

# Open Science

## Why and How?

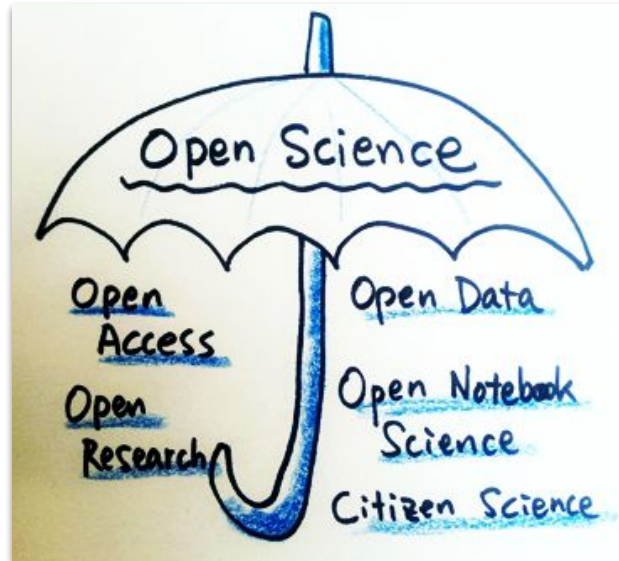


Image credit: Flickr user 지우 황 CC BY 2.0

Ultimate goal:

# Improving Openness, Integrity and Reproducibility of Scientific Research

# What are the current problems?

- Studies lacking rigor
- Outcomes that are never shared
- Results that are not reproducible



# What are the current problems?

RESEARCH ARTICLE

## Estimating the reproducibility of psychological science

Open Science Collaboration<sup>\*†</sup>

+ See all authors and affiliations

Science 28 Aug 2015:  
Vol. 349, Issue 6251, aac4716  
DOI: 10.1126/science.aac4716

### PubPeer, le site par qui le scandale arrive

Espace de discussion autour des productions scientifiques sur le Web, le site PubPeer permet aussi de corriger des articles, d'en obtenir la rétractation et, le cas échéant, de sanctionner des chercheurs en cas d'inconduite.

LE MONDE SCIENCE ET TECHNO | 23.10.2018 à 12h00 |

Par David Larousserie

Spoiler: Replication  
rate = 35/97 (36.1%)



[Browse](#)

OPEN ACCESS

ESSAY

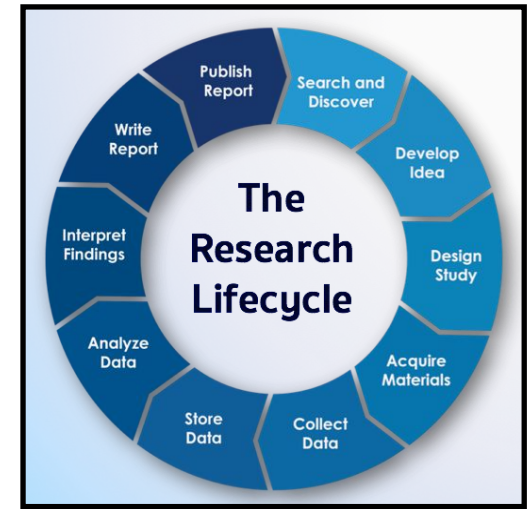
### Why Most Published Research Findings Are False

John P. A. Ioannidis

Published: August 30, 2005 • <https://doi.org/10.1371/journal.pmed.0020124>

# Different reasons for those problems:

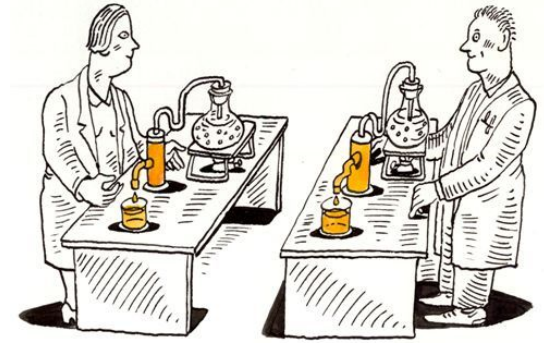
- Methodological, statistical, and reporting practices that result in overly tidy evidence
- Structural and organizational practices that result in unavailable, lost, or difficult to use data, code, and materials
- Rarely, intentional cases of scientific misconduct



