



# OPEN SCIENCE: JUST SCIENCE DONE RIGHT

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**DOI: 10.5281/zenodo.8062623**

**Meeting Ingenium**

**21-06-2023**

**Università di Chieti-Pescara**



# What is OPEN SCIENCE?

# Open science: a “buzzword”

“I call on all countries, companies and research institutions to support open data, open science, and open collaboration so that all people can enjoy the benefits of science and research”

T.A. Ghebreyesus, ‘

WHO Director-General's Opening Remarks at the Media Briefing on COVID-19 - 6 April 2020

## G7 - Open Science working group since 2016

G7 Science and Technology Ministers' Communique  
Sendai, May 2023

(2) In order to contribute to the creation of new knowledge, G7 Ministers need to cooperate in the expansion of open science with equitable dissemination of scientific knowledge and publicly funded research outputs.

## Annex 1: G7 Open Science (OS) Working Group

Mandate extended in the 2021 “G7 Research Compact”, committing the G7 nations to work together on open science.

## What is Open Science?

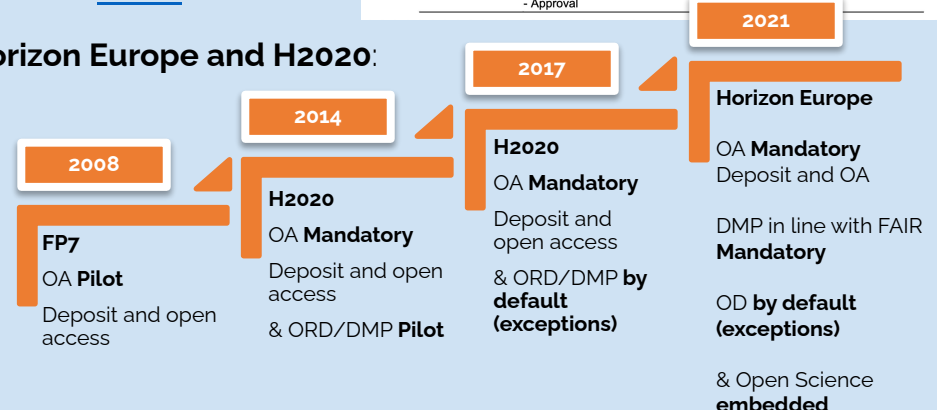
## In Europe: Council and European Commission

**2015 on:** Open Innovation, Open Science, Open to the world (publication)

Council conclusions on OS

**2016 on:** [EOSC](#)

## Horizon Europe and H2020:



### NOTE

From: General Secretariat of the Council  
To: Permanent Representatives Committee/Council  
No. prev. doc.: 8024/23  
Subject: *Preparation of the Council (Competitiveness (Internal Market, Industry, Research and Space)) on 22-23 May 2023*  
Draft Council conclusions on high-quality, transparent, open, trustworthy and equitable scholarly publishing  
- Approval

# What is Open science?

## A first definition

Paul David (2000/2007)

Two opposite models:

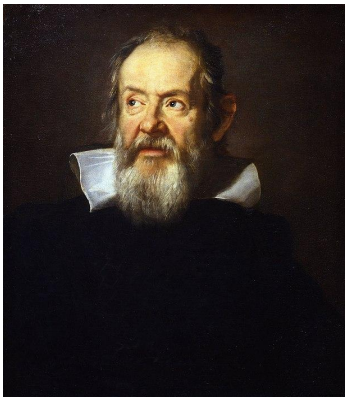
(1) "**open science**": Science as **collaboration**.  
It is the most fragile model. It needs public support  
(policies), not just funding.

(2) **Commercially oriented R&D**. Science as  
**competition**.  
based on proprietary information.

These two tendencies must be in the right  
balance.

# Open science as a trait of modern science

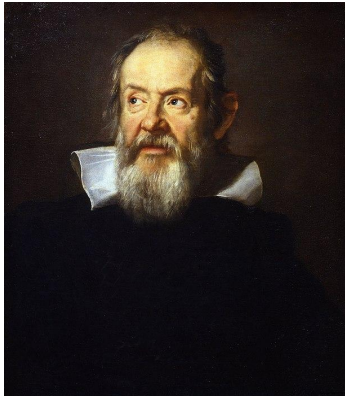
**Collaboration is made possible** through **publication**  
(via the press):



“**Parmi necessario**, oltre a le altre circuspezioni, per mantenere et augumentare il grido di questi scoprimenti, **il fare che con l’effetto stesso sia veduta et riconosciuta la verità da più persone che sia possibile**: il che ho fatto et vo facendo in Venezia et in Padova”.

(Galilei, 1610)

# Openness is about a discourse on the method



→ Science is based on the idea of **a debate, which precondition is to have shared and common data, tools and methodological foundations**

→ The method implies a set of rules of behaviour (**common ethos**)

# The ethos of (open) science: Mertonian CUDOS

**(1) Universalism** - everybody can do science

**(2) Communism** (Communalism) - knowledge belongs to everybody

**(3) Disinterestedness** - scientists should not follow personal agendas but work for the 'greater good'

**(4) Organized Skepticism** - judgment is suspended until findings have been examined

(Merton, 1942)

# Science is based on collaboration



*Thomas  
Jefferson*  
(1813)

“He who receives an idea from me, receives instruction himself without lessening mine; as he who lites his taper at mine, receives light without darkening me”



*Isaac  
Newton*  
(1676)

“If I have seen further it is by standing on the shoulders of Giants”.

