



Open Science - From our Values to our Research Practice

Workshop “Offene Wissenschaft in der Praxis” | Weizenbaum-Institut

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Human-Centered Computing | Institute of Computer Science | Freie Universität Berlin

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DISCLAIMER

In the following talk,

- » I use the term Open Science even though the term Open Scholarship is more adequate because it also includes arts and humanities.
- » I present my personal perspective on this topic only and not the perspective of the Freie Universität Berlin.
- » I provide an introductory talk, but there are many more information to dig deeper.
- » I use examples from various disciplines with a strong bias towards psychology, however, these examples are not suitable for all disciplines.
- » I build upon previous talks from Felix Schönbrodt (LMU) and Benedikt Fecher (HIIG) on open science.

Our goal is
a tenured position.

You waste your time here,
go writing.

But stop...

What has been your motivation to choose
your profession?

Our Self-Image as Scientists

- » We as scientists are motivated by the desire for knowledge and discovery, and not by the possibility of personal gain. **Disinterestedness**
- » The results of our research processes should belong to the whole community. **Communality**
- » We as scientists must scrutinise our scientific claims critically before accepting them. **Organized skepticism**
- » Every scientists should be able to contribute to the scholarly process regardless of race, nationality, culture, or gender. **Universalism**

Science encompasses all disciplines, research, and teaching, as well as projects and the social sphere. Participation in knowledge and knowledge creation should be made accessible to as many people as possible.

Open Science opens the scientific process from the first idea to the final publication to make it as comprehensible and usable for everyone as much as possible.

“Open” means anyone can freely access, use, modify, and share for any purpose (subject, at most, to requirements that preserve provenance and openness) but also the use of open technologies and open culture.

Components of Open Science

Open Methodology

The application of methods and the entire process behind them, as far as practicable and relevant documentation.

Open Access

Publish openly and make it usable and accessible to everyone.

Open Source

Use open source technology (software and hardware) and open your technologies.

Open Peer Review

Transparent and traceable quality assurance through open peer review.

Open Data

Make created data freely available by considering the principles of FAIR data.

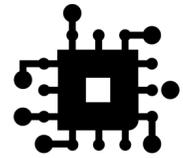
Open Educational Resources

Using free and open materials for education and university teaching.

What is New about Open Science?



Open Science translates well-known principles of good scientific practice into the digital age.



Open science means using open digital infrastructures for improving the scientific value creation in two regards



for the research community itself in terms of quality (e.g. verifiability of results) and quantity (e.g. efficiency and effectiveness of practice)



for the society in terms of communication and cooperation.

From Theory to Practice...

