

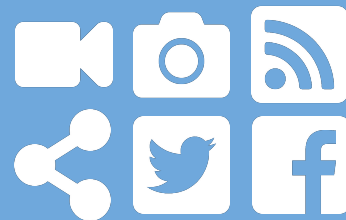
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this presentation

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respect the rights and licenses associated with
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<https://tinyurl.com/Slovenia-OS>



Open Science: the Science of the Future

[@pcmasuzzo](#)

Maribor, Slovenia - 14/11/2019

**OPEN
SCIENCE
MOOC**
FREE | OPEN | LEARNING

IGD^{ORE}
The Globally Distributed Institute for
Open Research and Education



What is Open Science?

open science stands for a transition to a new, more open and participatory way of **conducting**, **publishing** and **evaluating** scholarly research

central to this is the goal of increasing **cooperation** and **transparency** in all research stages

open science leads to more **robust** scientific results, to more **efficient** research and (faster) access to scientific results for **everyone**

this results in turn in greater societal and economic **impact**



Open Science is the science of the future

**we need open science
to build a (sustainable) future**



**SUSTAINABLE
DEVELOPMENT**

GOALS

The normative system of Science

Norm

Counternorm

The normative system of Science

Norm

Communality
Open Sharing

Counternorm

Secrecy
Closed

The normative system of Science

Norm

Communality

Open Sharing

Universalism

Evaluate research on own merit

Counternorm

Secrecy

Closed

Particularism

Evaluate research on reputation

The normative system of Science

Norm

Communality

Open Sharing

Universalism

Evaluate research on own merit

Disinterestedness

Motivated by knowledge and
discovery

Counternorm

Secrecy

Closed

Particularism

Evaluate research on reputation

Self-interestedness

Treat science as a competition

The normative system of Science

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Universalism

Evaluate research on own merit

Disinterestedness

Motivated by knowledge & discovery

Organized skepticism

Consider all new evidence, even
against one's prior work

Counternorm

Secrecy

Closed

Particularism

Evaluate research on reputation

Self-interestedness

Treat science as a competition

Organized dogmatism

Invest career promoting one's
own theories, findings

The normative system of Science

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QUALITY

Motivated by knowledge & discovery

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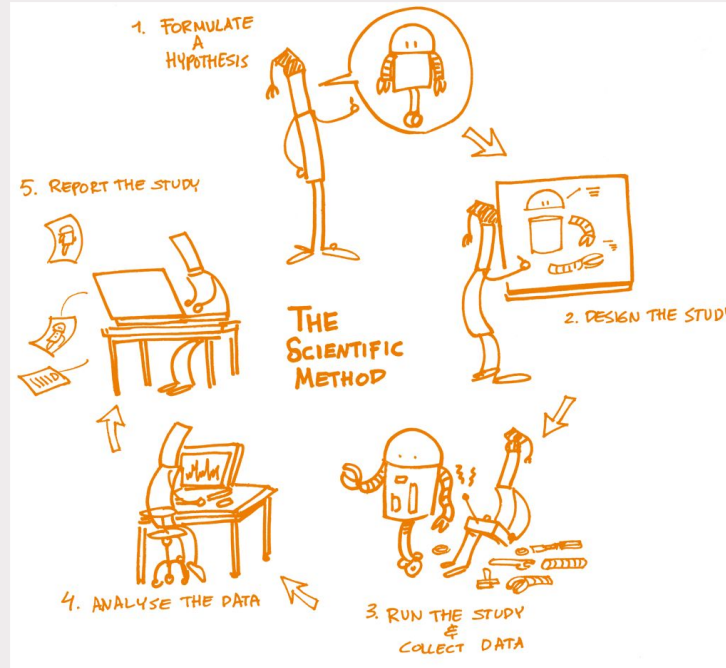
QUANTITY

Treat science as a competition

Organized dogmatism

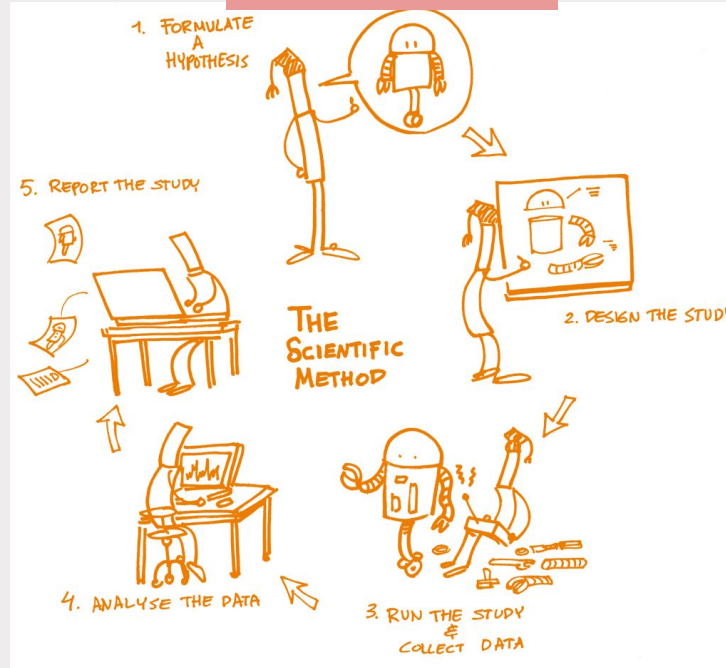
Invest career promoting one's
own theories, findings

