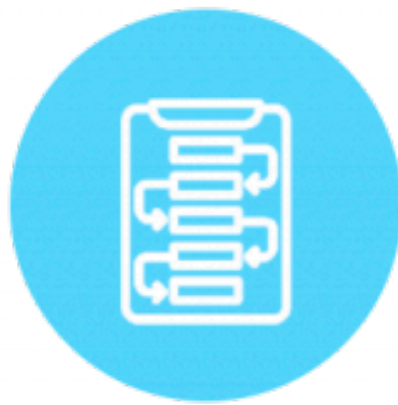
# Pre-Registration / Registered Reports



- Introduction, Research Question, Hypotheses, Methods, Planned Analyses.
- Publish the proposed



**DEVELOP  
IDEA**



**DESIGN  
STUDY**



**SUBMIT**



**COLLECT AND  
ANALYZE DATA**



# Pre-registration / registered reports

- Some journals guarantee publication if the pre-registration is followed - irrespective of the outcome.
- Main conclusions need to come from originally planned analyses.
- Can still do exploratory analyses, but should be secondary AND clearly labeled as such.



# Benefits of pre-registrations / registered reports

- Makes your science better by increasing the credibility of your results
- Allows you to stake your claim to your ideas earlier
  - Public vs Private pre-registration.
- Forces you to plan your project and analysis.
- You can win a \$1,000 prize for publishing the results of pre-registered research (via OSF).



# How-to pre-register

- As “registered report”
  - See specific journal guidelines
- As simple as “pre-registration”
  - OSF.io
  - Example template: <https://osf.io/z4nca/>
- When to preregister?
  - Right before you ]start data collection.
  - After you are asked to collect more data in peer review.
  - Before you begin analysis of an existing data set (secondary analysis)



# Benefits of open data



- As scientist, we are often limited by geography / funding / time
- Meta analysis
- Secondary Analysis
  - Findable
  - Open license to allow others to re-use
  - Re-use of data gives you citations, recognition, and visibility

# Open Data is normal in other sciences

- Genetics
- Climate research
- Machine Learning
- COVID



BMC Medical Research  
Methodology


Besaçon et al. *BMC Medical Research Methodology* (2021) 21:117  
<https://doi.org/10.1186/s12874-021-01304-y>

COMMENTARY

Open Access

## Open science saves lives: lessons from the COVID-19 pandemic



Lonni Besaçon<sup>1,2\*</sup> , Nathan Peiffer-Smadja<sup>3,4</sup>, Corentin Segalas<sup>5</sup>, Haiting Jiang<sup>6</sup>, Paola Masuzzo<sup>7</sup>, Cooper Smout<sup>7</sup>, Eric Billy<sup>8</sup>, Maxime Deforet<sup>9</sup> and Clémence Leyrat<sup>5,10</sup>

### Abstract

In the last decade Open Science principles have been successfully advocated for and are being slowly adopted in different research communities. In response to the COVID-19 pandemic many publishers and researchers have sped up their adoption of Open Science practices, sometimes embracing them fully and sometimes partially or in a sub-optimal manner. In this article, we express concerns about the violation of some of the Open Science principles and its potential impact on the quality of research output. We provide evidence of the misuses of these principles at different stages of the scientific process. We call for a wider adoption of Open Science practices in the hope that this work will encourage a broader endorsement of Open Science principles and serve as a reminder that science should always be a rigorous process, reliable and transparent, especially in the context of a pandemic where research findings are being translated into practice even more rapidly. We provide all data and scripts at <https://osf.io/renxy/>.

**Keywords:** Open science, Peer review, Methodology, COVID-19

# Open Data



Good: Open data make your stuff available on the internet

Better: Make it available in a structured table (not an image).