Open Access

Open Access

Open Sharing

Reproducibility

Open Review

Communication



Research Community

Organized Skepticism Dis-interestedness

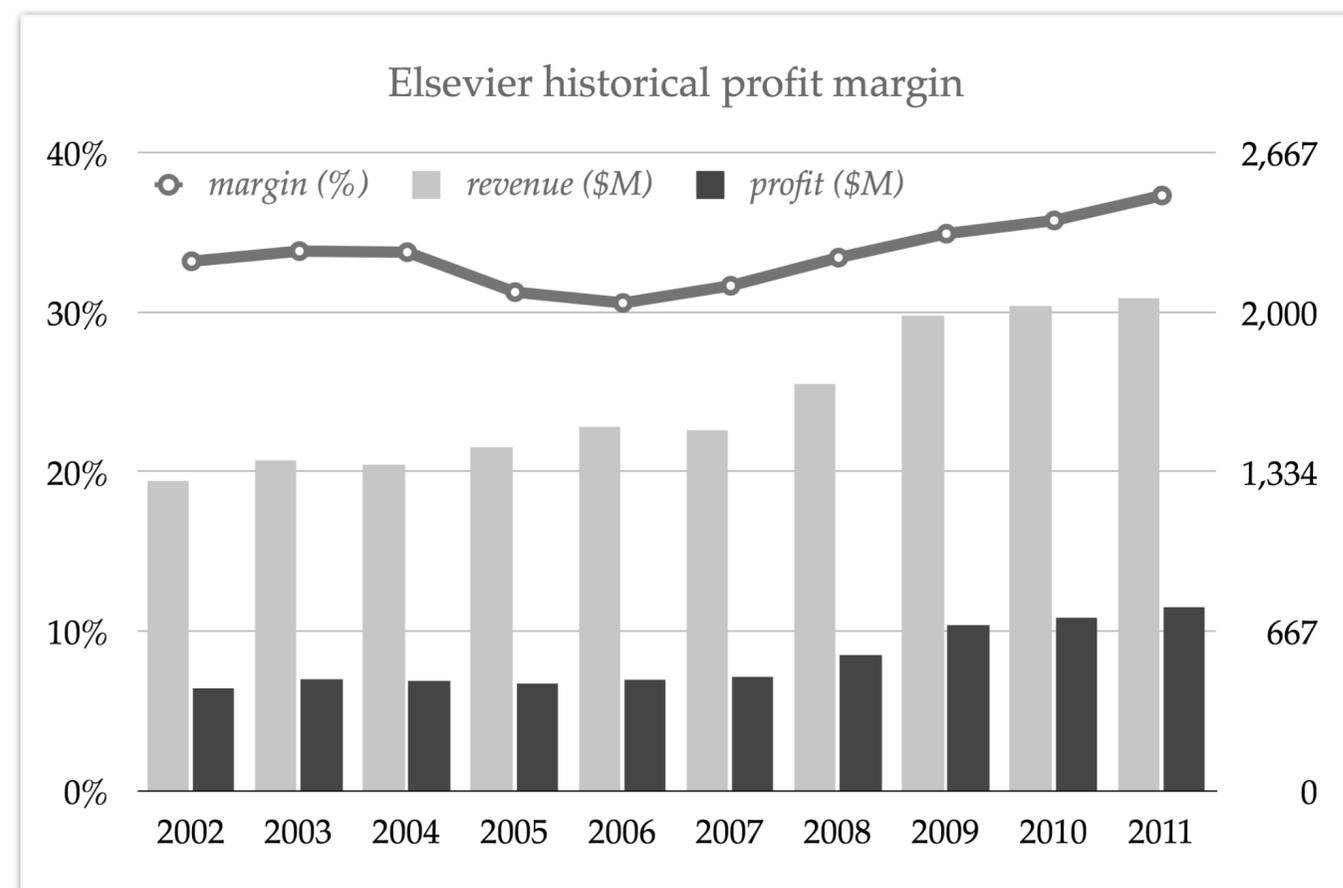
Communality



Open Access: Making our research accessible

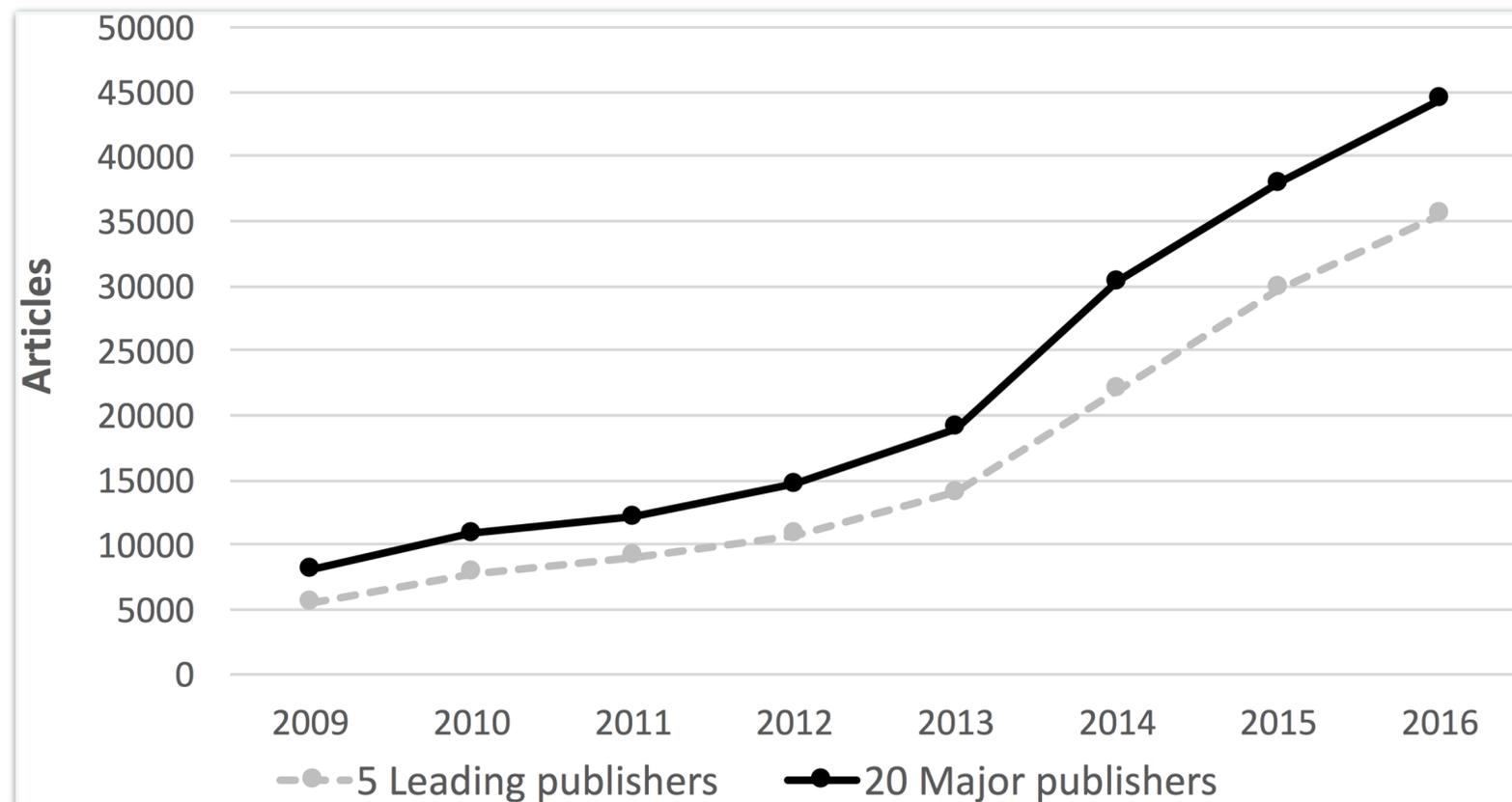
What is the Motivation for Open Access?