...but also **Giustino philosopher**: «Nonne vero hoc tale est quale etiam in nobis fieri videmus? Sermonen enim aliquem proferentes, sermonem gignimus; non per abscissionem, ita ut sermo (ratio) qui in nobis est imminuatur, proferentes. **Quale est etiam quod in igni videmus alium [ignem] fieri, non imminuto illo ex quo accensus est, sed in eodem statu manente; et qui ex eo accensus est etiam ipse existens apparet non imminuens illum ex quo accensus est»**

..but also **John of Salisbury**: «Bernard of Chartres said that **we are like dwarves on the shoulders of giants, so that we can see more things than them and further away, certainly not because of the acuity of sight or the height of our body, but because we are lifted and carried high from the stature of giants»**



# In sum

- Open Science means applying correctly the scientific methods to the entire scholarly communication workflow, by making the processes and products transparent, and FAIR.
- It is based on sharing, collaboration, openness (shared values at institutional levels)
- Real-life constraints/barriers:
  - copyright
  - infrastructures
  - Policies/mandates
  - (counter)incentives

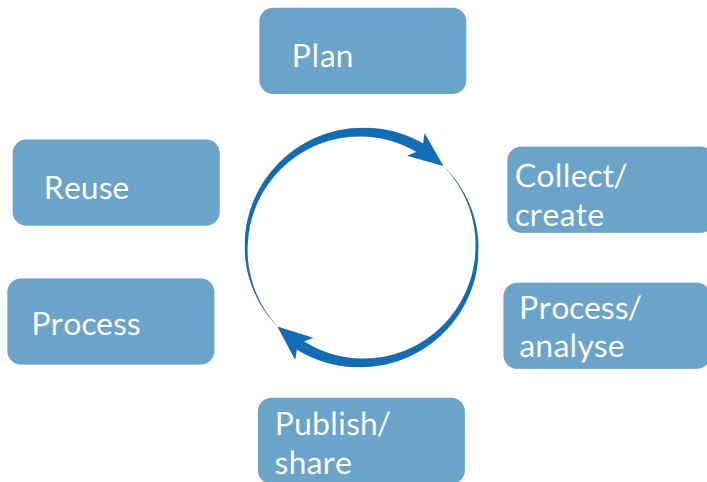
One step back:

**History of  
SCHOLARLY COMMUNICATION  
(pills)**

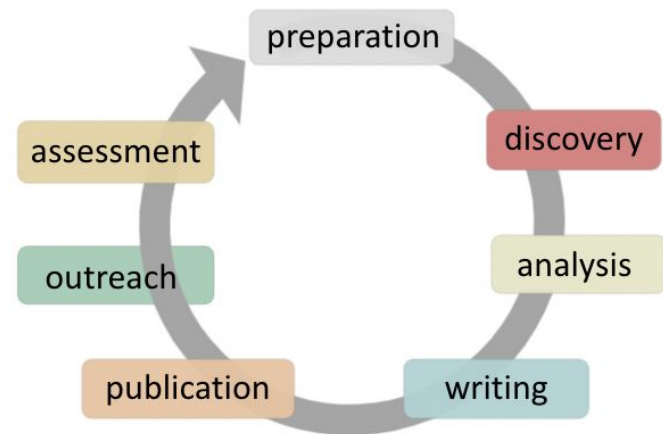
# What about scholarly communication

“the system through which research and other scholarly writings are **created, evaluated for quality, disseminated** to the scholarly community, and **preserved** for future use” (ACRL, 2003)

It can be seen as a **workflow**, a process, and a set of practices and empowering tools which structure our “scholarly behaviour” .



*Data centric perspective*



*Researcher centric perspective*

# The modern science system of communication

3 major innovations:

## 1. Copyright

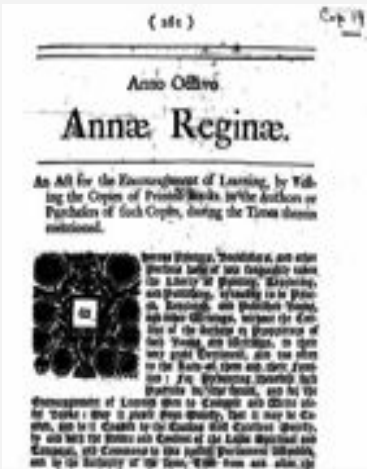
- 1710 Statute of Anne
- End of the system of privileges
- Lasts 14 years (+14)
- first european law on “copyright” = right on the copy.
- Birth of the “author”

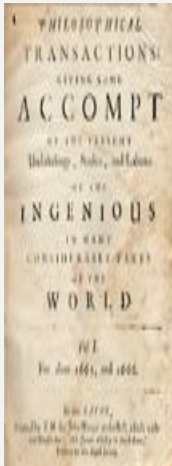
## Before print

- Roman law and the *res qui tangi possunt* (*Scientia donum dei est, unde vendi non potest*)
- Science as a common good

## The regime of privileges

- The object is not intellectual property but the actions of the press and book trade
- Censorship





## 2. Scientific Journals

- 1665: *Philosophical Transactions of the Royal Society of London*
- Public registry of Intellectual property
- Arbiter elegantiarum



## 3. Peer reviewing

- Perusal
- 1731 - Royal Society of Edinburgh
- It becomes the standard evaluation practice

# The spread of Scientific Journals and the birth of bibliometrics

**1665→ 1900: Journals become the “killer app” of modern science**



## **Maxwell (1950s):**

- creation of "international" journals for a world audience (International Journal of ..);
- use of English as the default language to facilitate the treatment of the whole world as a single market;
- libraries = primary market for magazines.