Science is not doing so well



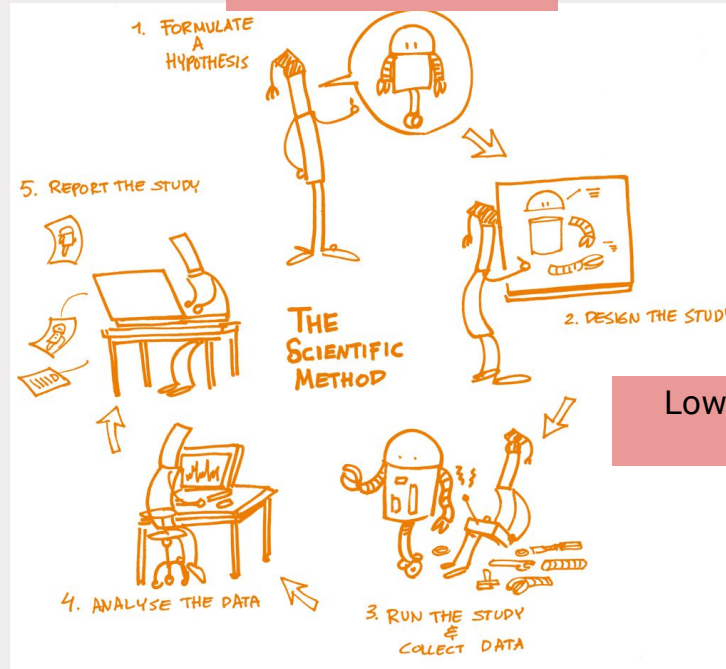
Science is not doing so well

Lack of replication studies



Science is not doing so well

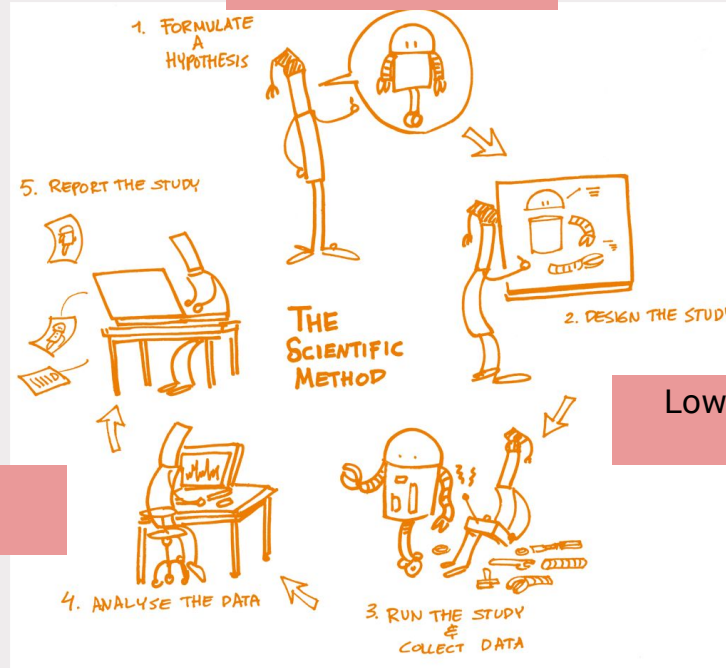
Lack of replication studies



Low statistical power

Science is not doing so well

Lack of replication studies



Low statistical power

p-hacking

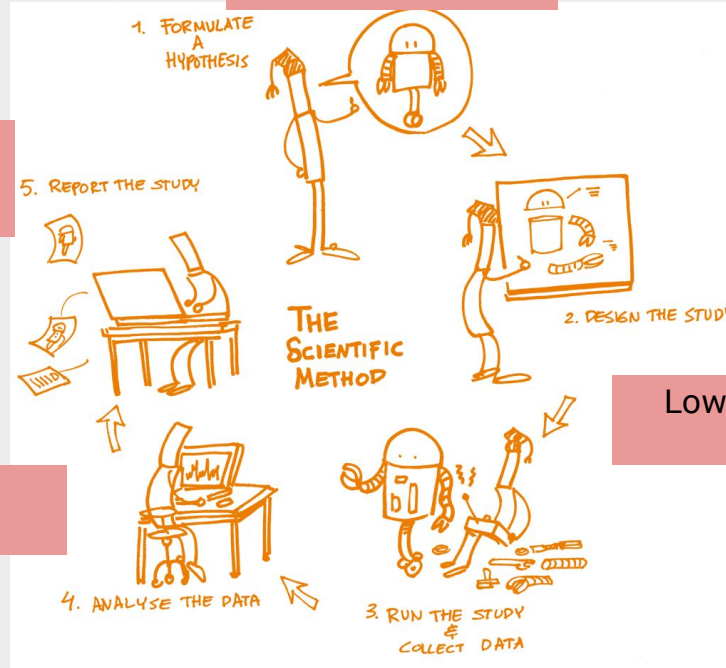
Science is not doing so well

Lack of replication studies

Lack of data
Publication bias
Paywalls

p-hacking

Low statistical power



Science is not doing so well

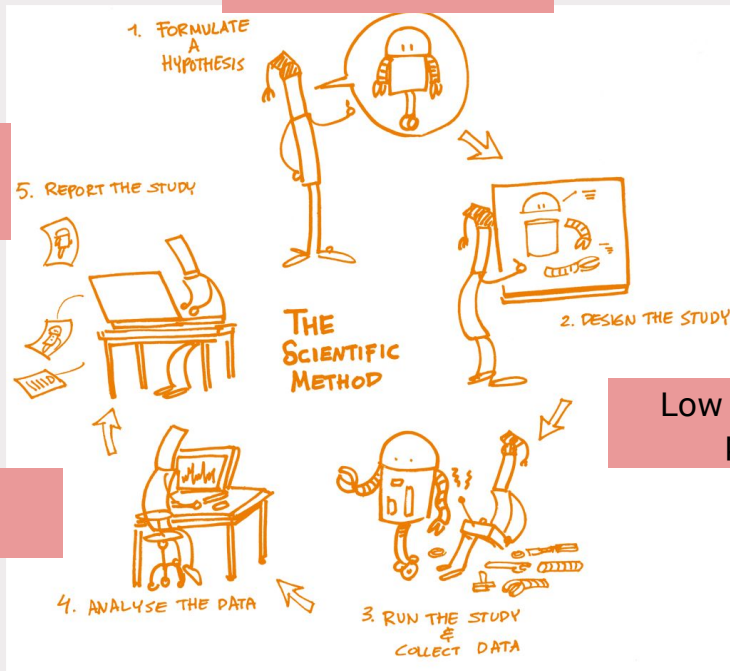
Lack of replication studies

Lack of data
Publication bias
Paywalls

HARKing (hypothesizing after results are known)
research excellence rhetoric /
games of power and systemic
biases in research evaluation
and assessment /
lack of trust from the public

p-hacking

Low statistical power



Open Science to the rescue

Science 1.0

gather data privately

write journal article

submit for

peer-review

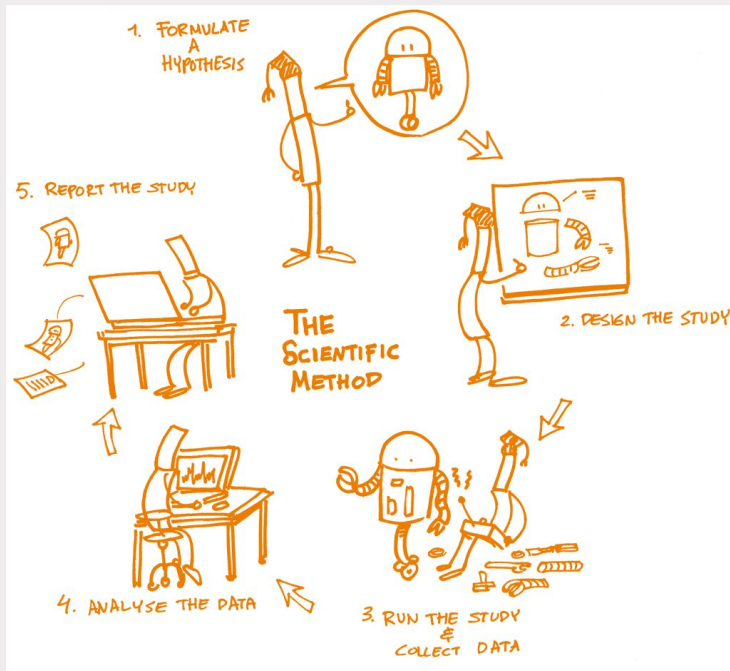
peer-review

gatekeepers

publish or reject



information available
to the public (or not?)



Open Science to the rescue

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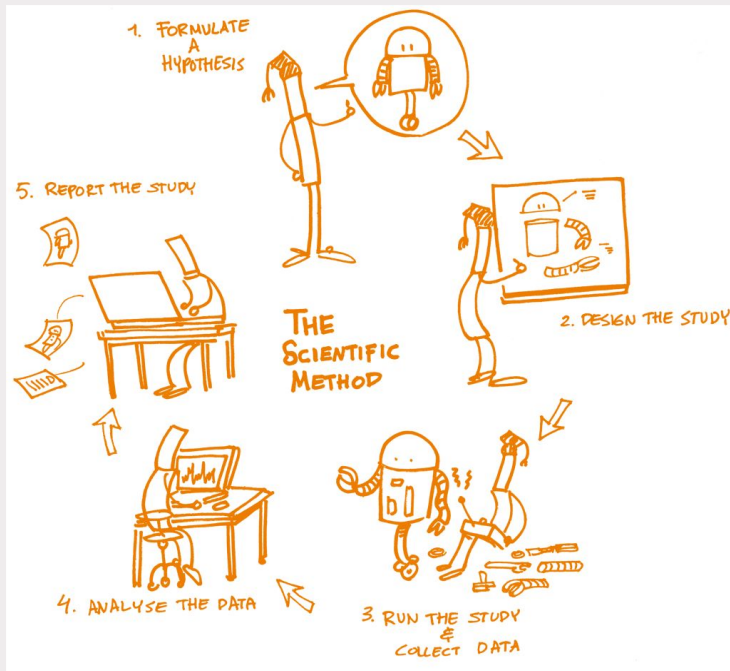
peer-review

gatekeepers

publish or reject



information available
to the public (or not?)