“It is argued (...) that research funded by tax-payers should be made available to the public free of charge so that the tax-payer does not in effect pay twice for the research (...)” (Phelps et al., 2012)



“As humanity progresses through the 21st century (...) many scholars point to the emergence of a disturbing trend: the world is dividing into those with ready access to knowledge and its fruit, and those without.” (Cribb & Sari, 2010)

What is the Current State of Open Access?



EU study that assessed the free availability of scholarly publications during the 1996 to 2013:

- » 50.9% of articles by German authors published in journals between 2007 and 2012 are now freely available online.
- » 71% of biomedical research publications and 35% in engineering are already Open Access.

Why is Open Access useful for your Career?

Number of Views:

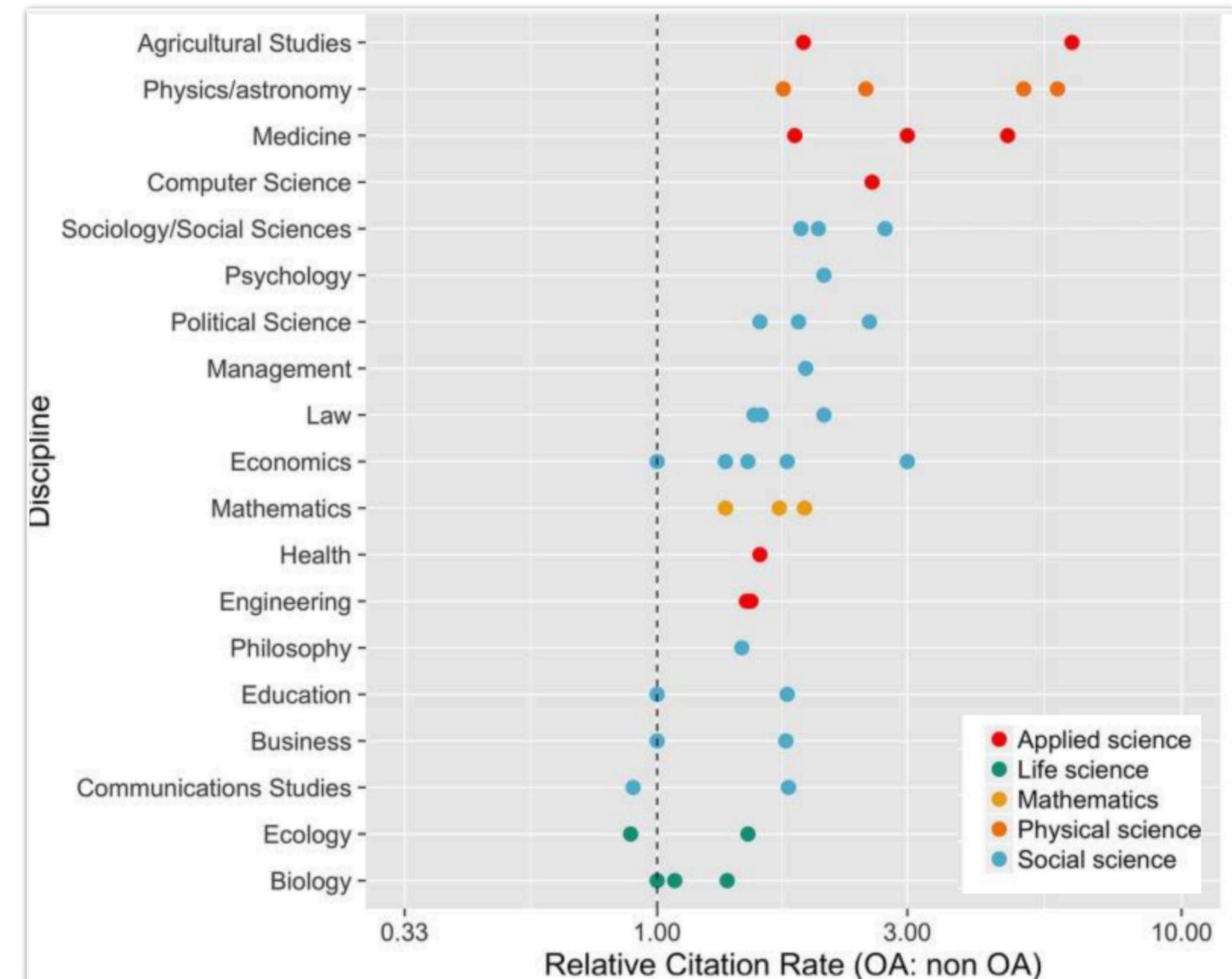
Open access articles are viewed three times more than non-open access content (Nature Communications).

Number of downloads:

Open access papers not only have higher total downloads (Wang et al., 2015).

Number of citations:

Articles published open access received higher citations than non-open access content (McKiernan & Bourne, 2016).



Open Methodology

Open Access

Reproducibility

Open Sharing

Communication

Open Review



Research Community

Organized Skepticism Dis-interestedness

Communality

Reproducibility:

Document and share our research practice

There is an increasing number of scientific publications



The screenshot shows a newsblog interface with a red header. The main article is titled "Global scientific output doubles every nine years" and is dated 07 May 2014. The article text discusses the rapid growth of scientific publications, citing a study by Bornmann and Mutz that found a doubling of output every nine years. The interface includes navigation links, social media icons, and a sidebar with "About this blog" and "Recent comments on this blog".