# Reproducibility?

Research findings become credible and useful if they are reproducible

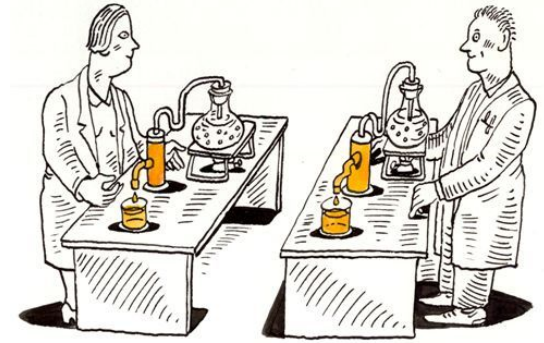
- The results are reliable, and others can independently obtain the same evidence
- Knowledge accumulation facilitated when others can reuse or extend credible ideas and findings



# Reproducibility?

## Computational Reproducibility

If you take a researcher's data and are able to reproduce their results by rerunning their code/analysis scripts

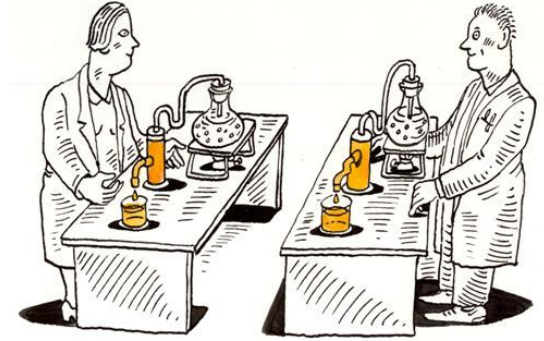


# Reproducibility?

Computational Reproducibility

## Methods Reproducibility

If you are able to reproduce what was done in a study, given the available details





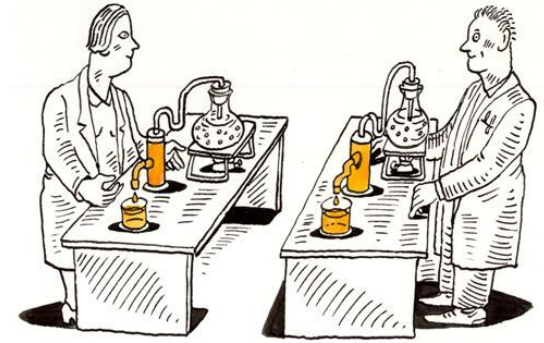
# Reproducibility?

Computational Reproducibility

Methods Reproducibility

## Results Reproducibility/Replicability

Whether we are able to come to the same statistical conclusions as the original study, if we were to completely reproduce the study's protocol and the analyses, and run them on an independent data set given the available information



# How can you then start doing open research?



→ What are the different steps?



# How can you then start doing open research?

## Preregister your study (when adequate)

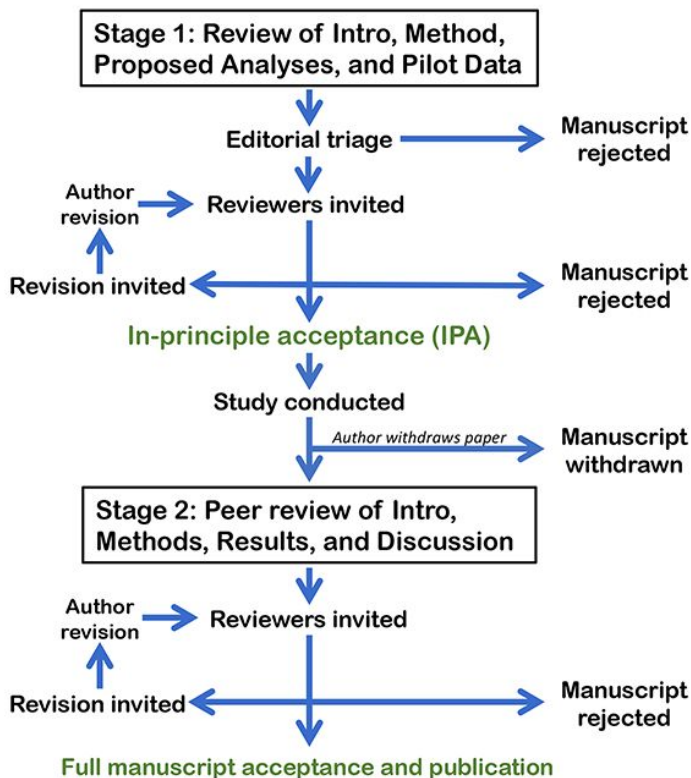
- separates hypothesis-generating (exploratory) from **hypothesis-testing** (confirmatory) research (both are important, but the same data cannot be used to generate and test a hypothesis = potential conflicts)
- a means of addressing publication bias in academic journals
- an opportunity to get feedback at an earlier stage