Science 2.0

pre-register studies

share ideas, methods,

protocols, data via

blogs, platforms,

repositories

submit preprints

publish in blogs, wikis,

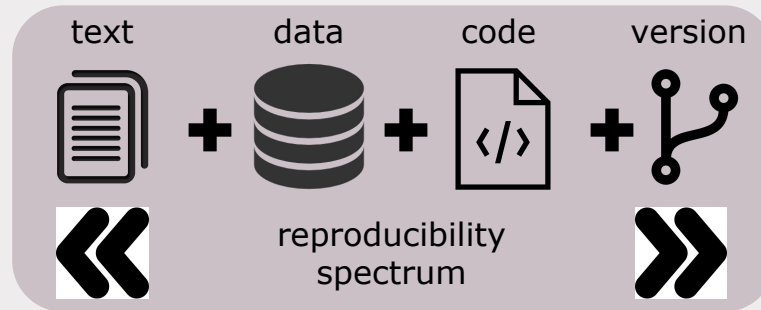
and in journals

information and data

available to the public

Research outputs in the Science 2.0 era

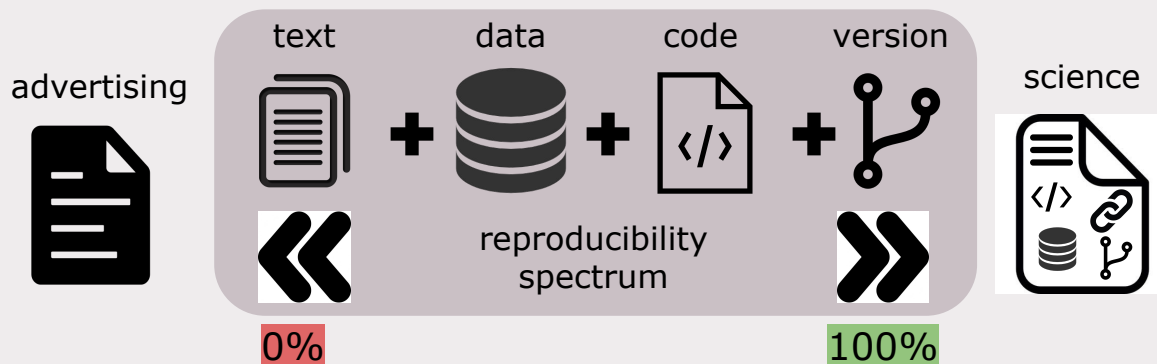
with the scientific method evolving, and adjusting to the explosion of information and technology, research outputs have evolved too, and now encompass far more than can be expressed in the 17th century construct of a research paper



A published article is the tip of the iceberg

“An article (about computational result) is **advertising**, not scholarship. The actual **scholarship** is the full software environment, code and data, that produced the result.”

Buckheit and Donoho (1995)



**OPEN SCIENCE:
JUST
SCIENCE
DONE RIGHT**

Open Access

Preprints

FAIR Data

Open Peer Review

Open Source

Registered Reports

Replication

Reproducibility

Incentives & Behavior

Assessment & Evaluation

A circular wooden sign with a metal handle at the top. The word "OPEN" is written in a large, decorative, black serif font across the center of the sign. The wood has a natural grain and some white paint or varnish. The background is a blurred indoor setting with warm, bokeh lights.

OPEN

open access

unlocking knowledge, empowering people

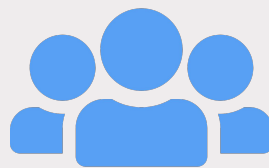
The current scholarly publishing system



Governments award public funds for research



Scientists conduct research



Research is written up and submitted to peer-review



Article is accepted, authors transfer copyright to journals



Published articles are locked behind paywalls



Libraries pay subscriptions or public pays per article to view on publisher website



Even after paying to read, readers are granted very little or no re-use permissions



All in all, very slow scientific progress and poor return on public investment

The current scholarly publishing system

We must acknowledge that by preventing
access to research output,
we are acting against meeting the
sustainable development goals and
we are perpetuating a system that is
destructive to science and society

Budapest Open Access Initiative



By "open access" [...] we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself.

The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.

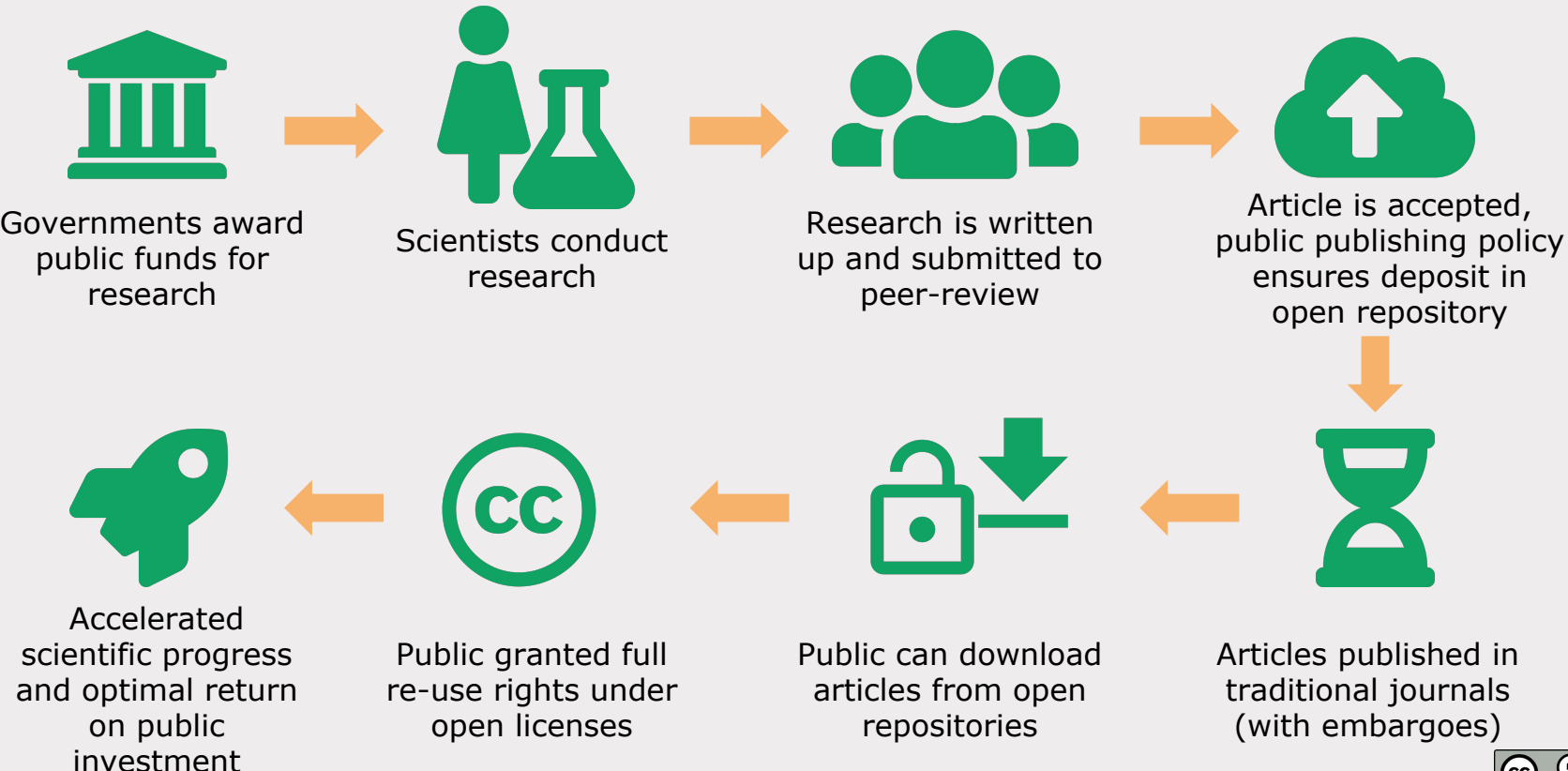
Budapest Open Access Initiative



By "open access" [...] we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself.

The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.