Best: Use non-proprietary formats (e.g. CSV instead of Excel)

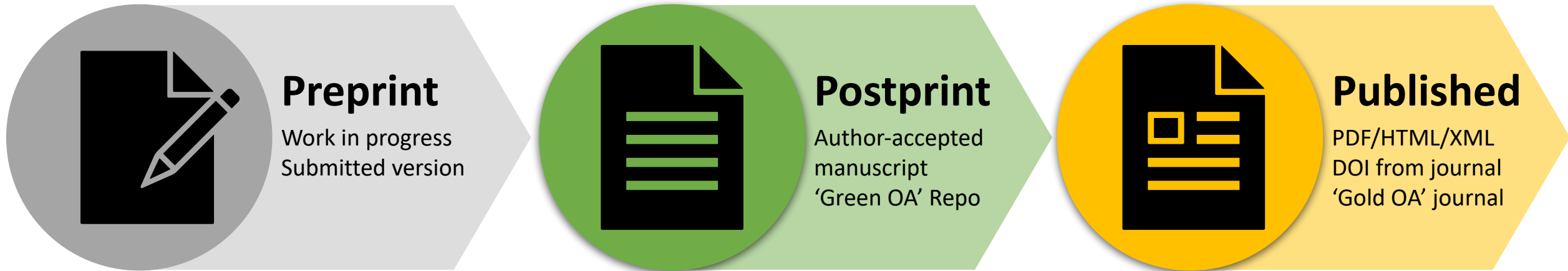
Outstanding: Link your data to other data to provide context



# How-to make data available

- Organize your data well right from the start
- Look for good examples or use standard formats if possible
- De-identify data (and follow ethics guidelines)
- Publish in field-specific database, or general repository (e.g., [OSF.io](https://osf.io))
- Publish data and metadata together, including
  - Protocols
  - Data cleaning
  - Analysis
- Link to pre-print or published paper