# How can you then start doing open research?

## Preregistration steps:



Template example:  
<https://osf.io/t6m9v/>

# How can you then start doing open research?



## Share Data, Materials or Code (when allowed)

→ allows others to benefit from and build on your work, and facilitates replication



Open Science Framework



# How can you then start doing open research?



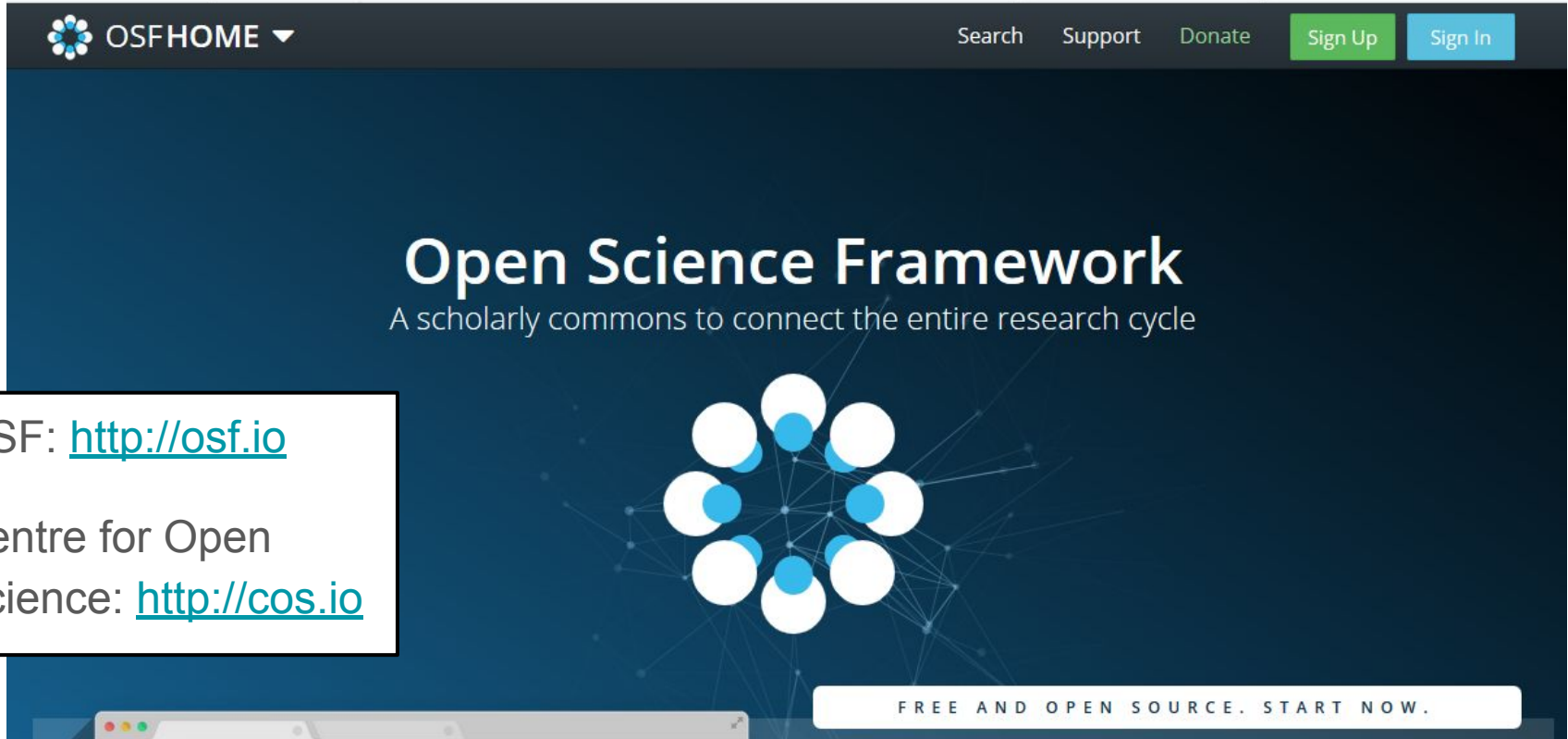
## Share a Paper or Preprint

→ accelerates scholarly communication, feedback that can improve the work, and discoverability of finished research