**1960s (Garfield):** Science Citation Index and the Impact Factor (bibliometrics).

**Journals grant intellectual property rights; act as brand; and they function as a career management system, thus** becoming more and more central to the academic communication system.

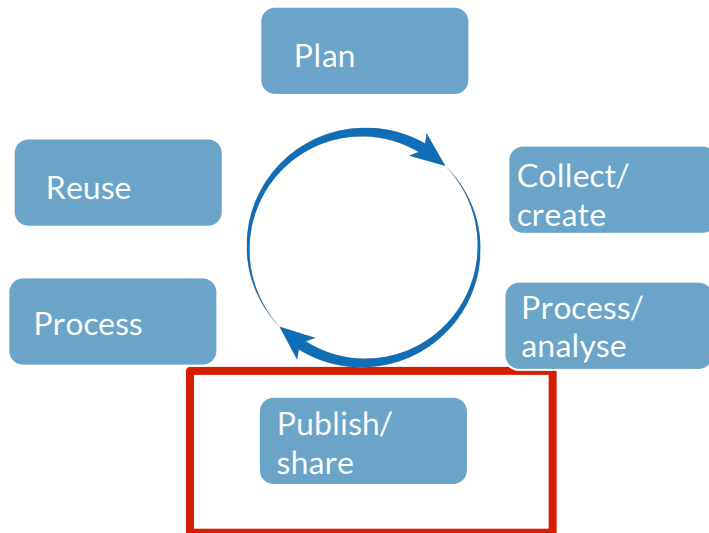
# 1990s

## The crisis of the modern scholarly communication system

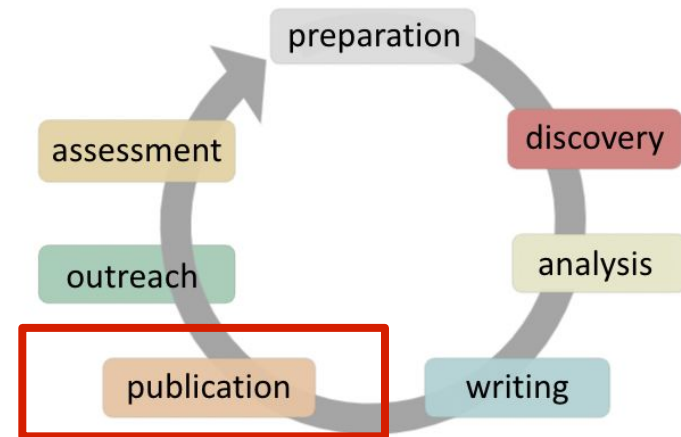
“Ostensibly aligned,  
**publishing and communication have diverged.**  
Journals and the concept of “version of record” are not only a legacy from print, but their roles have shifted to the point where some processes involved in scholarly publishing are getting in the way of optimal scholarly communication, as the present pandemic amply reveals.”

J.C. Guéron, Scholarly Communication and Scholarly Publishing, 2021

**NB: Formalised publishing practices are just a subset of a larger pool of various communication practices** (emails, social media, blogs, press, etc.), both between scholars and between scholars and the public.



*Data centric perspective*



*Researcher centric perspective* <sup>6</sup>



# Open Science: a recent definition

“Open science is defined as an inclusive construct that combines various movements and practices aiming to make multilingual scientific knowledge openly available, accessible and reusable for everyone, to increase scientific collaborations and sharing of information for the benefits of science and society, and to open the processes of scientific knowledge creation, evaluation and communication to societal actors beyond the traditional scientific community. It comprises all scientific disciplines and aspects of scholarly practices, including basic and applied sciences, natural and social sciences and the humanities, and it builds on the following key pillars: open scientific knowledge, open science infrastructures, science communication, open engagement of societal actors and open dialogue with other knowledge systems”.

[UNESCO recommendation on open science, November 2021](#)

# What is Open science?

## Open Science movements

### **1960 → on: Internet and the Web**

Protocols are published in the PD  
RFC as a working methodology

### **1987 → on: Free Libre Open Source Software movement**

GNU licenses

Working methodology based on open  
and early sharing of results and processes  
"Bazaar" (academia/puzzle) model

# What is Open science?

## Open Science movements

### 2002 → on: Open Access

*"An old tradition and a new technology have converged to make possible an unprecedented public good"* (BOAI, 2002)

Protocols (OAI-PMH), software, declarations (Berlin, 2003), and funder mandates (European Commission)

### 2006 → on: Open Content Creative commons licenses

## 2006 -2015 → Linked Open Data & FAIR data

Linked data:

```
☆ Data is available on the Web, in whatever format.  
☆☆ Available as machine-readable structured data, (i.e., not a scanned image).  
☆☆☆ Available in a non-proprietary format, (i.e, CSV, not Microsoft Excel).  
☆☆☆☆ Published using open standards from the W3C (RDF and SPARQL).  
☆☆☆☆☆ All of the above and links to other Linked Open Data.
```

FAIR data:

FAIR Principles: Findability, Accessibility, Interoperability a Reusability (Wilkinson et al., 2016)

What is  
Open  
science?