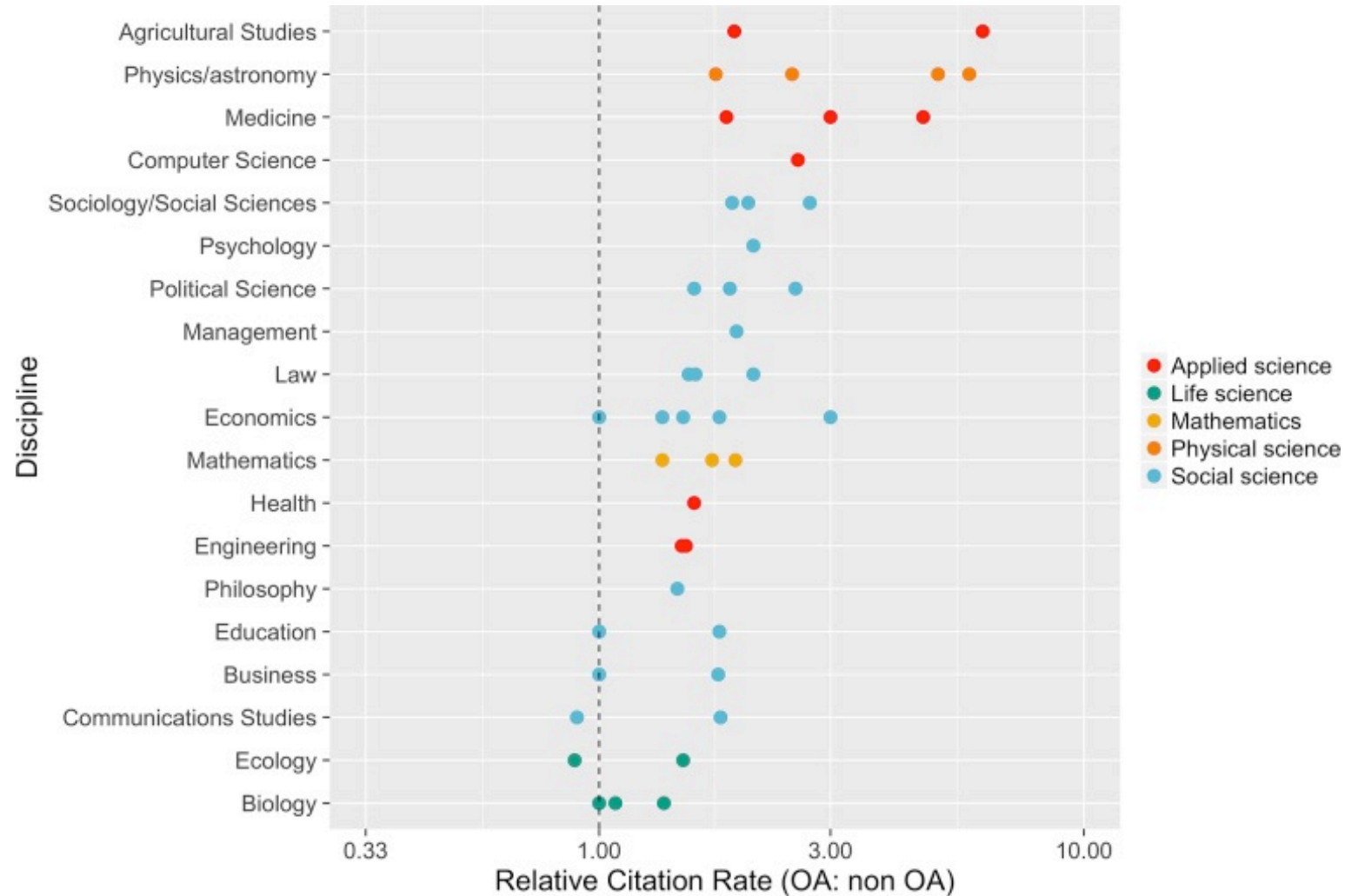
# Open Access Publications



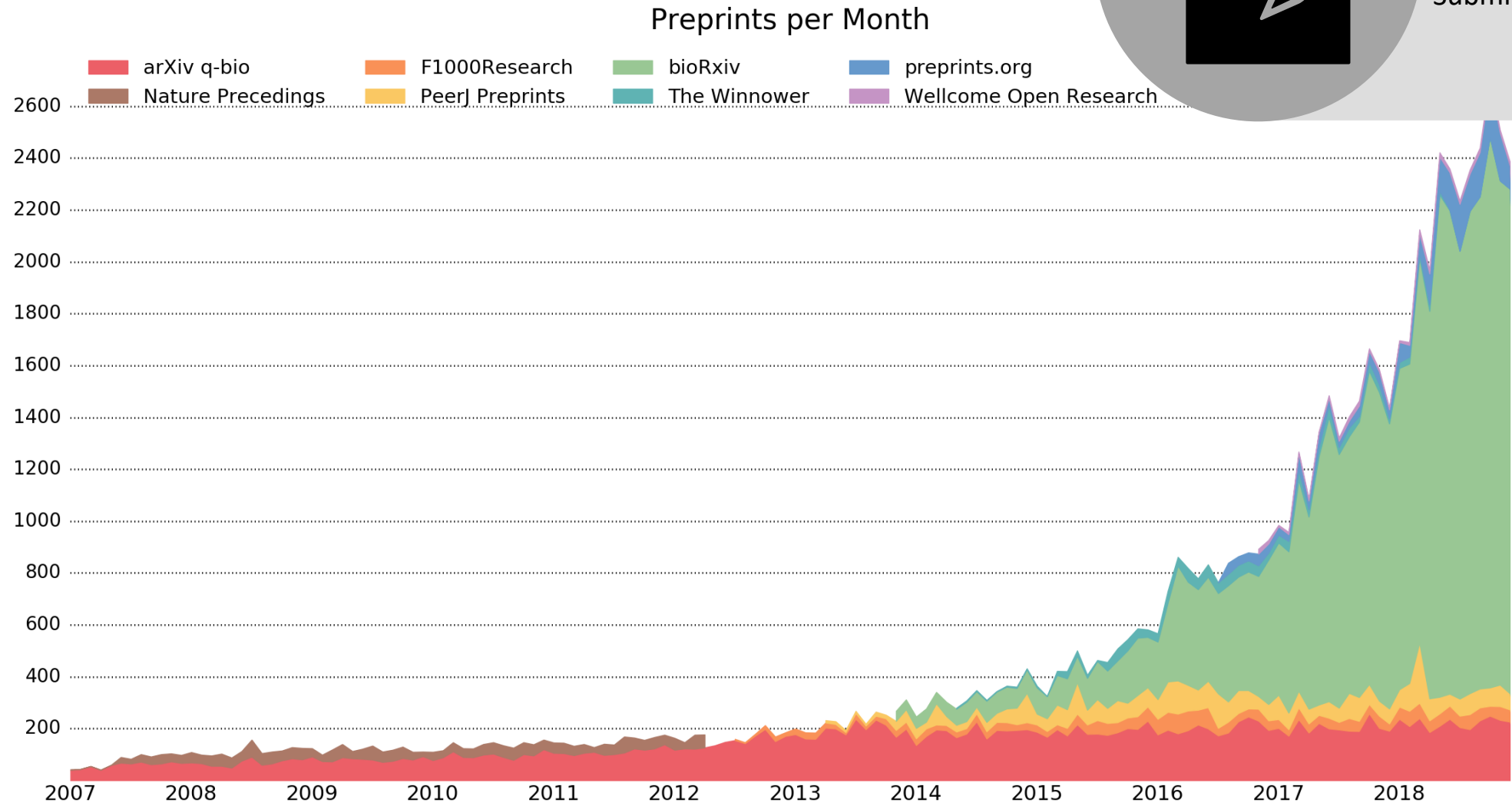