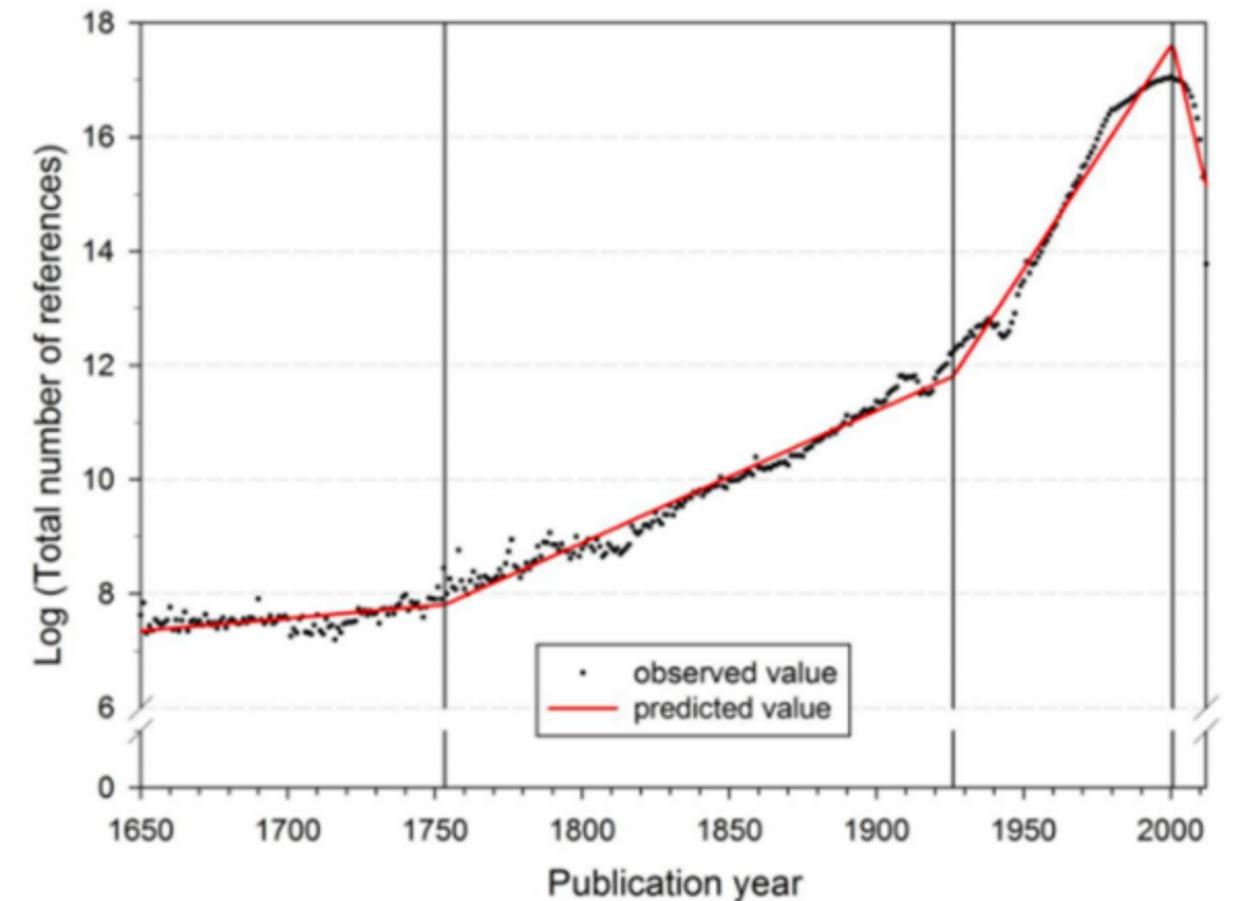


Figure 2. Segmented growth of the annual number of cited references from 1650 to 2012 (citing publications from 1980 to 2012)

At the same time the number of replications is small

NATURE | NEWS

Over half of psychology studies fail reproducibility test

Largest replication study to date casts doubt on many published positive results.

