Introduction to open and reproducible research

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Roadmap

- Why open research?
- Open research plans, materials, data, analyses, publishing: why, how and where?
- Open research and reproducibility
- Take-aways
- Q&A time!

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

BMC Medical Research Methodology

COMMENTARY Open Access

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

Lonni Besançon[1,2*], Nathan Peiffer-Smadja[3,4], Corentin Segalas[5], Haiting Jiang[6], Paola Masuzzo[7], Cooper Smout[7], Eric Billy[8], Maxime Deforet[9] and Clémence Leyrat[5,10]

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

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https://bmcmedresmethodol.biomedcentral.com/articles/10.1186/s12874-021-01304-y

TECHNOLOGY FEATURE | 24 April 2020

Open science takes on the coronavirus pandemic

Data sharing, open-source designs for medical equipment, and hobbyists are all being harnessed to combat COVID-19.

Mark Zastrow

A student in Warsaw assembles 3D-printed protective masks. Credit: Jaap Arriens/NurPhoto/Getty

https://www.nature.com/articles/d41586-020-01246-3

Kaitlyn M. Werner, PhD
@kaitlynmwerner

Open science truly is beautiful. Someone recommended a paper w. open data relevant to this question. Within minutes I was able to analyze my question because the data/code was so beautifully and efficiently organized -- the best I've seen! Major props to @russpoldrack and team.

> **Kaitlyn M. Werner, PhD** @kaitlynmwerner · May 1
> I have been thinking a lot about socioeconomic status and self-control/self-regulation. I'm starting to plan an esm+diary study where I can start digging into this topic in more detail, but in the meantime I'm curious: what are the interesting papers you've read in this space?
> Show this thread

11:52 PM · May 9, 2022 · Twitter Web App

Open science means transparency and **knowledge-sharing** in research processes to make knowledge **accessible** across academic groups, sectors and national boundaries. The concept of open science encompasses the entire research process […].

- The Research Council of Norway. Policy for open science 2020

"**Open Science** is becoming the modus operandi for carrying out research and innovation by **sharing knowledge, data and tools** as early as possible, in open collaboration with all relevant knowledge actors and society."

ec_rtd_horizon-europe-strategic-plan-2021-24.pdf (europa.eu)

“**Open Science** has the potential of making the scientific process more **transparent**, **inclusive** and **democratic**. It is (…) a true game changer in bridging the science, technology and innovation gaps and fulfilling the **human right to science**.”

UNESCO Recommendation on Open Science

https://youtu.be/I3Wkvx_ZaFo
https://www.unesco.org/en/natural-sciences/open-science

Changing research assessment system

Towards a reform of the research assessment system

Scoping Report

https://op.europa.eu/en/publication-detail/-/publication/36ebb96c-50c5-11ec-91ac-01aa75ed71a1/language-en/

Read final agreement here: https://research-and-innovation.ec.europa.eu/news/all-research-and-innovation-news/reforming-research-assessment-agreement-now-final-2022-07-20_en

The Netherlands:

nature > career news > article

CAREER NEWS | 25 June 2021

Impact factor abandoned by Dutch university in hiring and promotion decisions

Faculty and staff members at Utrecht University will be evaluated by their commitment to open science.

Chris Woolston

"By early 2022, every department at Utrecht University in the Netherlands will judge its scholars by other standards, including their commitment to **teamwork** and their efforts to promote **open science**"

https://www.nature.com/articles/d41586-021-01759-5

Germany:

Information for Researchers No. 61 | 1 September 2022

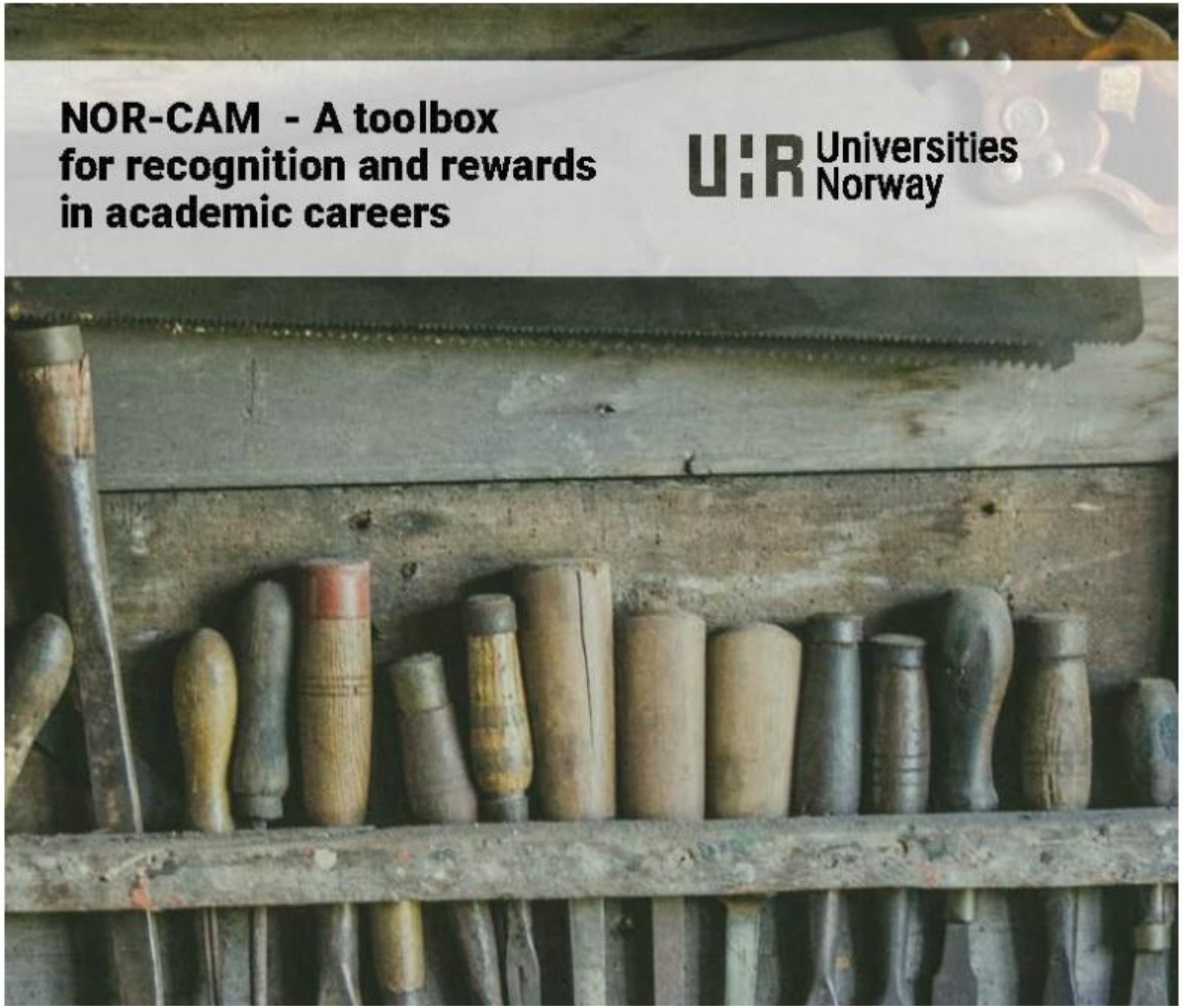
Package of Measures to Support a Shift in the Culture of Research Assessment

DFG changes proposal forms and introduces mandatory CV template / The aim is to support a shift in the culture of research assessment / Improvement of equal opportunity practices

"…CV can therefore now list up to ten further sets of research outcomes and findings that have been publicised in a variety of other ways, including articles on preprint servers, **datasets** or **software packages**"