Open  
Science  
movements



# What is Open science?

## Open Science practices



**early and open sharing** of research (for example through preregistration, registered reports, pre-prints, or crowd-sourcing)



**research output management** including research data management



measures to ensure **reproducibility** of research outputs



providing **open access** to research outputs (e.g. publications, data, software, models, algorithms, and workflows) through deposition in **trusted repositories**



participation in **open peer-review**



**involving all relevant knowledge actors** including citizens, civil society and end users in the co-creation of R&I agendas and contents (such as citizen science)

\*Listed in the proposal template

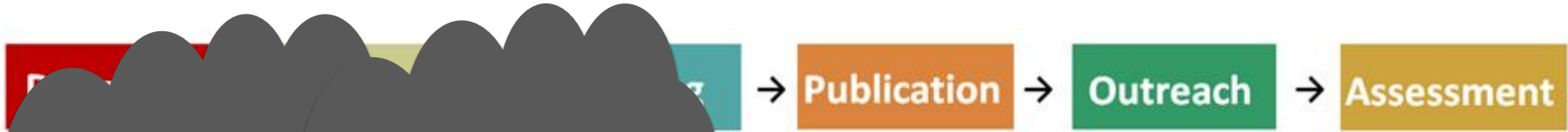
\*\* **Mandatory and non-mandatory** practices.



**A (bad) example of workflow**



# ...so, why is it a bad model?



- Archive
- Select journal to submit to
- Publish

- Archive presentations
- Tell about outside academia
- Researcher profiles

- Determine impact of research output
- Determine impact of researchers



**Archivio Marini**  
open access archive for political and social sciences

**Bollettino telematico di filosofia politica**  
Overlay journal of political philosophy

**DOAJ** DIRECTORY OF OPEN ACCESS JOURNALS

**e-LiS** e-prints in library & information science  
[2003-2018] 15th Anniversary

**figshare**

**ORCID**  
Connecting Research and Researchers

Google Scholar

Applying machine learning to suggest related articles

ADSL/INdE

Francesca Di Donato ✓  
ORCID iD  
Email verified on its profile  
Priority Open access Open science Secondary communication  
Digital Humanities

**WIKIPEDIA**  
The Free Encyclopedia

Are these documents OA? **YES**

Are these documents+data FAIR? **YES**

do I have this data? **YES**

Where is the data? I don't know!  
Where is the data? I don't know!  
Where is the data? I don't know!



# and I'm not alone...

The authors of the study, which is published today in *Current Biology*<sup>1</sup>, looked for the data behind 516 ecology papers published between 1991 and 2011. The researchers selected studies that involved measuring characteristics associated with the size and form of plants and animals, something that has been done in the same way for decades. By contacting the authors of the papers, they found that, whereas data for almost all studies published just two years ago were still accessible, the chance of them being so fell by 17% per year. Availability dropped to as little as 20% for research from the early 1990s.

"Most of the time, researchers said 'it's probably in this or that location', such as their parents' attic, or on a zip drive for which they haven't seen the hardware in 15 years." says Timothy Vines, the lead author on the study and an evolutionary ecologist at the University of British Columbia in Vancouver. "In theory, the data still exist, but the time and effort required by the researcher to get them to you is prohibitive."

Another challenge was simply tracking down authors and receiving a response, something at which the team was successful in just 37% of cases. The likelihood of being able to find a working e-mail address, even after an extensive online search, declined by 7% per year. Meanwhile, only around half of the authors with valid addresses responded to the requests, however old the paper.

<https://www.nature.com/news/scientists-losing-data-at-a-rapid-rate-1.14416>

NATURE | NEWS



## Scientists losing data at a rapid rate

Decline can mean 80% of data are unavailable after 20 years.

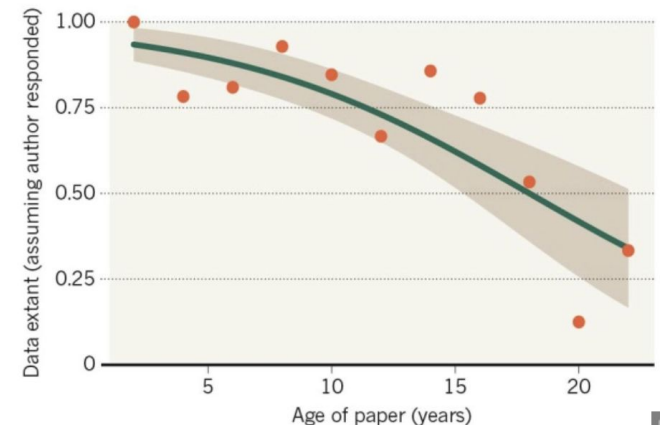
Elizabeth Gibney & Richard Van Noorden

19 December 2013

[Rights & Permissions](#)