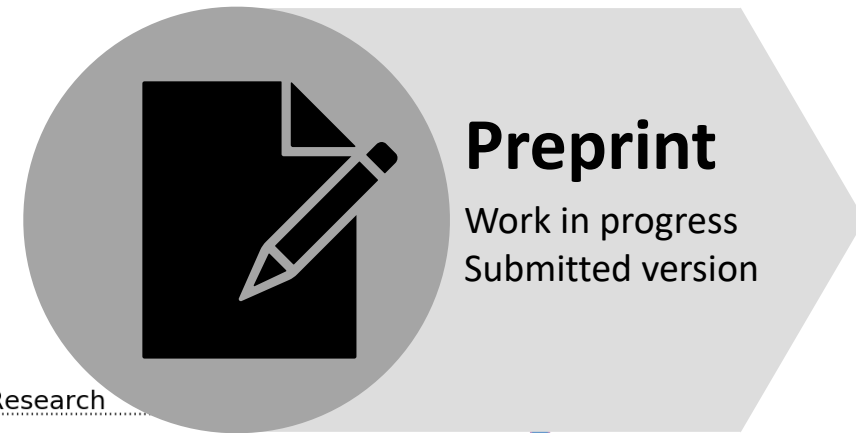
Find out what your publisher allows on SHERPA RoMEO <http://www.sherpa.ac.uk/romeo>