The Open Access publishing system



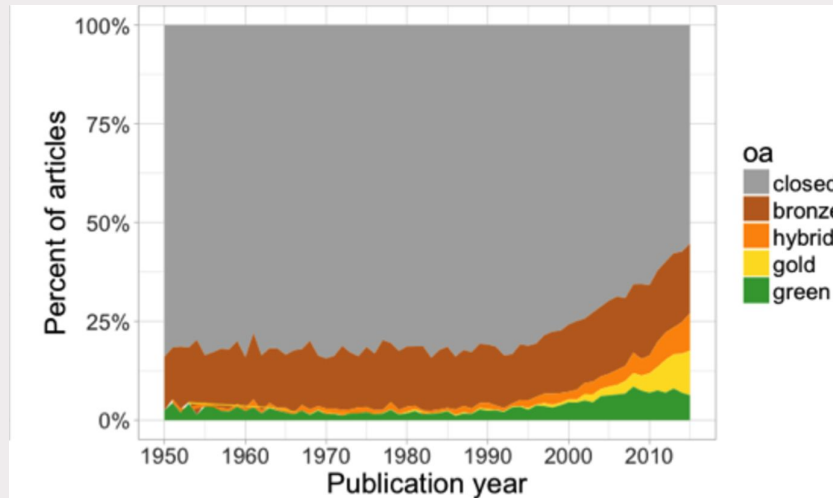
The Open Access landscape

Green: toll-access on publisher but free on OA repository (comes with no additional cost)

Gold: free at publisher/source (indexed by the DOAJ, requires paying APCs)

Hybrid: free under an open license in a toll-access journal (double dipping \$\$)

Bronze: available on publisher website but without any explicit license



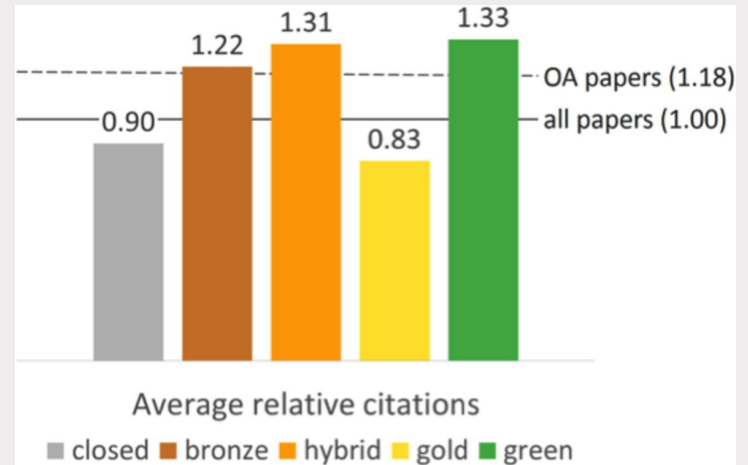
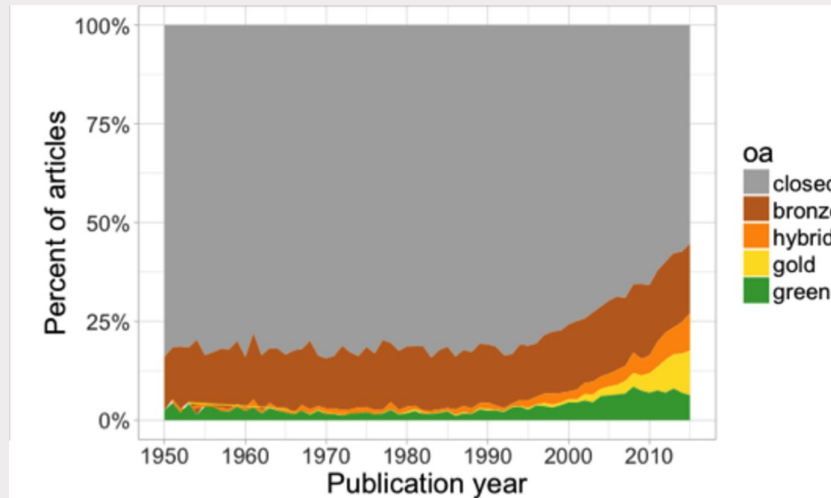
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Hybrid: free under an open license in a toll-access journal (double dipping \$\$)

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Plan S: the solution to everything?

Plan S requires that, from 2021, scientific publications that result from research funded by public grants must be published in compliant Open Access journals or platforms.

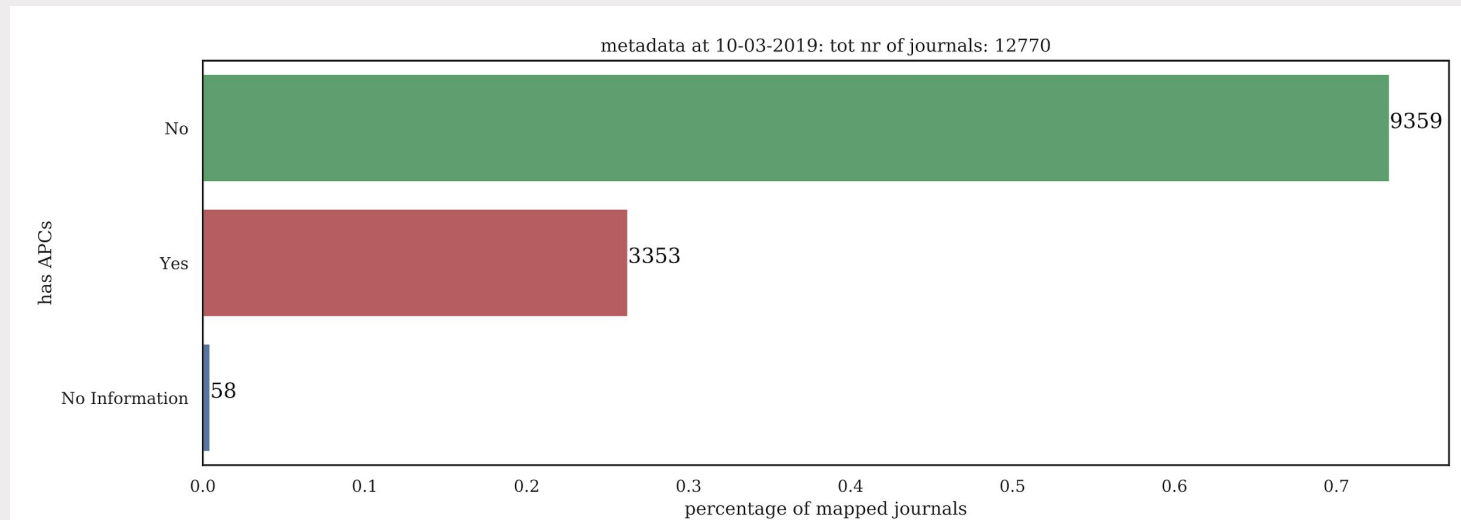


The APCs model is not the dominant one in Open Access

metadata downloaded on the 10th of March 2019


[<https://doaj.org/faq#metadata>]

73% of the journals indexed in the DOAJ do not have an APC





You don't need to break the bank!








Talk with your **fund**ers, your **university**, your **library**; check available **tools** and **resources**


 **THINK**


 **CHECK**

 **SUBMIT**


DOAJ
DIRECTORY OF
OPEN ACCESS
JOURNALS


THE PREPRINT SERVER FOR BIOLOGY



 **SHERPA/RoMEO**

Publisher copyright policies & self-archiving

Do you know a **free OA journal** you want to submit to?



Go ahead and submit



Can you publish the post-print?



Publish the post-print of your article: after it has been peer reviewed, but before final editorial type-setting(*)



Can you publish the pre-print?



Publish the pre-print of your article: before it has been submitted to a journal and peer-reviewed (*)



Consider choosing a **different journal** to submit to, if possible

(*) Check Sherpa/RoMEO for an overview of pre-print and post-print policies, as well as publishing licences and possible embargo periods imposed on post-print publishing.