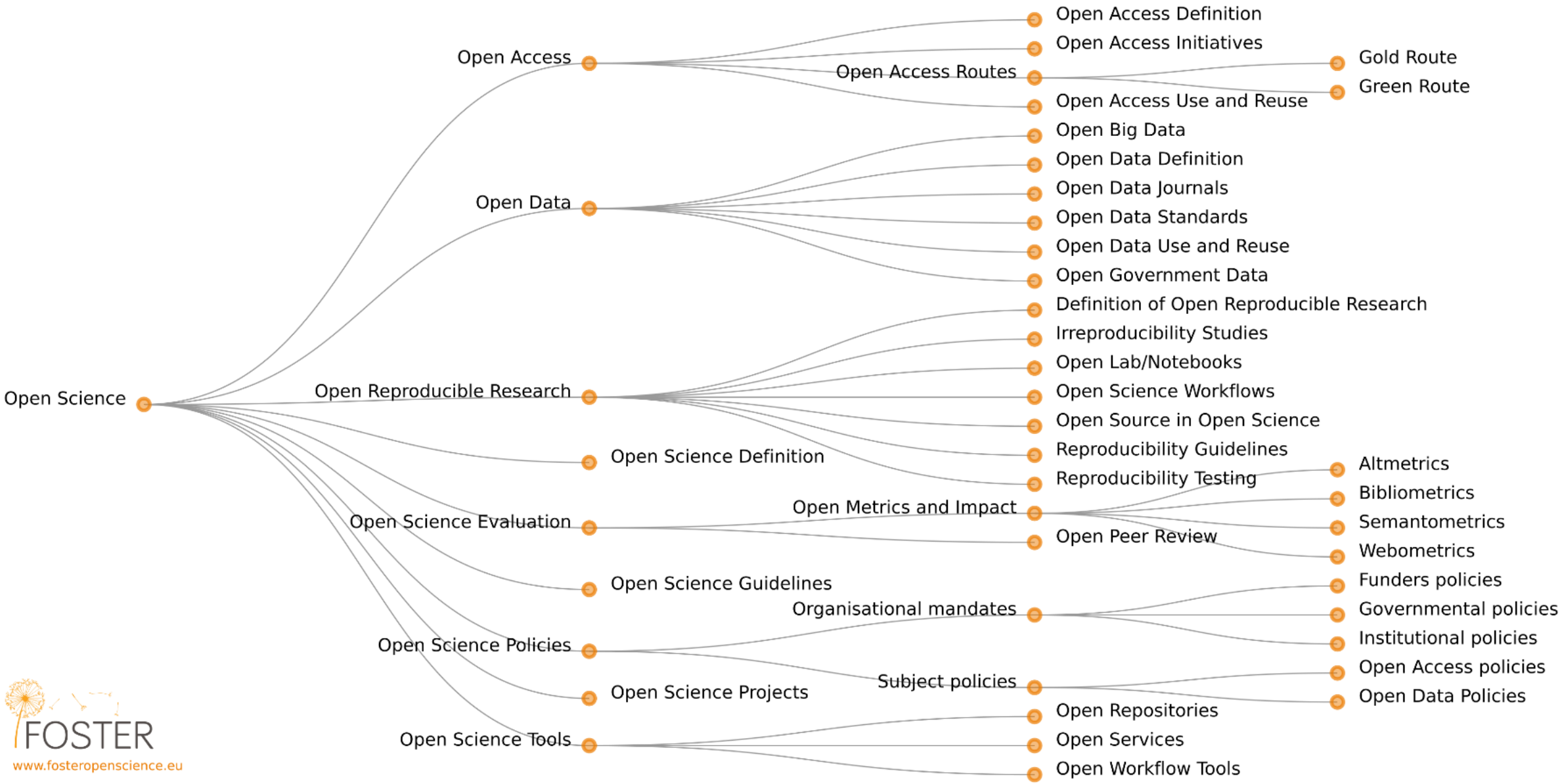
https://www.dfg.de/en/research_funding/announcements_proposals/2022/info_wissenschaft_22_61/index.html

Changing research assessment system – in Norway



https://www.uhr.no/en/front-page-carousel/nor-cam-a-toolbox-for-recognition-and-rewards-in-academic-careers.5780.aspx

Open Science Taxonomy

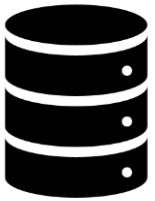


FOSTER
www.fosteropenscience.eu

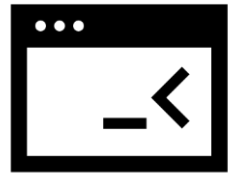
Open research plans

Open materials

Open data



Open analyses

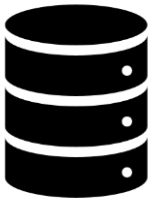


Open publishing

Open research plans

Open materials

Open data



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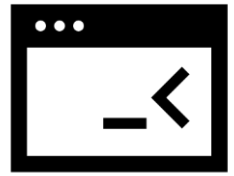


Open publishing

Open research plans: why?