Monya Baker

27 August 2015

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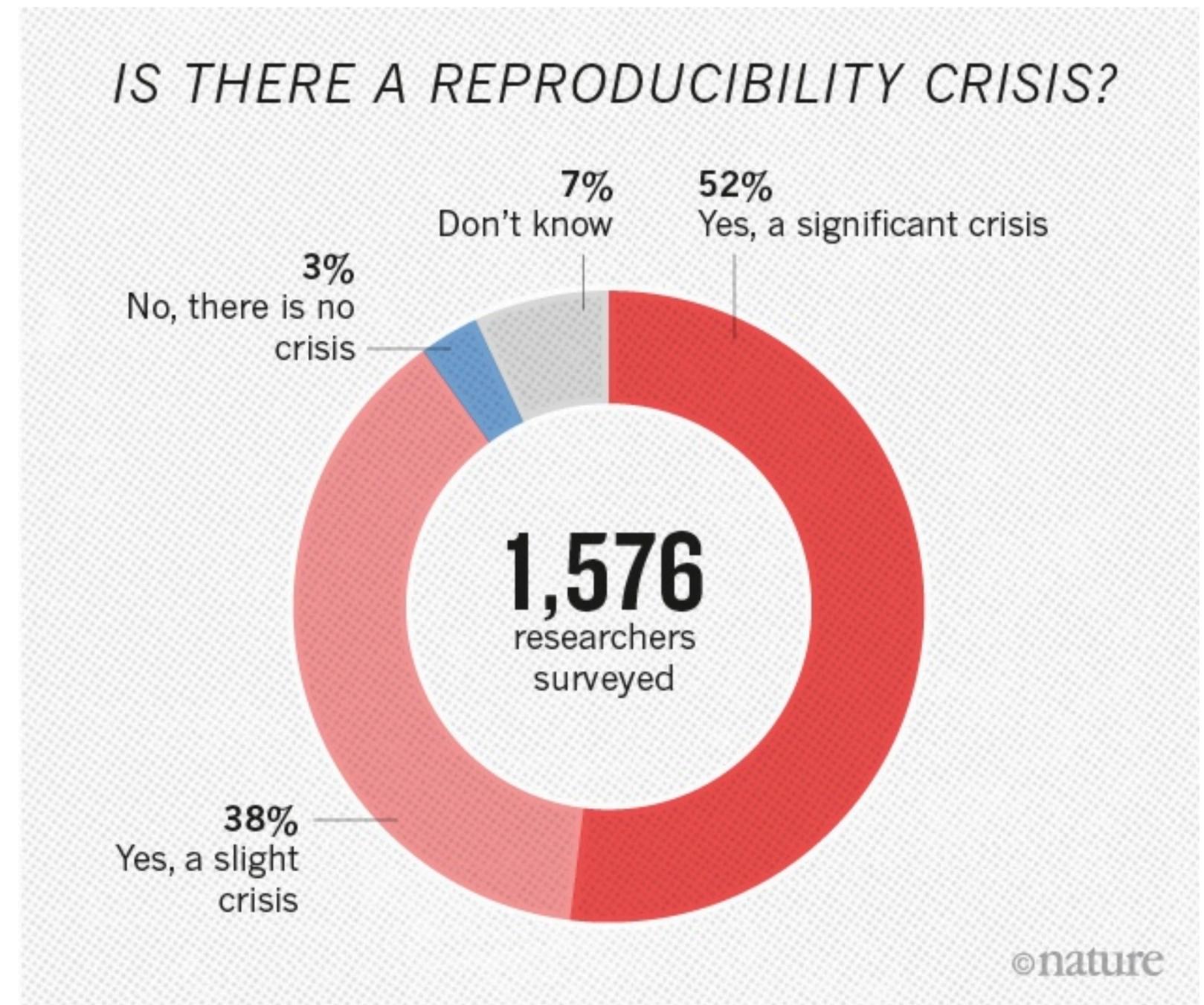
Don't trust everything you read in the psychology literature. In fact, two thirds of it should probably be distrusted.

In the biggest project of its kind, Brian Nosek, a social psychologist and head of the Center for Open Science in Charlottesville, Virginia, and 269 co-authors repeated work reported in 98 original papers from three psychology journals, to see if they independently came up with the same results.



Brian Nosek's team set out to replicate scores of studies.

The studies they took on ranged from whether expressing insecurities perpetuates them to differences in how children and adults respond to fear stimuli, to effective ways to teach arithmetic.



Replication help to strengthen our knowledge system

“The purpose of replication, or an attempt to replicate, is to strengthen the foundation of a theory so that it too will become a part of our general knowledge system. Another is to test its veracity or truth to determine if it should be supported as knowledge at all.” (Park, 2004)

Table 3. Degrees of replication

	Same measurement and analysis	Different measurement and analysis
Same data set	1. Checking the analysis	2. Re-analyzing the data
Same population	3. Exact replication	4. Conceptual extension
Different population	5. Empirical generalization	6. Generalization and extension

“I would recommend that researchers attempt to replicate the work of major researchers in a conceptual field before beginning an extension of that work [...]” (Park, 2004)