A social networking site is not an open access repository

	Open Access Repositories	Academia.edu	ResearchGate
Supports export or harvesting	Yes	No	No
Long-term preservation	Yes	No	No
Business model	Usually nonprofit	Commercial. Sells job posting services, hopes to sell data	Commercial. Sells ads, job posting service
Sends you tons of emails	No	Yes	Yes
Wants your address book	No	Yes	Yes
Fulfills requirements of your institute's OA policies	Yes	No	No

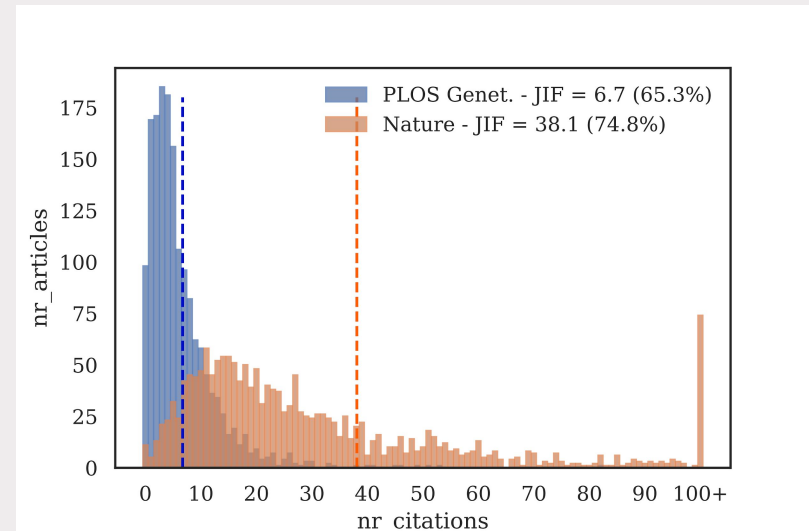
The Journal Impact Factor and research evaluation

We all know by now that JIF is a flawed metric

We need to move away from an evaluation system based on journal branding, and go back to research quality and relevance

Publishing in a glamour journal does not imply reproducibility, nor quality, nor statistical robustness, nor impact

Let's stop pretending we care about it



The rhetoric of research excellence

used in its current unqualified form, research excellence is pernicious and dangerous rhetoric that undermines the very foundations of good research and scholarship (Moore *et al.*)

Research excellence reinforces systemic biases in power, reduces diversity, and excludes many participants from the processes of scholarship

Open Science: a Shift in the Conversation
From Open Science to Inclusive Science



preprints

faster scientific dissemination

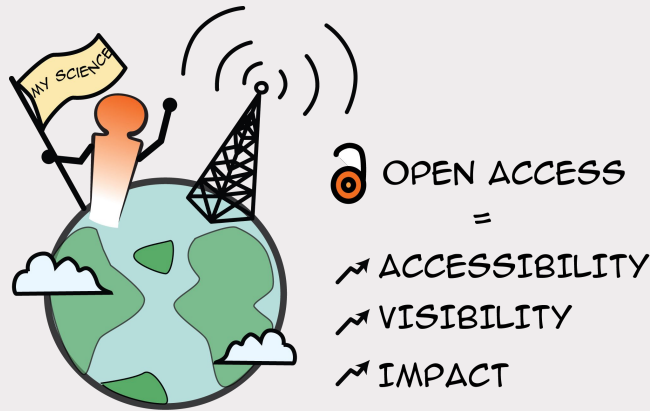
What are preprints?

Preprints

are manuscripts shared online
before the completion of
journal-organized peer review

Why should you *bother* posting pre-prints?

They are **open access**, and therefore increase your **visibility**



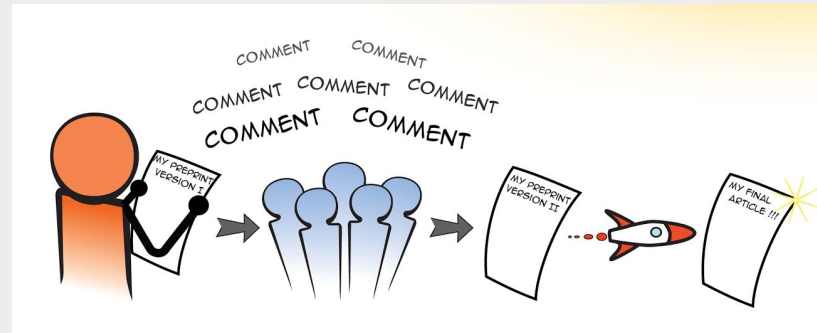
Why should you *bother* posting pre-prints?

They can help you advance in your career



Why should you *bother* posting pre-prints?

They allow for a wider
community feedback

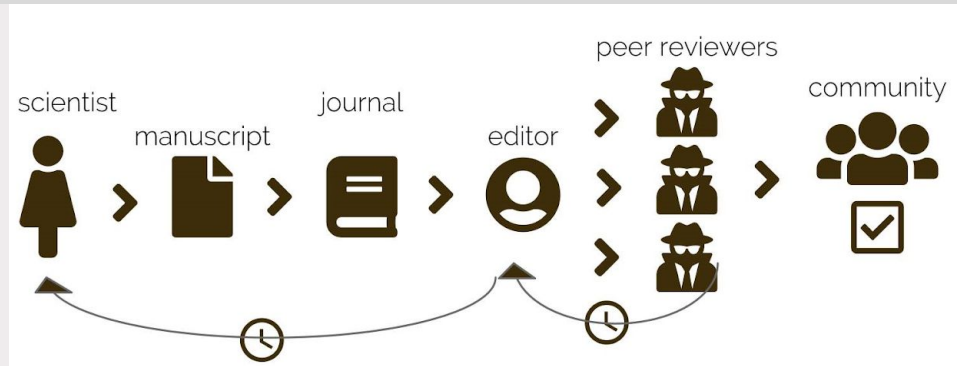


What if I get scooped?

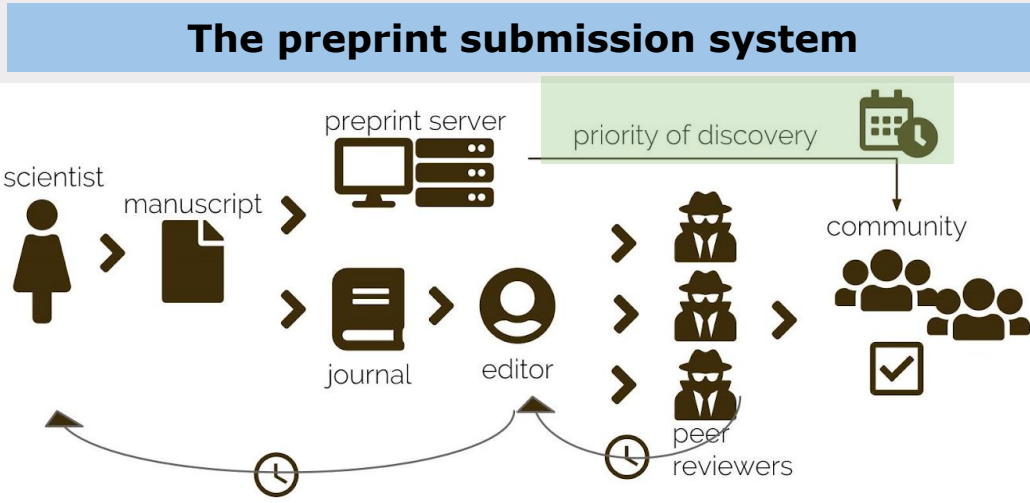


Preprints can establish priority of discovery

The traditional submission system



Preprints can establish priority of discovery



Am I allowed to post a preprint?

Short & idealistic answer:
your research, your choice

Long & realistic answer:
you need to have your
co-authors permission,
check for journal policies,
and understand licenses



arXiv.org



bioRxiv

SOC
ARXIV

Am I allowed to post a preprint?

Short & idealistic answer:
your research, your choice

Long & realistic answer:
you need to have your
co-authors permission,
check for journal policies,
and understand licenses



List of academic journals by preprint policy

From Wikipedia, the free encyclopedia



Don't be afraid of licenses, ask the community

CC0 waiver



CC0 places work in the public domain, waiving all copyright and related rights.

Allows anyone to repost or reuse your preprint in any medium for any purpose, even without attributing it to you.

Often used for works created by U.S. government employees, as these are already in the public domain in the U.S.

Ideal for datasets.³

CC BY



Attribution (BY)

Allows anyone to repost or modify your preprint in any medium for any purpose, but requires that users provide attribution to you and include a link back to the original whenever the material is used and shared.