- More **visibility** to research ideas and plans early in the process as well as null results
- Clearer **distinction** between what was planned and what was not planned ahead (e.g. your *post hoc* analyses)
- Reduced researcher **biases** (less data/statistics manipulation)
- You will **think more deeply** about your research design and planned analyses
- You can claim credit for your **research ideas**!

Open research plans: how?

Preregister!

Specify the **research design**, **hypotheses**, and/or **analysis plan** prior to observing the outcomes of a study.

Typically in a form of a time-stamped, frozen document made available on an online platform.

Open research plans: where?

Focus	Type of research	Platform	Template
Discipline-specific	Clinical research	clinicaltrials.gov	Generic
	Animal research	animalstudyregistry.org	Generic
	Economics/Social sciences	socialscienceregistry.org	Generic
Discipline-general	Basic research	aspredicted.org	Generic
		osf.io/registries	Structured, Unstructured, Qualitative research, Replications, etc.

Open research plans

Time and place: Oct. 17, 2022 9:00 AM–10:30 AM, Zoom Add to calendar

Preregistration of research studies

Learn about what preregistration is and how to preregister your own studies.

Time and place: Oct. 21, 2022 9:00 AM–10:30 AM, Zoom Add to calendar

Preregistration on Open Science Framework (OSF)

Learn about how to preregister your study on Open Science Framework (OSF) and how to navigate the platform.

https://www.ub.uio.no/english/courses-events/courses/other/research-reproducibility/

Need help with preregistration?

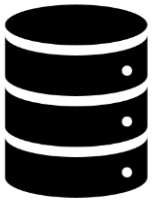
Get in touch with:

agata.bochynska@ub.uio.no

Open research plans

Open materials

Open data



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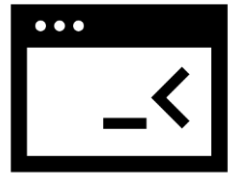

Open publishing

Open research plans

Open materials

Open data

Open analyses

Open publishing

Open materials: why?

- Enable **re-use** of different materials used in research (and reduce resources for development of tools, instruments, stimuli, etc)
- Make it easier for others to see **how (exactly) your study looked**
- Allow for **validating** your research
- Allow for **replicating** your research by other investigators or research groups

Open materials: how?

- Make sure that the materials are not **copyrighted** (when you make them fully open)
- Provide all materials with clear, consistent **names**
- Create comprehensive **documentation**
- Provide detailed **instructions** on how to use the materials (including a **license** for reuse)

Open materials: where?

- Upload on your personal/lab/institutional website
- Upload in an online repository

zenodo

Open Science Framework

figshare

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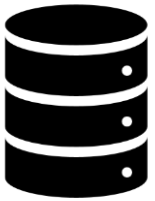
https://zenodo.org/
https://osf.io/
https://figshare.com/

Open research plans

Open materials

Open data



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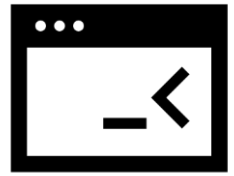
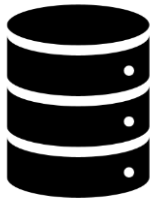


Open publishing

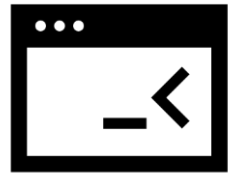
Open research plans

Open materials

Open data

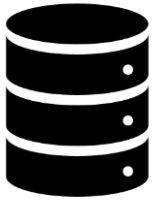


Open analyses



Open publishing

Open data: why?