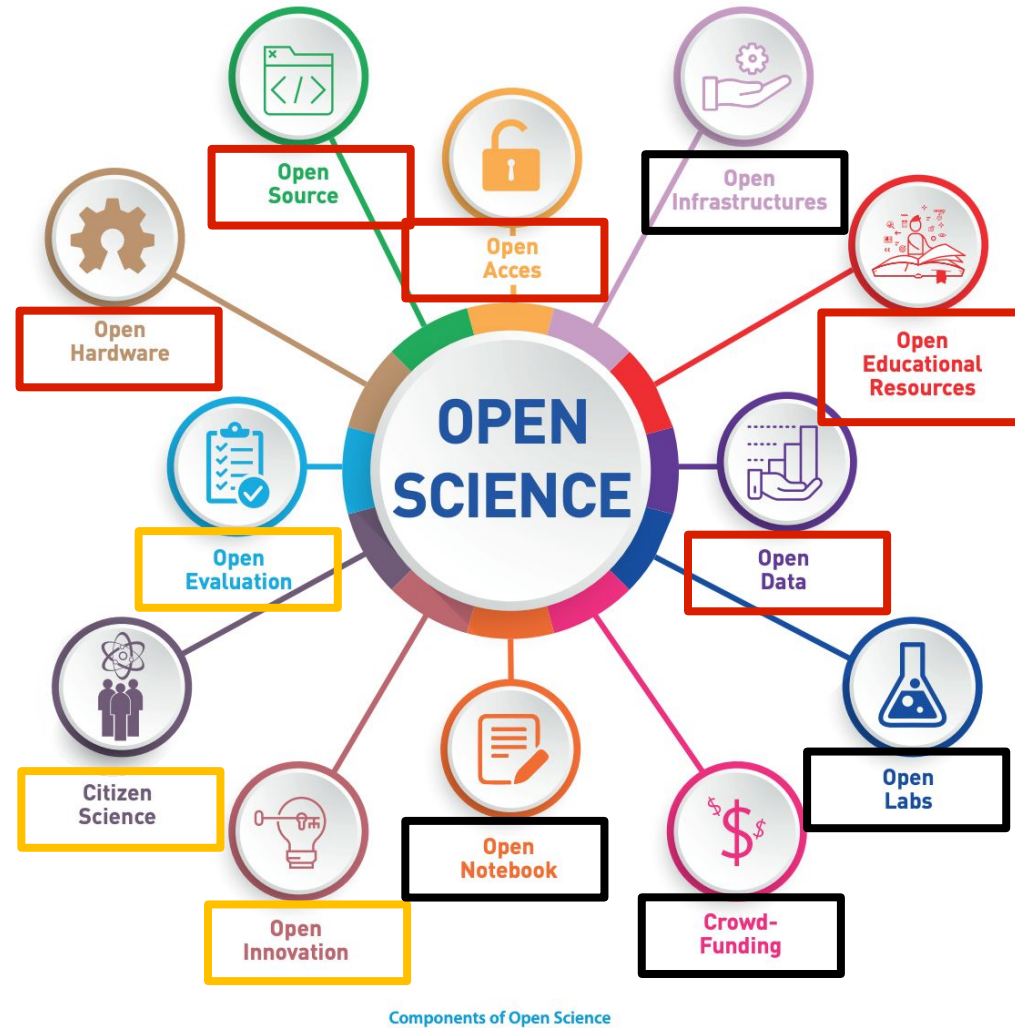
### MISSING DATA

As research articles age, the odds of their raw data being extant drop dramatically.



# Back to the definition

“..aiming to [1] make multilingual scientific knowledge **openly available, accessible and reusable** for everyone, to [2] increase scientific **collaborations and sharing** of information for the benefits of science and society, and [3] to **open the processes** of scientific knowledge **creation, evaluation and communication** to societal actors beyond the traditional scientific community.



# Back to the definition

“... It comprises all scientific disciplines and aspects of **scholarly practices**, including basic and applied sciences, natural and social sciences and the humanities,

and it builds on the following **key pillars**:

## **open scientific knowledge**

(open access, open data, open source, open hardware, OERs, open labs, open notebooks)  
so to make it reused by others

## **open science infrastructures**

ESFRIs and other Research Infrastructures (see also the PNIR for the Italy) and the EOSC as a common ecosystem of resources and tools

## **science communication**

open processes (including evaluation) and research objects  
value what values (quality)

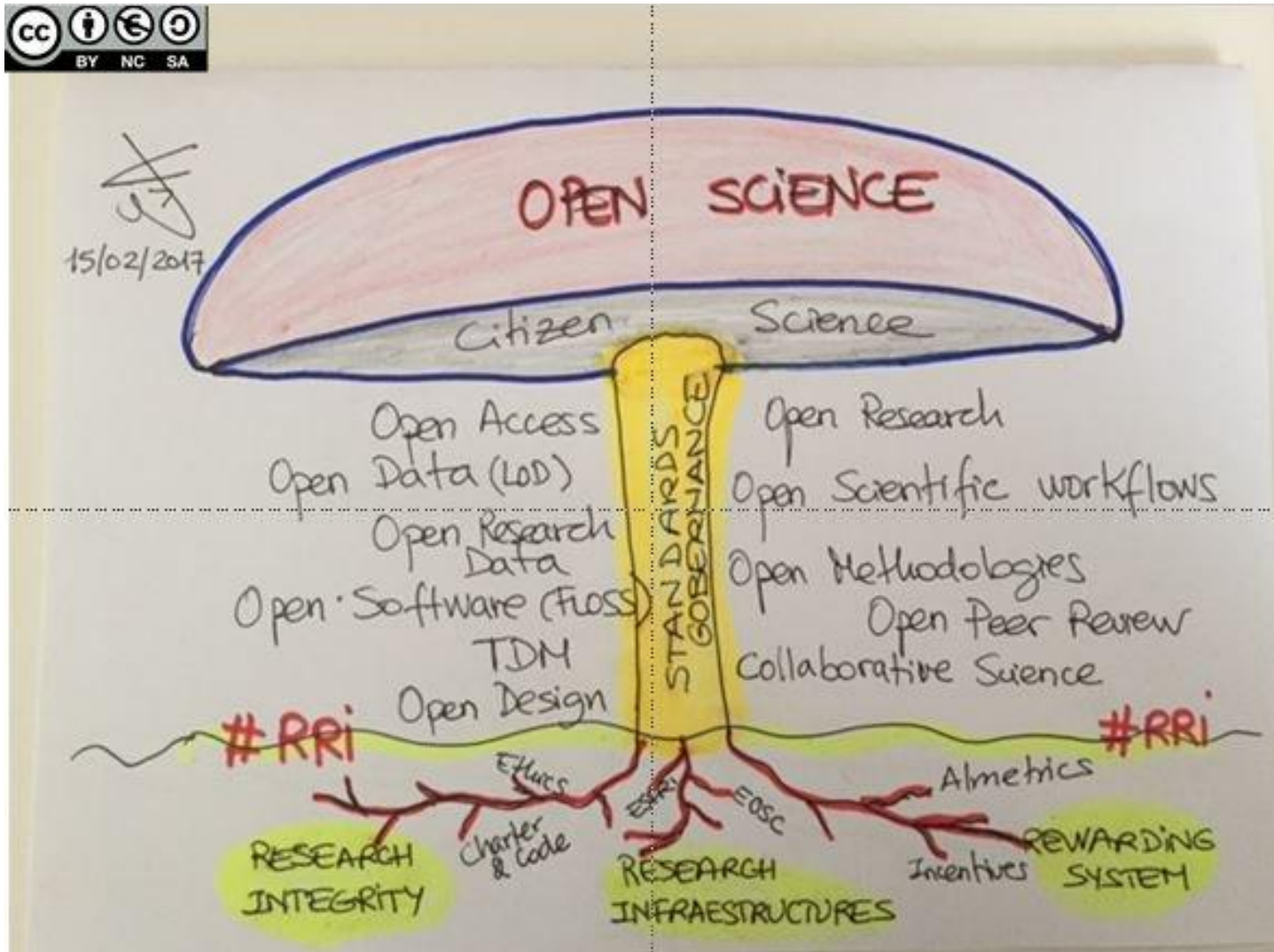
## **open engagement of societal actors**