Open Educational Resources

Open Data

Open Sharing

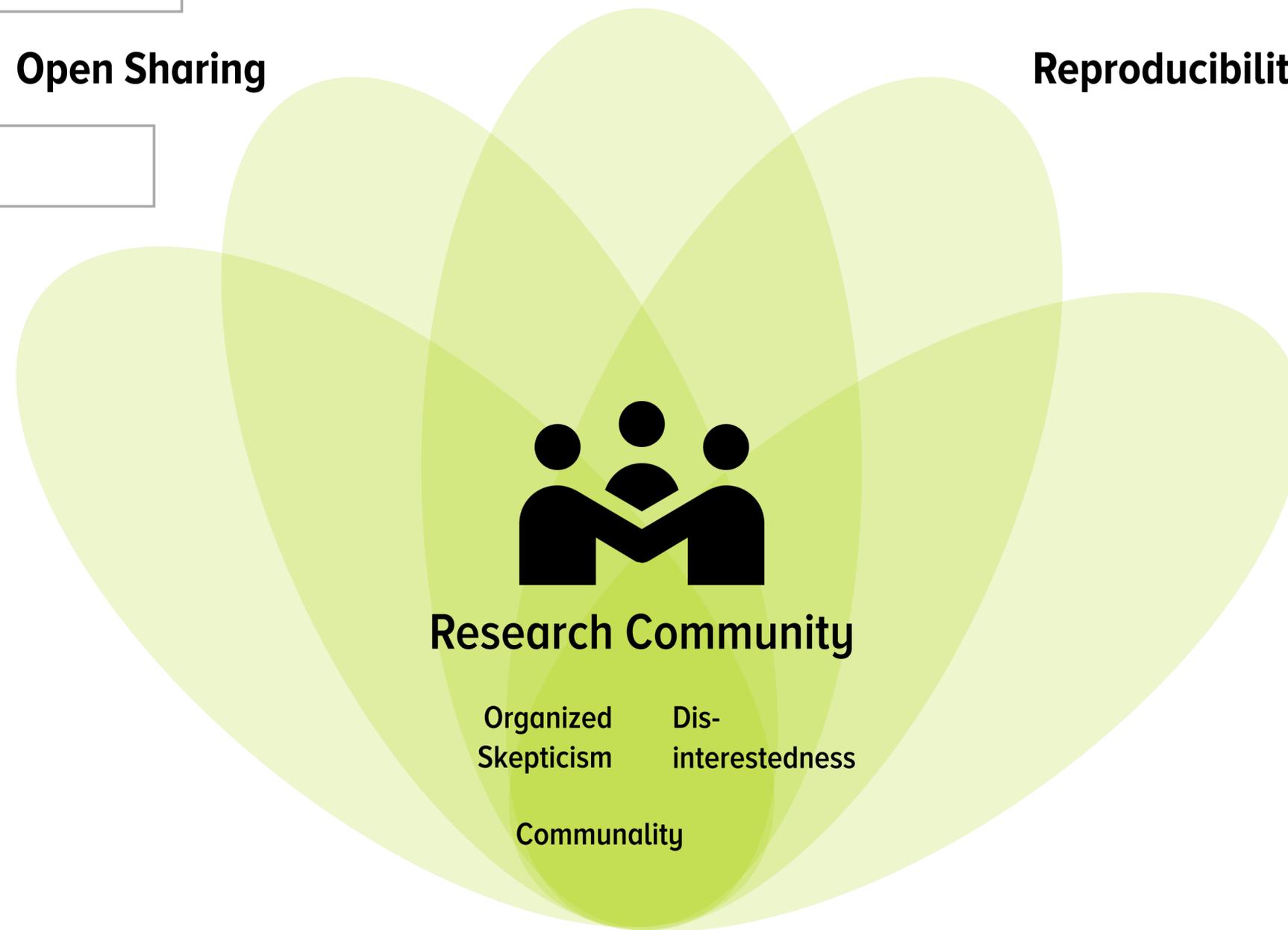
Open Source

Open Review

Open Access

Reproducibility

Communication



Research Community

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Open Sharing: Enable collaboration

Why do we need to share data?

Access to data is fundamental if researchers want to reproduce, verify and build on results that are reported in the literature. (HCSTC, 2011).

Open Data emphasises, besides openness, the importance of usability and access to the entire dataset or knowledge work in a convenient and modifiable form (Molloy, 2011).

FAIR data, for example, aims to realise valuable scientific data and knowledge to be published and utilised by making them findable, accessible, interoperable, and reusable (Wilkinson et al., 2016).

re3data.org
REGISTRY OF RESEARCH DATA REPOSITORIES

Search...

Search

zenodo

How should we share our data?

100% of authors in the following studies signed to share the data upon request.

Actual sharing rate

- » **27%** out of 141 requests (Wicherts et al., 2006)
- » **38%** out of 394 requests (Vanpaemel et al., 2015)
- » **44%** out of 204 requests provided some „artifacts“ (Stodden et al., 2018), where 26% could be reproduced.

» „Sharing upon request“ does not work.

8.14 Sharing Research Data for Verification

(a) After research results are published, psychologists do not withhold the data on which their conclusions are based from other competent professionals who seek to verify the substantive claims through reanalysis and who intend to use such data only for that purpose, provided that the confidentiality of the participants can be protected and unless legal rights concerning proprietary data preclude their release. This does not preclude psychologists from requiring that such individuals or groups be responsible for costs associated with the provision of such information.

(b) Psychologists who request data from other psychologists to verify the substantive claims through reanalysis may use shared data only for the declared purpose. Requesting psychologists obtain prior written agreement for all other uses of the data.

Ethical Principles of Psychologists and Code of Conduct
<https://www.apa.org/ethics/code/index.aspx>

Policies can “help” sharing data



We expect our researchers to **maximise the availability of research data, software and materials with as few restrictions as possible**. As a **minimum, the data underpinning research papers should be made available** to other researchers at the time of publication, as well as any original software that is required to view datasets or to replicate analyses. (<https://wellcome.ac.uk/funding/managing-grant/policy-data-software-materials-management-and-sharing>)



Deutsche
Forschungsgemeinschaft

All the findings of the project must be announced to the relevant community and **made available for use free of charge**, also to third parties. **Disclosure of any source code produced is mandatory**; project results must be made available as an open source in a suitable location. (http://www.dfg.de/en/research_funding/programmes/infrastructure/lis/funding_opportunities/research_data/)