External Factors

- Funder requirements
- Publisher requirements

Career Benefits

- Increased visibility
- More data reuse
- New collaborations
- Increased citations

Scientific Progress

- More robust research
- Enables verification of results
- Enables new collaborations across disciplines and borders
- Opens up for new uses of data
- Avoids duplication
- Easier to use data in teaching

Research Data Policy at UiO

1. Research data shall be made **openly available for further usage**
2. Research data should be **made available at an early stage**
3. Research data shall be **provided with a data management plan**
4. Research data shall **have metadata and be documented**
5. Research data must be **securely archived**
6. Research data shall be provided with **licenses for access, reuse and redistribution**
7. Research data should be **made freely available, but the actual distribution cost should be covered**

https://www.uio.no/english/for-employees/support/research/research-data-management/policies-and-guidelines/

Open data: how?

https://twitter.com/mads100tist/status/1366103674989277185

Open data: how?

- Data availability statements (“data available upon request”) do not work - deposit data in a **data repository** (data archive)
- Apply consistent, meaningful, and compatible **file naming**
- Choose accessible, patent-free, and open **file formats**
- Make sure you have the necessary **documentation** (and metadata)
- **Reduce complexity** by grouping large groups of similar files in zip bundles (and check any size limitations of the repository)

Open data: where?

- General purpose repositories (Zenodo, OSF, Figshare)
- National or institutional repositories (DataverseNO, Sikt/NSD)
- Discipline-specific repositories
- Data papers
- Supplementary materials to an article

Research data

Research data

- Time and place

Good research data management plays an essential role in Open Science, which is increasingly important for scholars around the globe. The University Library provides courses on key concepts as a part of the Skills Development for Research Data project.

We can provide training on the following topics:

- Introduction to research data management (RDM)
- Current data management policies (UiO, Research Council of Norway, EU)
- Data management planning
- Data organization
- Metadata and documentation
- Data classification and storage
- Sharing and archiving research data
- Copyright and licensing
- Data discovery and reuse

https://www.ub.uio.no/english/courses-events/courses/other/research-data/

Upcoming sessions

Introduction to research data management

Nov. 3, 9:00 AM, Zoom

Data management planning

Nov. 4, 9:00 AM, Zoom

Data organization, metadata, and documentation

Nov. 9, 9:00 AM, Zoom

Data classification and storage selection

Nov. 11, 9:00 AM, Zoom

Copyright and licensing

Nov. 14, 1:00 PM, Zoom

Sharing and archiving research data

Nov. 16, 9:00 AM, Zoom

Finding and reusing research data

Nov. 18, 9:00 AM, Zoom

https://www.ub.uio.no/english/courses-events/courses/other/research-data/

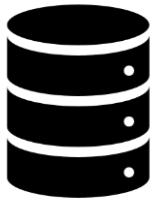
Need help with research data?

Send an email to research-data@uio.no

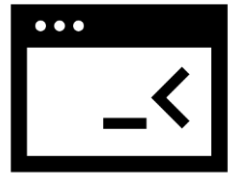
Open research plans

Open materials

Open data



Open analyses

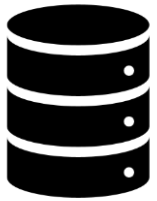


Open publishing

Open research plans

Open materials

Open data



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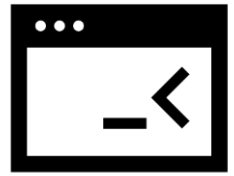
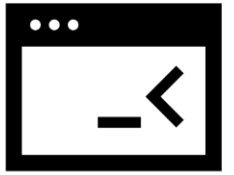


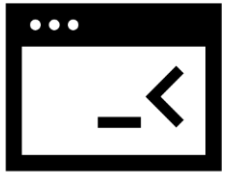
Open publishing

Open analyses: why?



- Makes it easier for you to **re-use** your analyses/code
- Makes it possible for others to **re-run** your analyses
- …and spot mistakes (if there are any)
- …or use your code as an inspiration!
- Allows for **verification** of the results (e.g. during peer-review process)

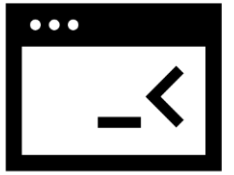
Open analyses: how?