Encouraged by NIH.¹

Fits the original definition of open access.²

-NC,-ND,-SA

These terms can be added to the CC BY license to produce 5 other licenses
<https://creativecommons.org/licenses/>



Noncommercial (NC)

Prohibits commercial use of the material.

If you select it, you don't grant permission to:

- Republish a figure in a paywalled journal
- Use the preprint to advertise products
- Reprint the work in a textbook sold commercially



No derivatives (ND)

Prohibits the sharing of adaptations of the material.

If you select it, you don't grant permission to:

- Translate the preprint to another language
- Create a copy of the preprint with extensive annotations
- Adapt a diagram or drawing for use in another paper



ShareAlike (SA)

Requires adaptations of the material to be released under the same license.

For example, a figure that is modified from your preprint would have to *also* be published under a CC BY-SA license. (However, a book containing that modified figure could have its own, more restrictive license).

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No license

All rights reserved


If you do not select a license, you do not give default permission to reuse the work (beyond what is required to post to the preprint server).

As a result, you don't grant permission to:


- Repost your paper, unchanged, on a class website

Using a figure in academic talks or text & data mining may also be prohibited in countries without a fair use or equivalent doctrine. Note that some servers (bioRxiv, arXiv, etc) allow TDM for all manuscripts.

Preprints: you gotta love them!

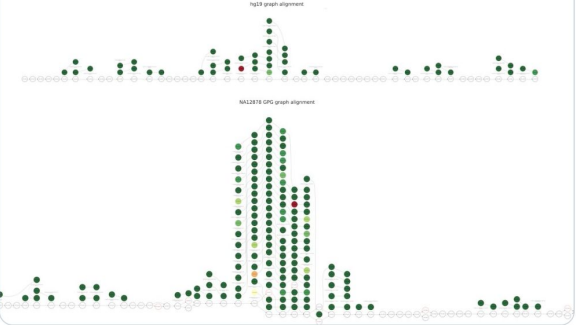
 **Guillaume Bourque** @guilbourque

Can I just say that I think [@biorxivpreprint](#) is the greatest thing since sliced bread? Within a week, lots of feedback and even a new collaboration! So much better than waiting for months for 2-3 reviews that are sometimes uneven in terms of quality...

 **Guillaume Bourque** @guilbourque · Aug 26

Linear genomes are so 2000s... Say hello to graph genomes for epigenomic data! Check out this ChIP-seq peak that would have been missed otherwise...

Very excited about our new paper on this: [biorxiv.org/content/10.1101...](https://www.biorxiv.org/content/10.1101/101101)



2:05 PM · Aug 30, 2019 · [Twitter for iPhone](#)

50 Retweets 249 Likes

NOT PEER-REVIEWED

"PeerJ Preprints" is a venue for early communication or feedback before peer review. Data may be preliminary. [Learn more about preprints](#) or [browse peer-reviewed articles](#) instead.

Do you speak open science? Resources and tips to learn the language

Research article Science and Medical Education

Paola Masuzzo^{1,2}, Lennart Martens^{1,2}

January 3, 2017



Providing researchers with the skills and competencies they need to practise Open Science

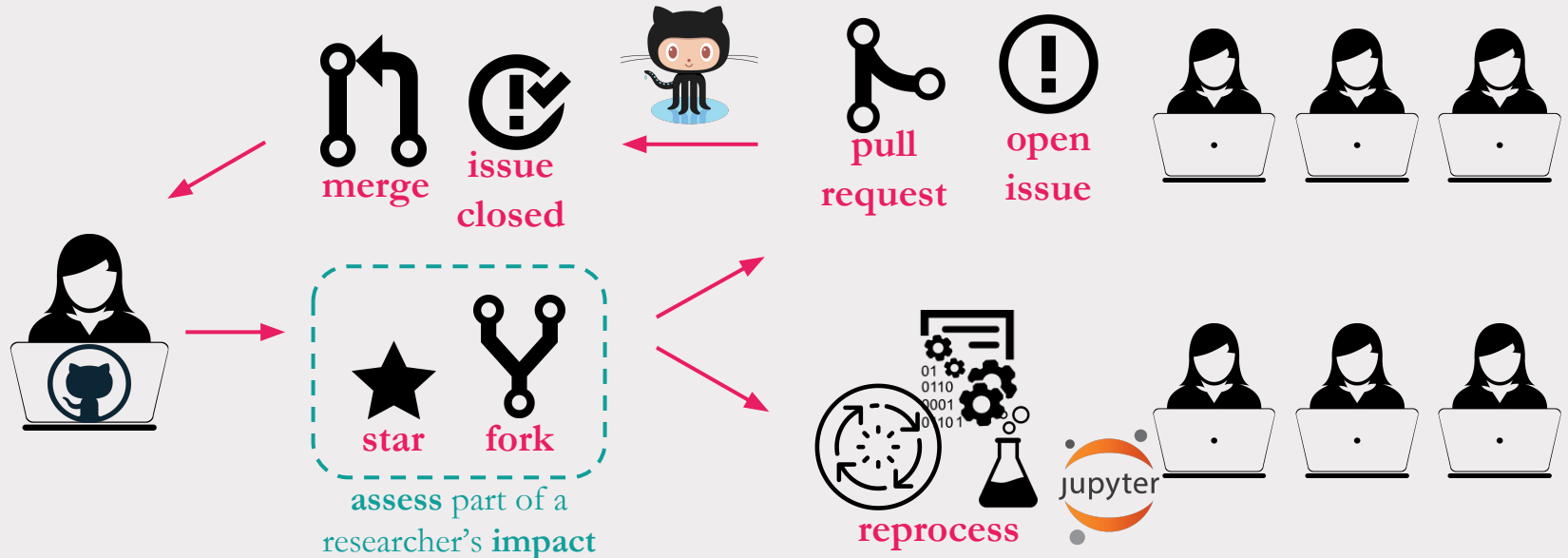
Report of the Working Group on Education and Skills under Open Science

open source

for reproducible & participatory research

Why open source?

open source is powerful because it lowers the barriers to adoption, allowing ideas to spread quickly



Open source enables reproducibility

Welcome to the Turing Way


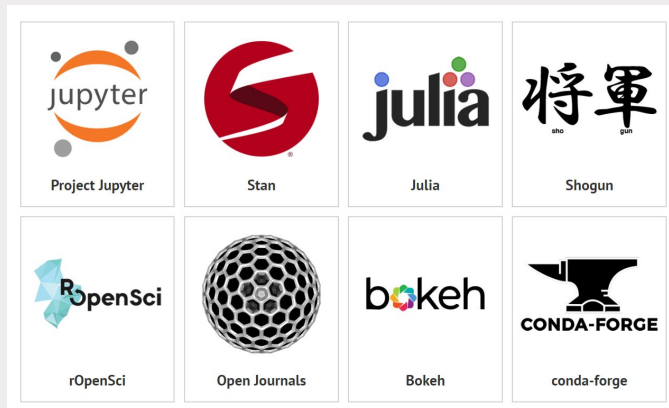
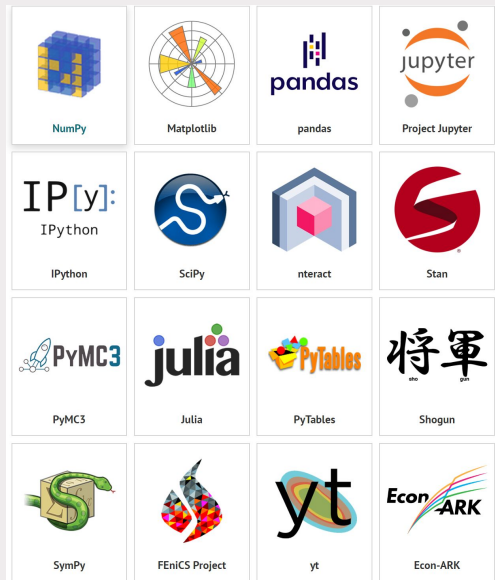
The Turing Way is a lightly opinionated guide to reproducible data science.