„expects and supports the timely release and sharing of final research data“



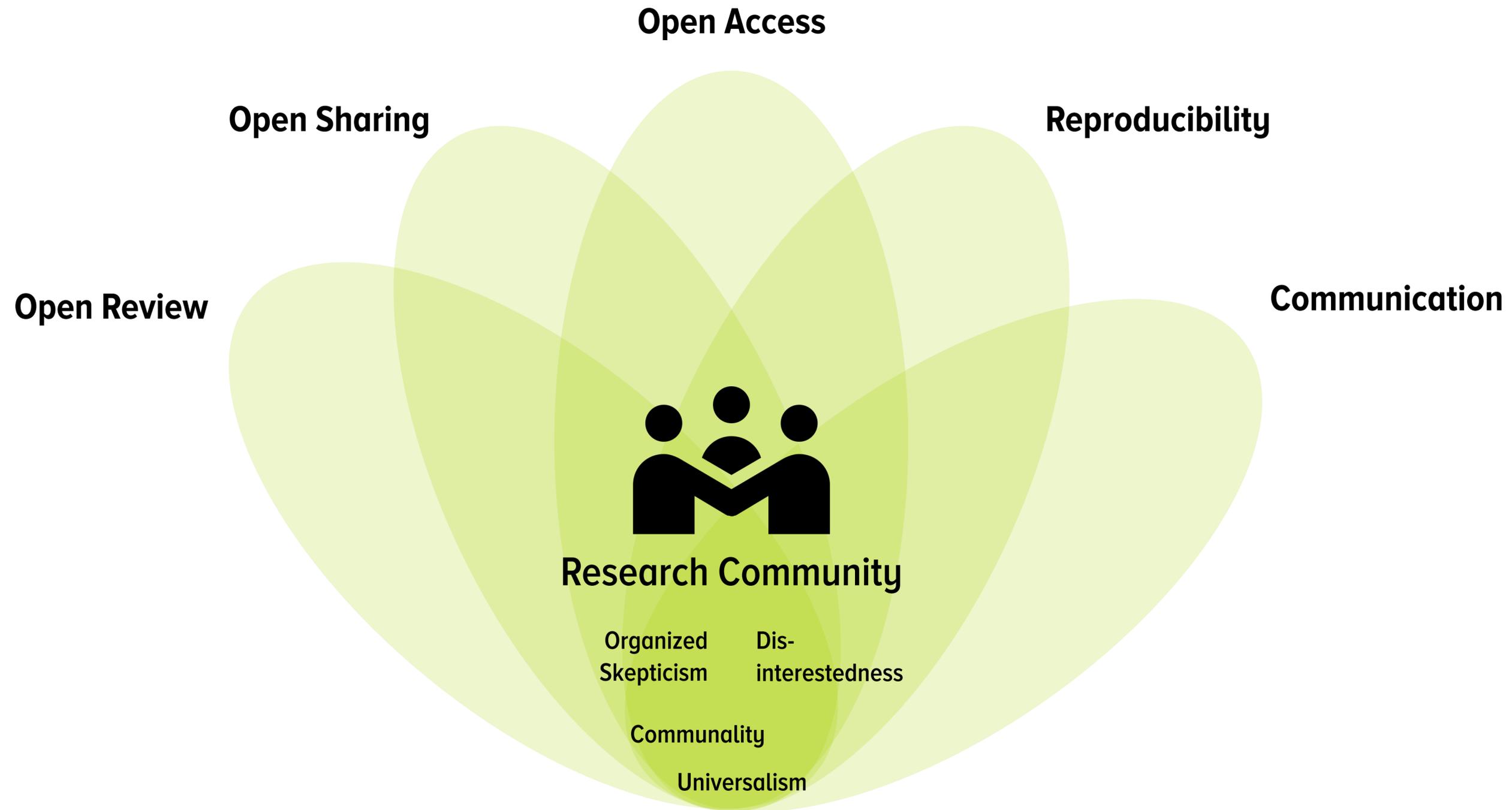
SCHWEIZERISCHER NATIONALFONDS
ZUR FÖRDERUNG DER WISSENSCHAFTLICHEN FORSCHUNG

„erwartet der SNF, dass Daten [...] auf öffentlich zugänglichen, digitalen Datenbanken archiviert werden“



„It is recommended to make all research data [...] available for reuse, for example under Creative Commons licence“





Making Science Understandable

“Science is by nature complicated, making it all the more important that good science writing should be simple, clean and clear” (Cribb & Sari, 2010).