- If you use point-and-click software (Excel, SPSS) write notes that reflect your **workflow**
- If you use code, **annotate** it clearly
- Use **version control** system (e.g. Git)
- Consider using **containers** (capture computational environment)

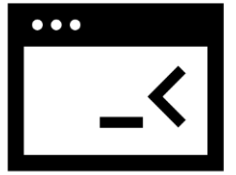
More on reproducible environments: https://the-turing-way.netlify.app/reproducible-research/renv.html

Open analyses: where?



- Share analysis code as a **text file**
- Share your analyses through **GitHub** (especially if you use Git as your version control system)
- Use **shareable notebooks** (e.g. Jupyter)
- If you use containers, share a ‘frozen’ version of your code through any platform/repository you use

Open analyses: where?



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Menu ← Services and tools ← IT services

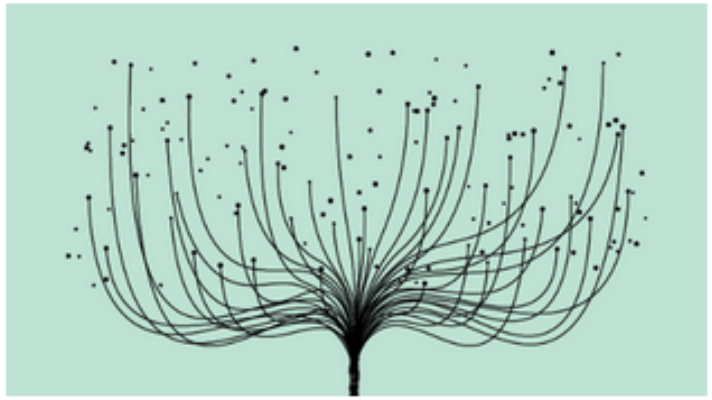
IT Services for Research

Norwegian version of this page

Research Platforms →	Computations (HPC) →	Storing Research Data →
Research Statistics →	Data Collection and Analysis →	Research Data Management →
Publish, Write and Cite →	Presenting Data in GIS and Maps →	

https://www.uio.no/english/services/it/research/

Open analyses



Time and place: Oct. 26, 2022 1:00 PM–2:30 PM, Zoom Add to calendar

Reproducible research workflows

Learn about tools and practices for more reproducible and effective research.

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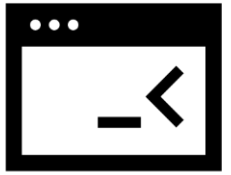
https://www.ub.uio.no/english/courses-events/courses/other/research-reproducibility/

Open analyses



Carpentry: Training on foundational coding and data science skills

At University of Oslo (UiO), Carpentries workshops based on Software Carpentry, Data Carpentry, and Library Carpentry lessons are offered to facilitate sharing and re-using of code and data among graduates and researchers from all faculties and units.

Carpentry: Version Control with Git

Nov. 4, 9:00 AM, Domus Theologica: Room 214

Carpentry: R for Reproducible Scientific Analysis (Novices)

Nov. 22, 9:00 AM, Domus Theologica: Room 214

Data Carpentry: Social Sciences and Humanities Using R, November 24 and 25

Nov. 24, 9:00 AM, Kristine Bonnevies hus, Room 3127

Data Carpentry: Social Sciences and Humanities Using R, November 24 and 25

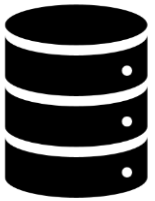
Nov. 25, Kristine Bonnevies hus, Room 3127

https://www.ub.uio.no/english/courses-events/courses/other/Carpentry/

Open research plans

Open materials

Open data



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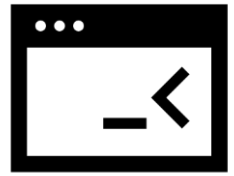

Open publishing

Open research plans

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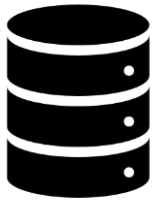