+ may help stand against the 'positive results only' bias



# And in practice?

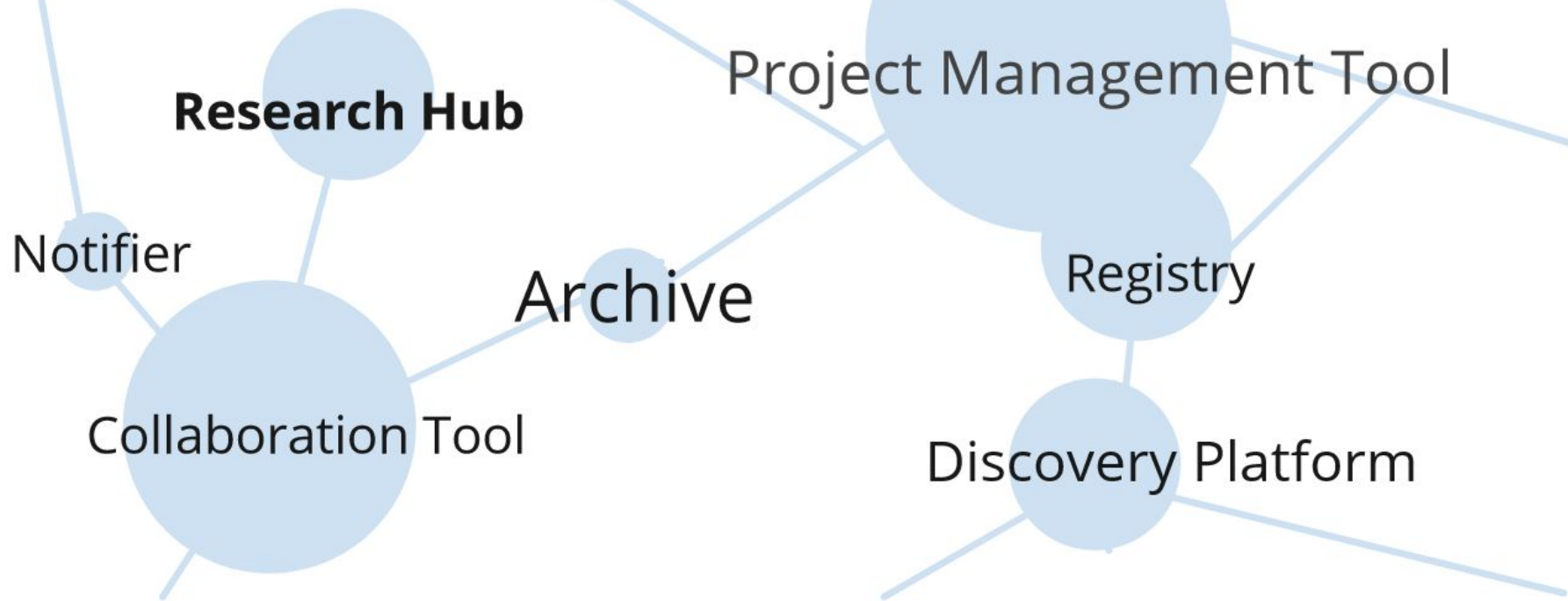


OSF: <http://osf.io>

Centre for Open  
Science: <http://cos.io>

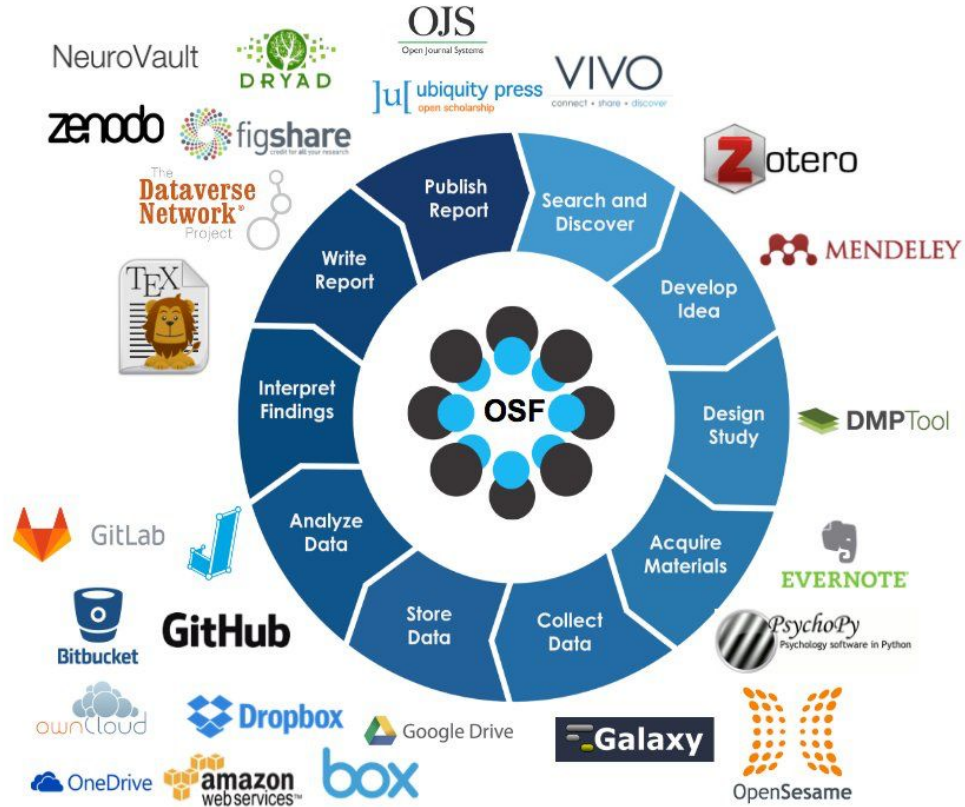


# What is OSF?





# OSF: Tools



# Demo project

Demo Project Files Wiki Analytics Registrations Forks Contributors Settings

Click on a storage provider or drag and drop to upload

Filter i

Name ^ v	Size	Version	Down...	Modified ^ v
Demo Project				
- OSF Storage				
- Data				
- OSF Storage				
clean_data.csv	7.5 kB	1	0	2017-05-01 04:23 PM
Data Dictionary.docx	81.5 kB	1	0	2017-05-01 04:23 PM
- Materials				
- OSF Storage				
analyses.R	529 B	1	0	2017-05-01 04:23 PM
cleaning.R	201 B	1	0	2017-05-01 04:23 PM
Questionnaire.docx	78.5 kB	1	0	2017-05-01 04:23 PM
- Manuscripts				
- OSF Storage				

Demo Project Files Wiki Analytics Registrations Forks Contributors Settings

## Gender and Political Identification

Contributors: Jennifer Freeman Smith, Ian Sullivan, Courtney K. Soderberg  
Affiliated Institutions: Center For Open Science  
Date created: 2018-01-04 12:24 PM | Last Updated: 2018-01-04 12:35 PM  
Create DOI / ARK  
Category: Project  
Description: Add a brief description to your project  
License: CC-BY Attribution 4.0 International

Private Make Public + 0

Wiki

No wiki content

Citation osf.io/d5ntj v

Components Add Component Link Projects

No components have been added to this project.

Tags

add a tag

Recent Activity

Courtney Soderberg added Center For Open Science affiliation to Demo Project

2017-01-31 10:31 AM

Files

Click on a storage provider or drag and drop to upload

Filter i

Name ^ v	Modified ^ v
Demo Project	
- OSF Storage	

# Some incentives for openness

- **Badges:** There are presently **41 journals** that offer one or more open practice badges to authors  
= clear sign that you have engaged in open and reproducible research practice



- **Registered Reports** as a means of addressing publication bias in academic journals.