“Scientists must be able to explain what they do to a broader public to garner political support and funding for endeavors whose outcomes are unclear at best and dangerous at worst, a difficulty that is magnified by the complexity of scientific issues” (Puschmann, 2014)



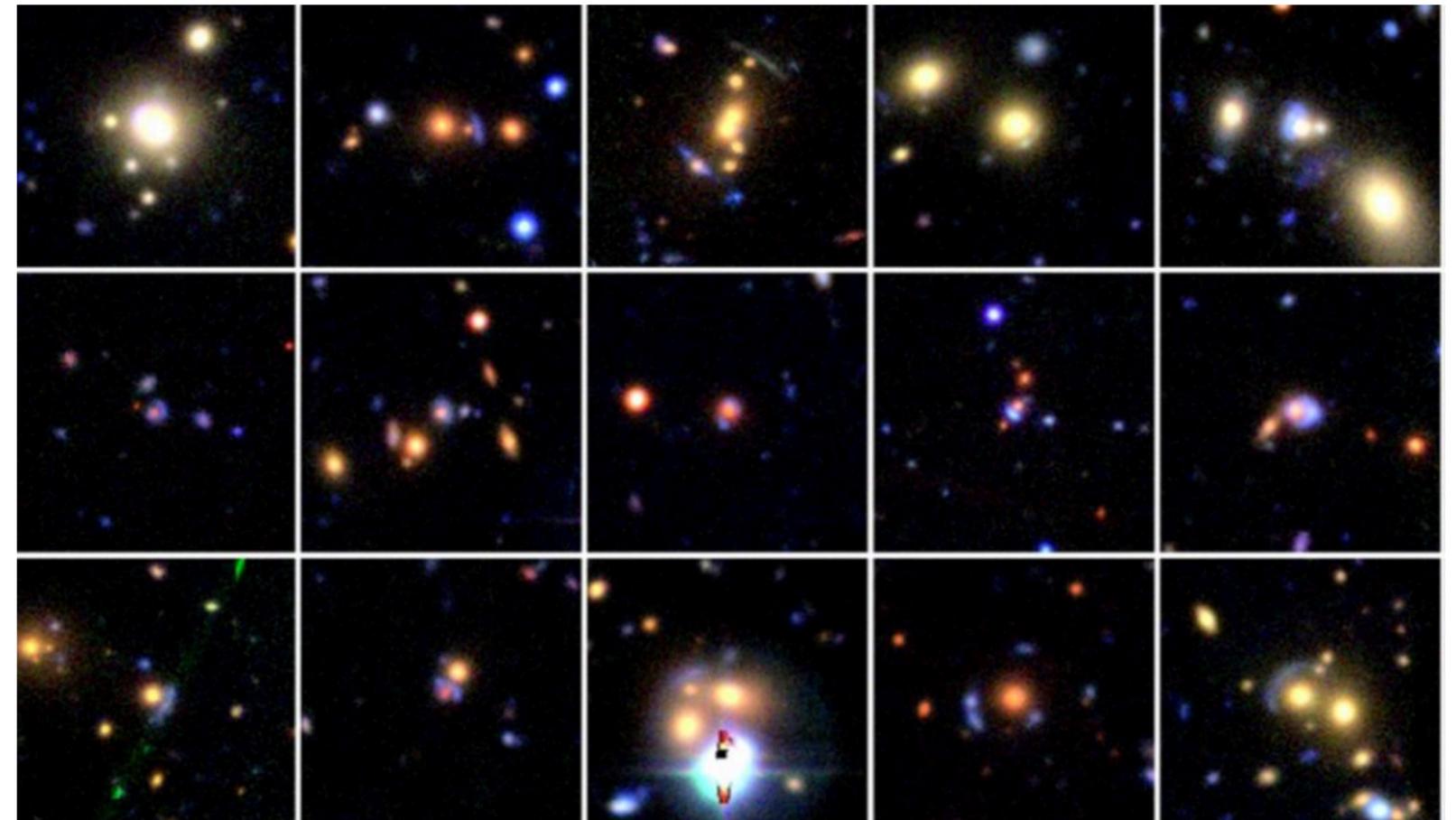
Including Citizen in Knowledge Creation



You don't have to be a scientist to do science.

By simply running a free program, you can help advance research in medicine, clean energy, and materials science.

[Join Rosetta@home](#)

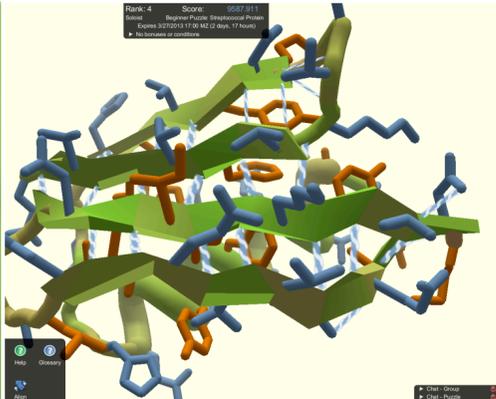


<https://www.zooniverse.org/>



foldit BETA

Solve Puzzles for Science



What could be your next steps?

How to engage in Open Science?



- 1. Submit pre-prints of your manuscript to publicly available repositories.** Many major journals allow the posting of pre-prints to open repositories, e.g. arxiv.org, prior to submission and peer review.
- 2. Post published articles in a public repository** (e.g. Pubmed Central). Typically, 6–12 months after publication, most publishers allow the posting of an author’s version of the manuscript to public repositories.
- 3. Publish in open access journals where possible.** Many subscription-based journals also offer the option to pay an additional charge for open access.
- 4. Share data and material.** The code, methods, and data to produce findings in your manuscript should be made publicly available in an open repository equipped with credit metrics for data generator, code writer, and data reuser. These metrics should be based upon real and precise utility and should be transparent so that others can derive their own metrics from them.

My last comment

We need a cultural change which starts with you but it must include the scientific system as a whole.

*What is the current situation of scientists? Check out hashtag **#unbezahlt** on Twitter.*

Discussion