citizen science, crowd-funding

## and **open dialogue with other knowledge systems**

open innovation

# An umbrella (or a mushroom?) term

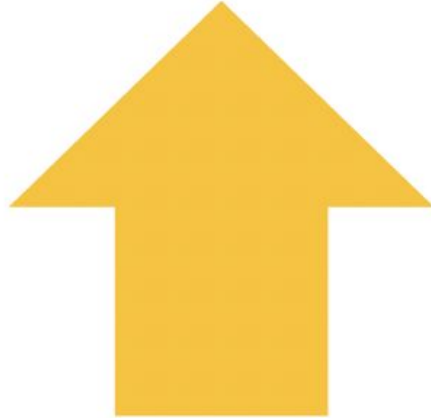


Source: Eva Mèndez, [Twitter](#), 2017

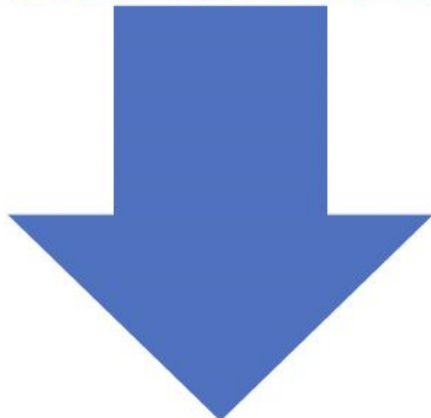
# In sum (again)

- Open Science means applying correctly the scientific methods to the entire scholarly communication workflow, by making the processes and products transparent, and FAIR.
- It is based on sharing, collaboration, openness (shared values at institutional levels)
- **But there are real-life constraints/barriers:**
  - copyright
  - (missing/not interoperable/closed) infrastructures
  - Policies/mandates
  - **(counter)incentives**

# Your career



# Open Science



SOCIAL AND TECHNICAL BARRIERS



[@protohedgehog](#)

(Tennant, J., 2018)

OPEN SCIENCE  
and the  
**RESEARCH ASSESSMENT  
SYSTEM REFORM**

# The pandemic, and the urge to open up the research results

Robert Terry (WHO):

Less than 25% of the scientific material included in the WHO COVID Guidelines comes from traditional publications. "They proved useless, just when we needed them most"

Open Science – time to unlock the potential of the digital



## Overview

The key is the internet – digitization

Open science requires systems thinking

The value is making new knowledge from connections

Standards to make (machine) interoperable

Minimize technical, legal, financial and linguistic barriers

Effective Ethical Equitable

Collaboration not Competition for Global Goods

A reset for scientific careers new incentive measures needed



But who are THEY?



We do have  
a problem

36%

margin of **scholarly publishers**

Source:

<https://www.theguardian.com/science/2017/jun/27/profitable-business-scientific-publishing-bad-for-science>

**10** billions dollar  
annual cost for the  
**subscriptions to scholarly  
publications** (journals)  
worldwide

Source: Schimmer, R., Geschuhn, K. K., & Vogler, A. (2015). Disrupting the subscription journals' business model for the necessary large-scale transformation to open access. doi:10.17617/1.3

**26** billions euro  
lost every year in Europe  
because research data are not  
properly managed

Source: [Directorate-General for Research and Innovation \(European Commission\)](#), [PwC EU Services](#) Cost of not having FAIR research data, 2019-01-16

Societe Belge des Balances & Bascules  
RUE DE L'INTENDANT, 43 - BRUXELLES

# A "publish or perish" system

## 19th century scientist

I must find the explanation for this phenomenon in order to truly understand Nature...



## 21st century ~~scientist~~ academic

I must get the result that fits my narrative so I can get my paper into Nature..



facebook.com/pedromics

Research assessment mostly based on bibliometric indexes or on selected «top class» list of **journals**

## Effects:

- many many publications
- high citation rate
- "important" venues (read: high IF)

But this does not in itself imply excellence in research!