# More to be enjoyed



## The Open Science Training Handbook

<https://open-science-training-handbook.gitbooks.io/book/content/>

*The focus of the new handbook is not spreading the ideas of Open Science, but showing how to spread these ideas most effectively.*



<https://opensciencemooc.eu/>

# Open source resources / Free collaborative tools



Free software; Free culture;  
Free services



# Other useful resources



[thinkchecksubmit.org](http://thinkchecksubmit.org)



Publisher copyright policies & self-archiving

[sherpa.ac.uk/romeo](http://sherpa.ac.uk/romeo)

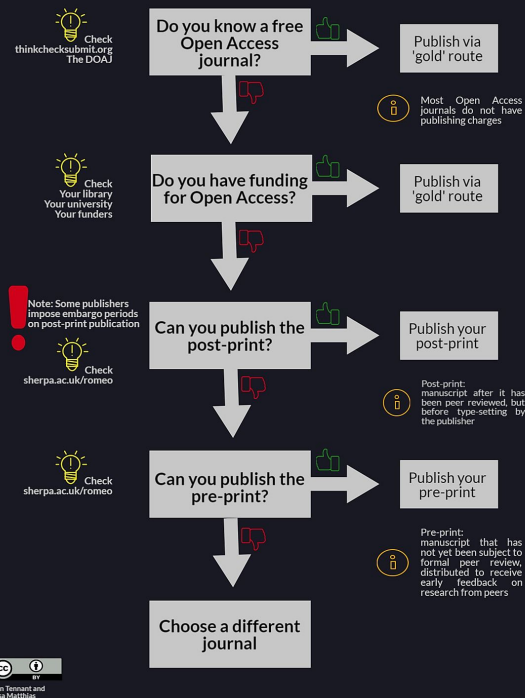
## Retraction Watch

Tracking retractions as a  
window into the scientific  
process

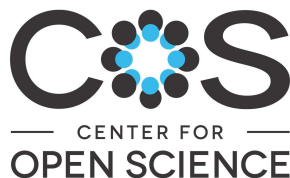
<https://retractionwatch.com/>

## HOW TO MAKE YOUR RESEARCH OPEN ACCESS

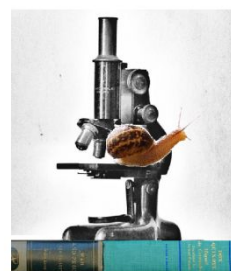
FOR FREE AND LEGALLY



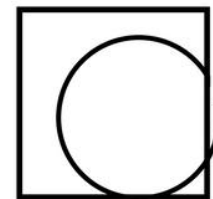
# Open research initiatives



## *Brief aside: Slow Science*



slow science in belgium



**SLOWPEN**  
SCIENCE

# Any thoughts?

*Open science as  
THE solution?*

*Isn't it a risky bet?*



*Will that really make  
any change?*

*Could we imagine  
another alternative?*



# Video: Is most published research wrong?



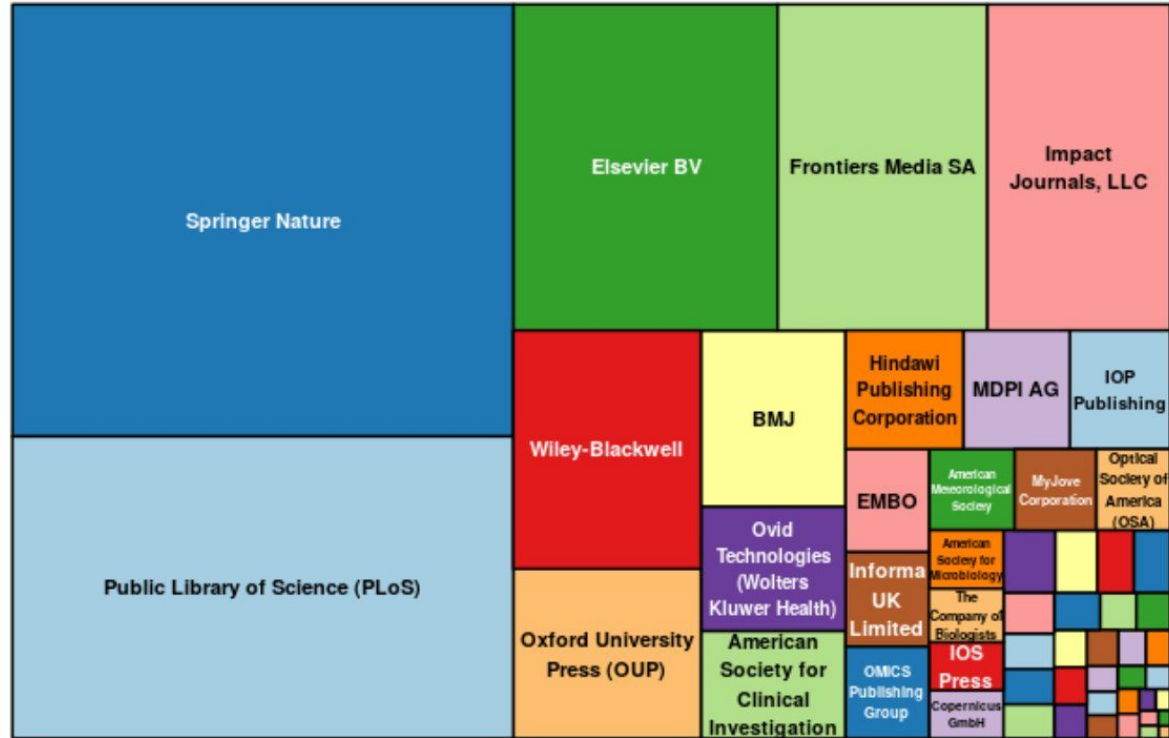
Is Most Published Research Wrong?

1,708,985 views

65K 826 SHARE SAVE ...

<https://www.youtube.com/watch?v=42QuXLucH3Q>

# Proportion of fees paid per publisher (in Euro)



AgriXiv

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Earth  ArXiv

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MarXiv

 MindRxiv

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paleo  
rxiv

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ARXIV

SportRxiv

  
THESIS  
COMMONS

# A new paradigm for the scientific enterprise: nurturing the ecosystem

	Pattern	Pipeline metaphor emphasizes	Ecosystem metaphor emphasizes
1	Basic development of scientist	Linear: K-12, grad school, postdoc, "superdoc", tenure-track "What is your job?"	Multiple pathways, life-long learning, multiple jobs, moving into and out of specific roles/industries "What are you working on?"