# Open Access articles get more citations



# Benefit of posting pre-prints



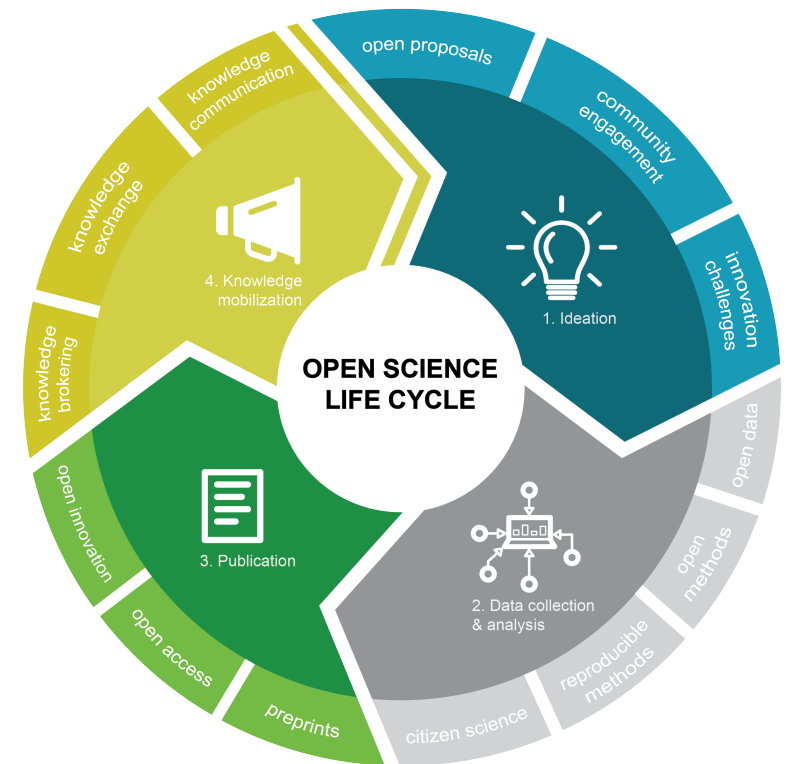
# How-to pre-print



- When your manuscript is ready....
- Upload on OSF.io, bioRxiv, PsyArXiv,...
  - ArXiv automatically tweets
- Collect feedback
- Submit to journal as usual.
  - Update pre-prints at each round of review

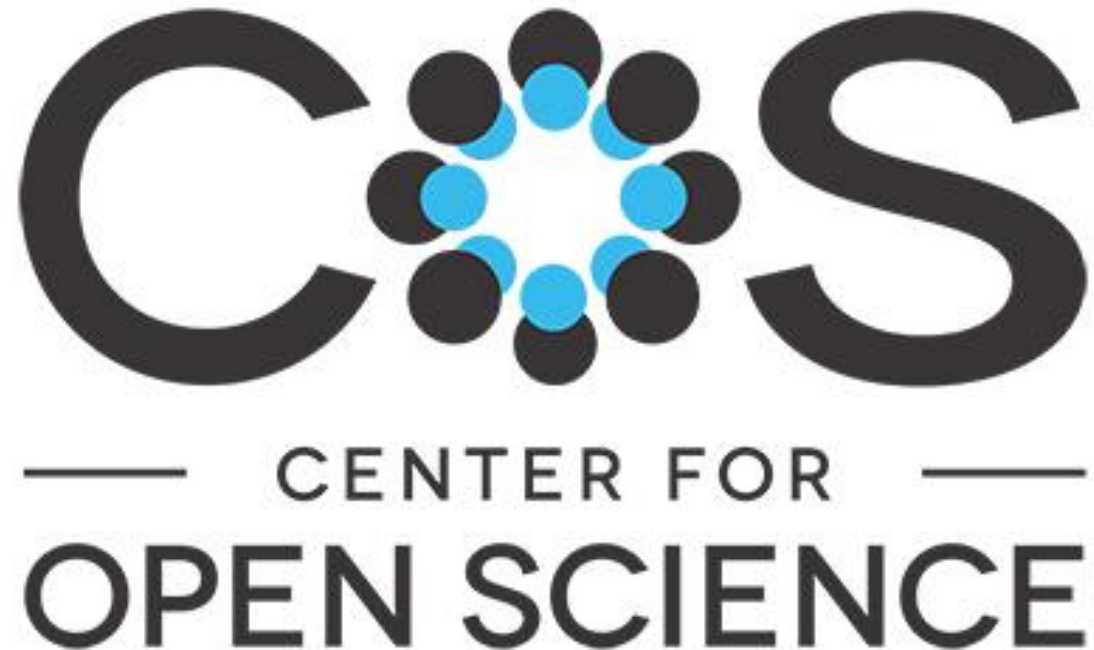
# Benefits of Open Science for early career researchers (and the rest of us)

- Become a pioneer in your field
- Get known faster
- Receive higher citations
- Demonstrate impact of research
- Develop research networks without borders
- 
- We are all going to have to do it at some point



# Open Science Framework (OSF)

- <http://osf.io/>
- Private or Public
- Projects by Author
- Files
- Links
- Registrations
- Public DOI



# Open Science Framework - Starter readings

- Canada's open-science position: [https://science.gc.ca/eic/site/063.nsf/eng/h\\_98054.html](https://science.gc.ca/eic/site/063.nsf/eng/h_98054.html)
- Québec's open-science position: <https://frq.gouv.qc.ca/science-ouverte/>
- Open Science handbook: <https://book.fosteropenscience.eu>
- Open Science Foundation: [www.OSF.io](http://www.OSF.io)
- Center for Open Science: [www.cos.io](http://www.cos.io)