Dr Maria van Kerkhove, WHO Covid-19 Technical Lead at HDR UK conference June 2021

*'...publication in a high impact journal does not equal quality..... it is important we need to receive data from chemistry, engineering, architecture not just medicine...'*

# (Several criticisms and) a problem of method

Goodhart's law:

"when a measure becomes a target, it ceases to be a good measure"

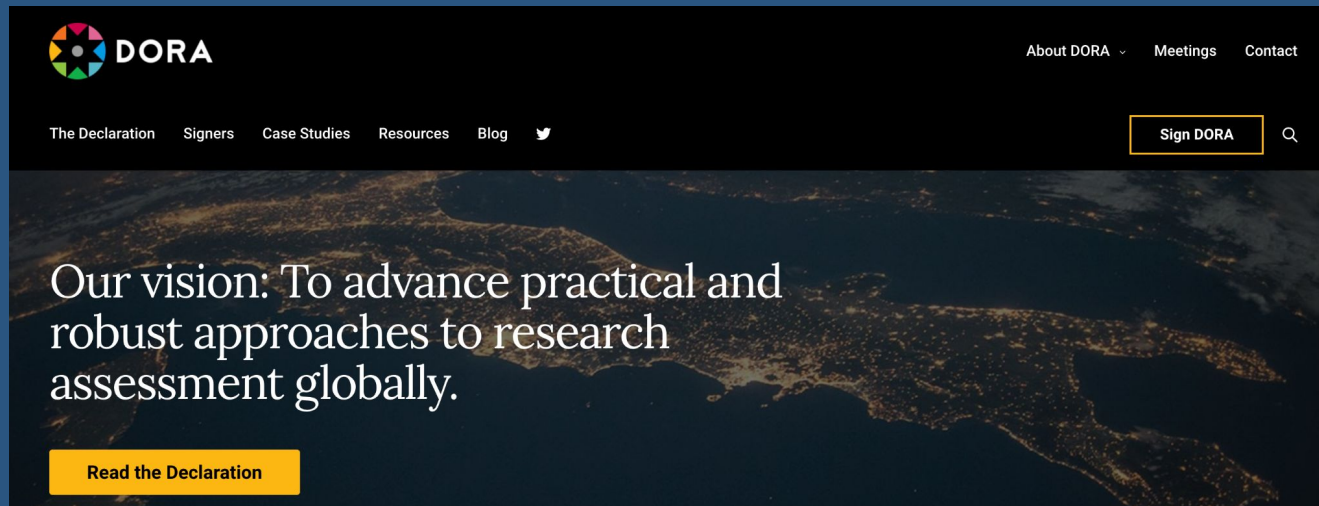
# Gaming the metrics

“Researchers will do anything to publish papers in some journals, including even creating fake authors”

“ [...] publishing papers in certain journals is the only way to earn grants, tenure, and promotions”

**But things are  
changing**  
and many funders  
are embracing  
Open Science

# The Declaration on Research Assessment (DORA)



“There is a **pressing need** to improve the ways in which the output of scientific research is evaluated by funding agencies, academic institutions, and other parties”.



**IN EUROPE**

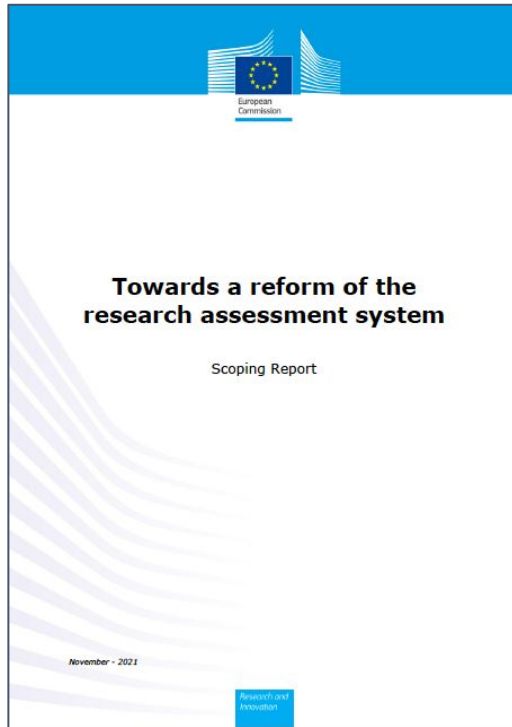




Photo by [Taisiia Shestopal](#) on

1. **2016:** [Amsterdam call for actions for OS](#)
2. **2017:** [Evaluation of research careers fully acknowledging Open Science practices](#)
3. **2017:** [Rewards, incentives and/or recognition for researchers practicing Open Science](#)
4. **2017:** [Responsible metrics and evaluation for open science](#)
5. **2017:** [EOSC Declaration](#)
6. **2018:** [COMMISSION RECOMMENDATION \(EU\) 2018/790 of 25 April 2018 on access to and preservation of scientific information](#)
7. **2019:** [Indicator frameworks for fostering open knowledge practices in science and scholarship](#)
8. **2019:** [Future of Scholarly Publishing and Scholarly Communication](#)
9. **2019:** Report: [Research Assessment in the Transition to Open Science](#)
10. **2020:** [Open Science Policy Platform final report](#)
11. **2020:** [EOSC Strategic Research and Innovation Agenda](#)
12. **2020:** Science Europe, [Position statement and recommendations on research assessment processes](#)
13. **2020:** [Commission Communication COM\(2020\) 628 of 30 September 2020 on a new European Research Area for R&I](#)
14. **2020:** [Council Conclusions on the new ERA of December 1st 2020](#)
15. **2020:** [Digital skills for FAIR and open science. Report from the EOSC Executive Board Skills and Training Working Group:](#)
16. **2021:** RDA: [Rewards and Incentives for Open Science](#)
17. **2021:** [Conclusions for the Competitiveness Council of 27-28 May on attractive and sustainable researchers' careers and working conditions](#)
18. **2021:** [Proposal for a Council Recommendation on a "Pact for Research and Innovation in Europe", as a first key achievement of the new European Research Area](#)
19. **2021:** [G7 Research Compact](#)