		Data	
		Same	Different
Analysis	Same	Reproducible	Replicable
	Different	Robust	Generalisable



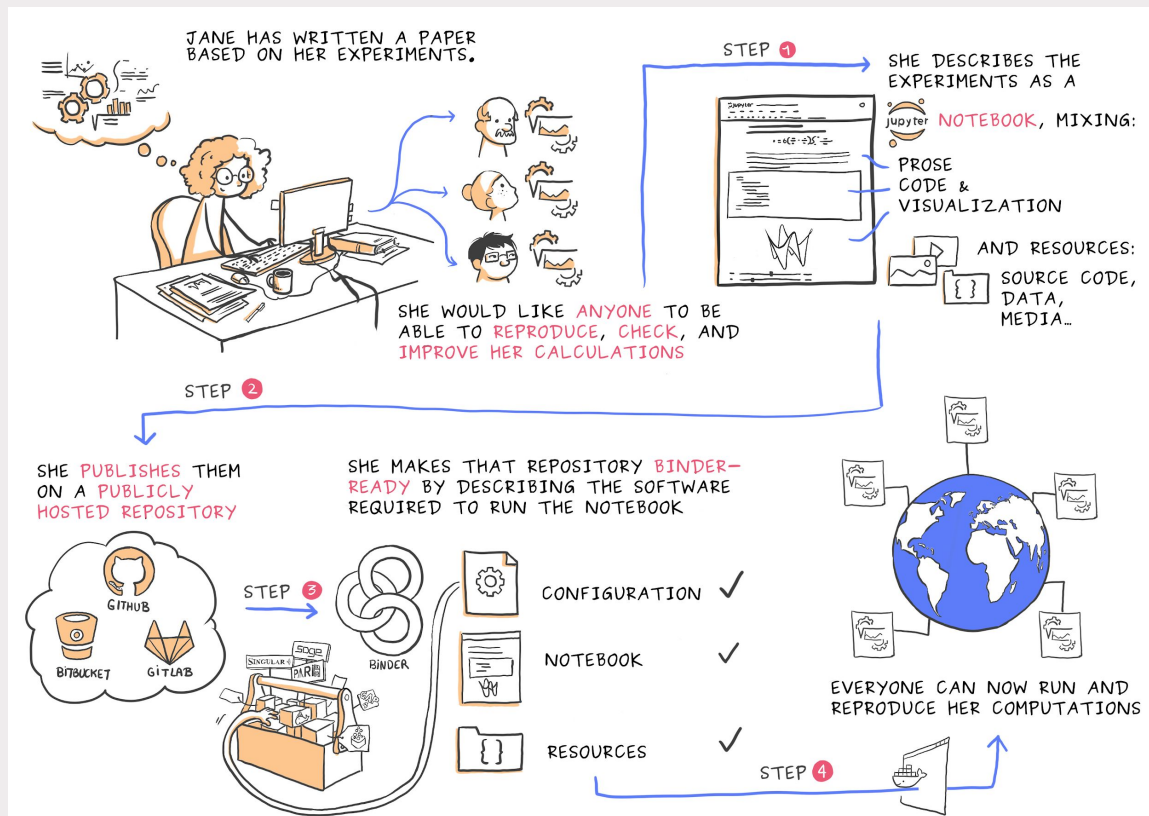
NumFOCUS and successful open source stories

The mission of NumFOCUS is to promote open practices in research, data, and scientific computing by serving as a fiscal sponsor for open source projects and organizing community-driven educational programs.



in just over 5 years, it has attracted over 500 unique contributors, 20,000 individual code contributions, and 2,500 article citations

Open source and literate programming



The article does the “advertisement”

Computer Science > Symbolic Computation

Computing isomorphisms and embeddings of finite fields

Ludovic Brielle, Luca De Feo, Javad Doliskani, Jean-Pierre Flori, Éric Schost

(Submitted on 3 May 2017)

Let \mathbb{F}_q be a finite field. Given two irreducible polynomials f, g over \mathbb{F}_q , with $\deg f$ dividing $\deg g$, the finite field $\mathbb{F}_q[X]/f(X)$ into $\mathbb{F}_q[Y]/g(Y)$. When $\deg f = \deg g$, this is also known as the isomorphism problem.

This problem, a special instance of polynomial factorization, plays a central role in computer algebra software. We present several improvements and generalizations. Our detailed complexity analysis shows that our newly proposed variants are significantly faster. We also implement most of the presented algorithms, compare them with the state of the art computer algebra software, and show that our variants consistently outperform available software.

Subjects: **Symbolic Computation (cs.SC)**; Mathematical Software (cs.MS); Number Theory (math.NT)

Cite as: [arXiv:1705.01221](https://arxiv.org/abs/1705.01221) [cs.SC]

(or [arXiv:1705.01221v1](https://arxiv.org/abs/1705.01221v1) [cs.SC] for this version)

The code is the actual "scholarship"

Computer Science > Symbolic Computation

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A research project on isomorphisms of finite fields <https://arxiv.org/abs/1705.01221>

research-paper finite-fields isomorphism algorithms

668 commits 10 branches 5 releases 5 contributors

Branch: master New pull request Create new file Upload files Find file Clone or download

Luca De Feo Updated Dockerfile Latest commit 3a77d85 on Jun 15, 2018

implementation	Typo.	2 years ago
misc	Typo.	2 years ago
notebooks	README fixes	2 years ago
paper	Removed junk from bib file	last year
.gitignore	Impl of fast kummer for prime-power extensions	4 years ago
.gitmodules	Update elmul.	3 years ago
Dockerfile	Updated Dockerfile	last year
README.md	Added Jupyter notebook with (more) plots, updated readmes	2 years ago

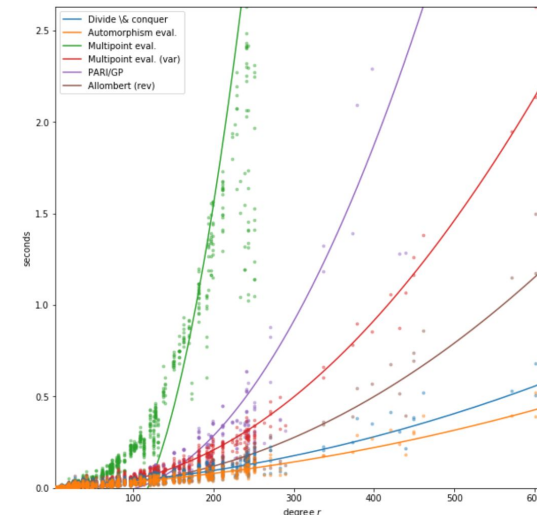
Variants of Allombert's algorithm

Small auxiliary degree

Comparison of variants of Allombert algorithm with auxiliary degree $s = \text{ord}_q(r)$. Dots represent individual runs, lines represent degree 2 linear regressions.

The "Automorphism evaluation" and "Divide & conquer" variants perform best.

```
In [4]: %_ = plot_allombert_lowaux(d[(d.prime > 100) & (d.prime < 2**20)])
```



Make sure you choose an open license

{ Which of the following best describes your situation? }



I need to work in a community.

Use the [license preferred by the community](#) you're contributing to or depending on. Your project will fit right in.

If you have a dependency that doesn't have a license, ask its maintainers to [add a license](#).



I want it simple and permissive.

The [MIT License](#) is short and to the point. It lets people do almost anything they want with your project, like making and distributing closed source versions.

[Babel](#), [.NET Core](#), and [Rails](#) use the MIT License.



I care about sharing improvements.

The [GNU GPLv3](#) also lets people do almost anything they want with your project, *except* distributing closed source versions.

[Ansible](#), [Bash](#), and [GIMP](#) use the GNU GPLv3.

{ What if none of these work for me? }

My project isn't software.

[There are licenses for that.](#)

I want more choices.

[More licenses are available.](#)

I don't want to choose a license.