2	Career model	Single breadwinner in a static environment: singular focus on productivity for a tenure-track job Standardized career ladders defined by a job title in: academia, industry, NGOs Success defined by job title	Diverse family arrangements: dynamically responding to changing needs Multiplicity of niches not restricted to corporate or academic hierarchies: scientific work and identity that transcends job title Self-defined measures of success
3	Academic positions	One-way valve Independence: defined by securing of Assistant Professor position (financial)	Open ecosystem: flows in and out Independence: claimable at any time (conception and pursuit of your own ideas)
4	Budget and pace	One-size fits all, bigger and faster always better "All-or-nothing": singular focus of life	Diversity of scales, both in pace and budgets "Fractional" science/scholarship
5	Working style	Principal investigator + apprentices Hierarchical, top-down, permissions culture Individualistic, competitive	Peers + collaborators Peer-to-peer, collaborative, permissionless culture Solidarity, cooperative
6	Resource access and publishing models	Private or institutionally based, closed to outsiders Closed-access "high prestige" journals, data hoarding for competitive advantage	Commons-based access: community labs, MakerSpaces, DIY Biology Open science, open access, preprints, data sharing
7	Funding	Competitive, winner-take-all. Concentration of resources in high prestige institutions	Collective allocation, experiment with alternative means of proposal evaluation Wider distribution, not dependent on affiliation.
8	Institutional changes	Keep structure: limit access, train fewer PhDs Scarcity, long-term permanent institutional employment accessible to lucky few	Transform institutions: engage ever more scientists Abundance, platform cooperativism, project-oriented work, basic income, universal health care

<https://f1000research.com/articles/7-803/v1>

# Research = Different steps

## 1) Research management **planning**

→ includes thinking about how data will be stored, backed up and shared

## 2) **Structuring** a project: research plan - and pre-analysis plan, if confirmatory

## 3) **Pre-registration** of the project

→ positive aspect: advertises your work (future collaboration, extra-info...)

## 4) Collect the data, write your report and **share your work!**