# Towards a common reform process



(EC, 2021)

## The research process is changing

*Less linear, more open and collaborative, multiplicity of outputs, "team science"*

## The traditional valuation system is not suited to reflect this change

*It is the Achilles heel of the OS, quantitative aspects and publications are evaluated, collaborative processes and different types of results remain outside*

A [process of reform](#), which increases the efficiency, impact, and social responsibility of research, was needed

*The Council conclusions on the new ERA and on research careers go in this direction*

*A cultural change is needed*


# The process towards the *Agreement on reforming research assessment*

- **2021:** consultation of the EC with stakeholders and publication of the scoping report.
- **December 2021:** publication of a call for expressions of interest to join the coalition that helped drafting the agreement.
- **Jan -July 2022:** Drafting by drafting team + meetings with core group and stakeholder assembly to discuss the elements of the agreement + member states consultation process (ERAC and ERA Forum). June: Council conclusions.



# “Research assessment and implementation of Open Science”

Council conclusions of June 10, 2022

 Council of the European Union

Brussels, 10 June 2022  
(OR. en)

10126/22

RECH 371  
TELECOM 267  
COMPET 491  
IND 227  
MI 468  
EDUC 245

**OUTCOME OF PROCEEDINGS**

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From: General Secretariat of the Council  
On: 10 June 2022  
To: Delegations

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No. prev. doc.: 9515/22

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Subject: Research assessment and implementation of Open Science  
- Council conclusions (adopted on 10 June 2022)

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Delegations will find in annex the Council conclusions on “Research assessment and implementation of Open Science”, adopted by the Council at its 3877<sup>th</sup> meeting held on 10 June 2022.

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10126/22 FV/lv 1  
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# The Agreement on Reforming Research Assessment

Published on July 20th  
2022

European Commission > Research and innovation > News > All research and innovation news > Reforming research assessment: The Agreement is now final

NEWS ARTICLE | 20 July 2022 | Directorate-General for Research and Innovation

## Reforming research assessment: The Agreement is now final

Launched in January 2022 as a co-creation exercise, the [process](#) of drafting an agreement for reforming research assessment has reached an important milestone. On 8 July, the final version of the agreement was presented at a Stakeholder Assembly bringing together the [350+](#) organisations from 40+ countries having expressed interest in being involved in the process.

Our vision is that the assessment of research, researchers and research organisations recognises the diverse outputs, practices and activities that maximise the quality and impact of research. This requires basing assessment primarily on qualitative judgement, for which peer review is central, supported by responsible use of quantitative indicators.

**28 Sept. 2022:** Launched and opened to signatures

# Content

## 1. Principles

It establishes a **common direction** for a research evaluation reform, based on 10 commitments, respecting the autonomy of organizations.

## 2. Commitments

## 3. CoARA

In particular, it includes the principles, commitments and timeframe for reforms and establishes the principles for a coalition of organizations willing to work together in implementing such reform.

## 4. Timeframe

### *Annexes*

1. The need for a research assessment reform
2. Glossary
3. Reform journey
4. Toolbox

- 1. Recognise the diversity of contributions to, and careers in, research in accordance with the needs and nature of the research**
- 2. Base research assessment primarily on qualitative evaluation for which peer review is central, supported by responsible use of quantitative indicators**
- 3. Abandon inappropriate uses in research assessment of journal- and publication-based metrics, in particular inappropriate uses of Journal Impact Factor (JIF) and h-index**
- 4. Avoid the use of rankings of research organisations in research assessment**

*5. **Commit resources** to reforming research assessment as is needed to achieve the organisational changes committed to*

*6. **Review and develop research assessment criteria, tools and processes***

*(For units and institutions - promoting interoperability - and for individuals and projects, with the direct involvement of researchers)*

**Supporting  
commitments**

*7. **Raise awareness** of research assessment reform and provide transparent communication, guidance, and training on assessment criteria and processes as well as their use*

*8. **Exchange practices and experiences** to enable mutual learning within and beyond the Coalition*

*9. **Communicate progress** made on adherence to the Principles and implementation of the Commitments*

*10. **Evaluate practices, criteria and tools** based on solid evidence and the state-of-the-art in research on research, **and make data openly available for evidence gathering and research***



## Coalition for Advancing Research Assessment

Our vision is that the assessment of research, researchers and research organisations recognises the diverse outputs, practices and activities that maximise the quality and impact of research. This requires basing assessment primarily on qualitative judgement, for which peer review is central, supported by responsible use of quantitative indicators.

## In practice...

CoARA will work to **enable systemic reform** based on common principles and to **facilitate information exchange and mutual learning**.

**+460 members** (end of May, 2023)

**Working Groups and National Chapters** are going to be defined and **will start working in a few weeks**

**Thank you!**  
**Questions?**

# References

ACRL, Principles and Strategies for the Reform of Scholarly Communication 1, 2003.

Agreement on Reforming Research Assessment, <https://coara.eu/agreement/the-agreement-full-text>

Budapest Open Access Initiative

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