[Here's what happens if you don't.](#)

Researchers need to be equipped with tools and resources



And they need to be rewarded for
more than just papers



Open Access

Preprints

FAIR Data

Open Peer Review

Open Source

Registered Reports

Replication

Reproducibility

Incentives & Behavior

Assessment & Evaluation

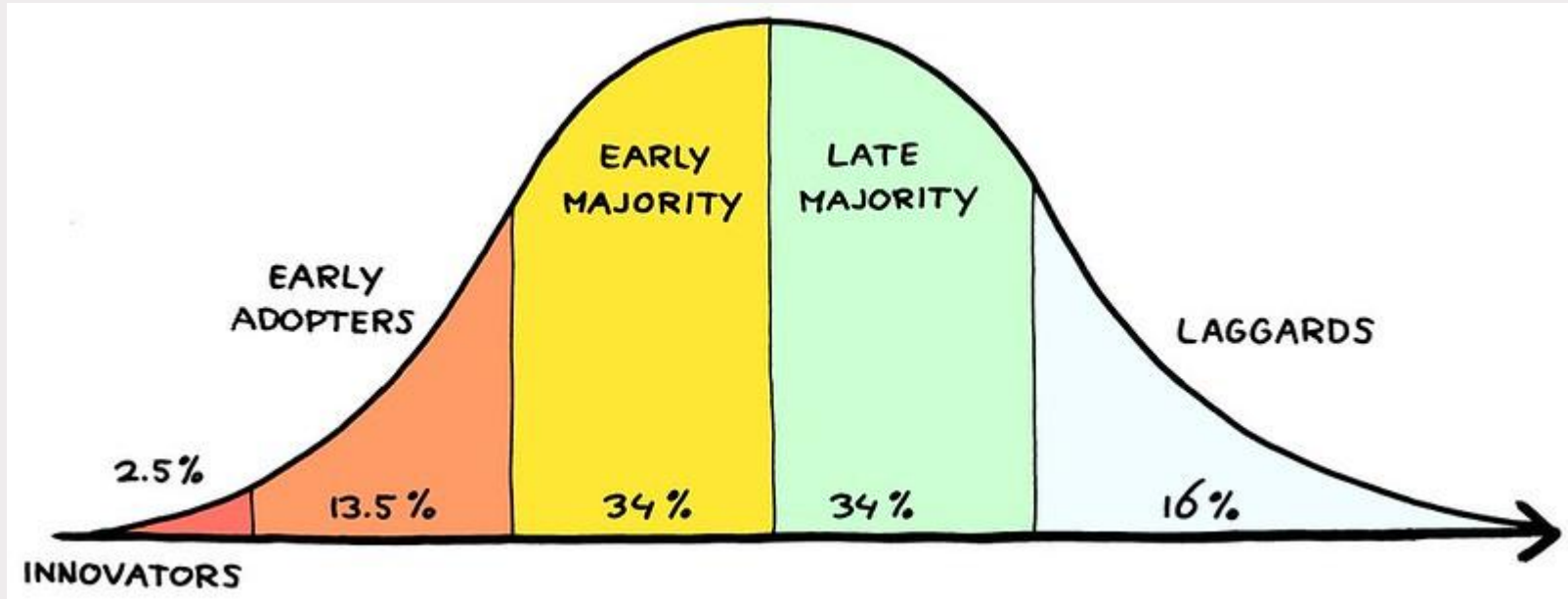
A circular wooden sign with a metal handle at the top. The word "OPEN" is written in a large, decorative, black serif font across the center of the sign. The wood has a natural grain and some white paint or varnish. The background is a blurred indoor setting with warm, bokeh lights.

OPEN

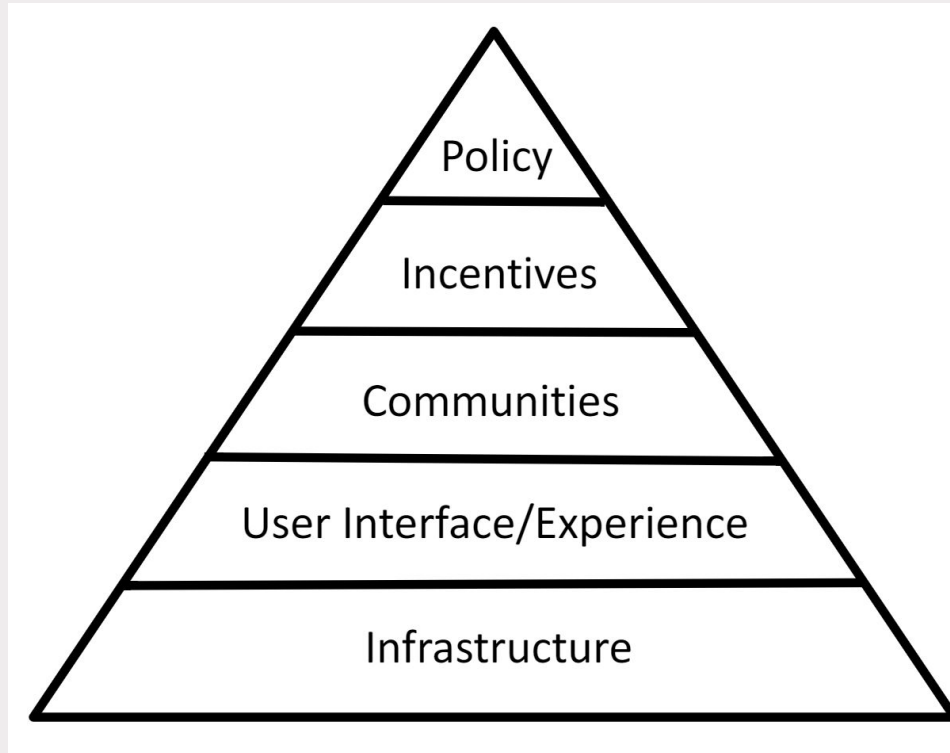
How do we make it all happen?

Change

The adoption curve in diffusion of innovations



A comprehensive strategy is needed to effect culture change



make it required

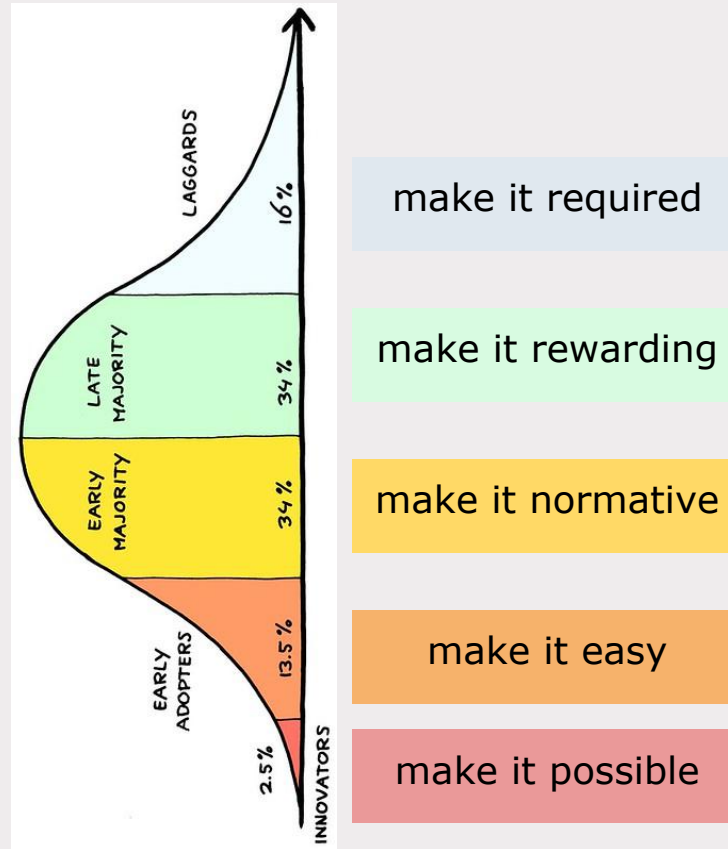
make it rewarding

make it normative

make it easy

make it possible

Enabling a culture change





Embrace
incrementalism, change
can happen by degrees,
every little step counts

Focus on good science
practices, not on social
identity

Reach out to the
community!

welcome to the Open Science
Massive Open Online Course
(and Community!)



<https://opensciencemooc.eu/>

**Our mission is to help make “Open” the
default setting for all global research**

We want to help create a welcoming and
supporting community, with good tools, teachers,
and role-models, and built upon a solid
values-based foundation of freedom and equitable
access to research



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Thank you



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