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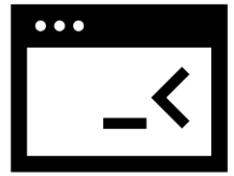
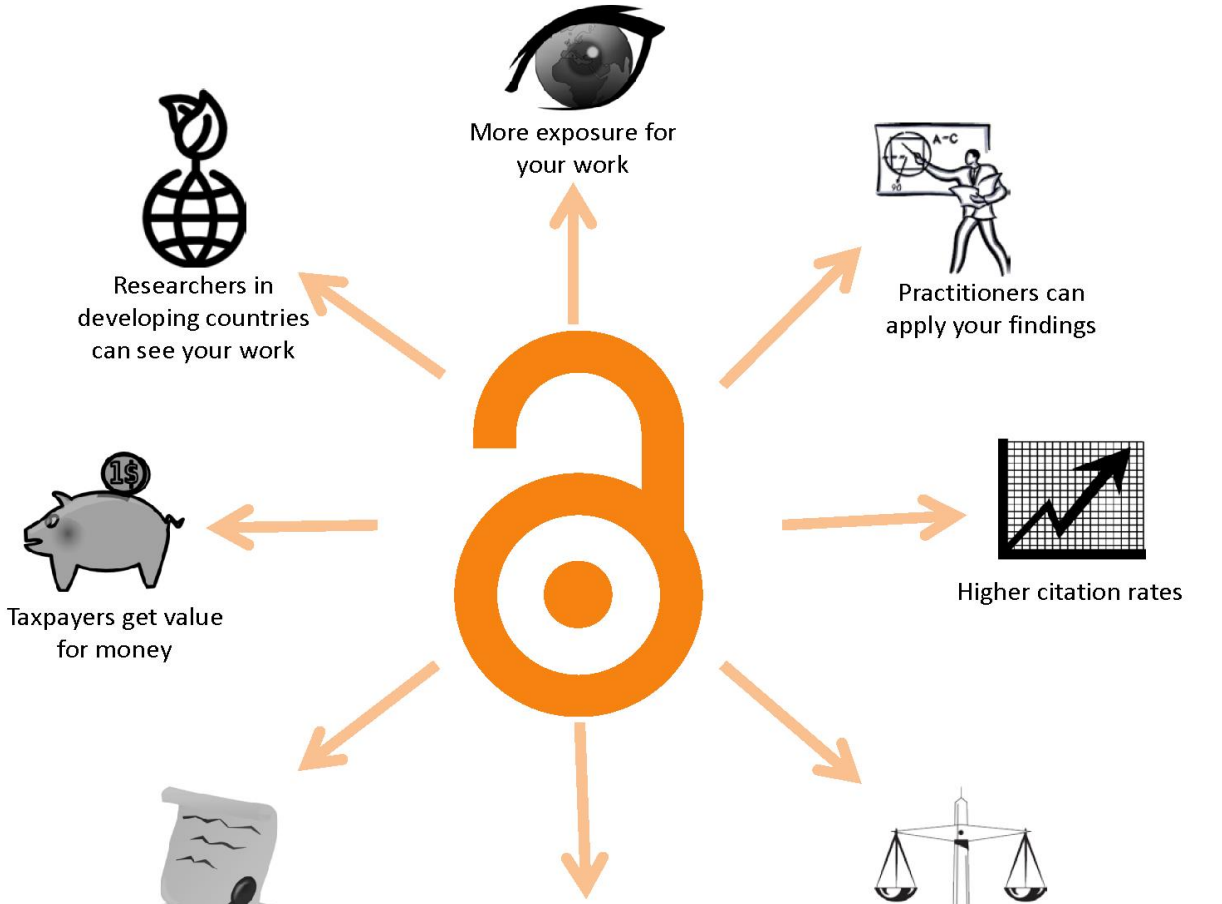


Open publishing

Open publishing: why?



Open publishing: how?

What requirements apply? Funds from RCN, EU, etc.? Institutional requirements?

- https://www.ub.uio.no/english/writing-publishing/open-access/research-funders.html

Find a journal/publisher and check UiO's website if we have an agreement.

- https://www.ub.uio.no/english/writing-publishing/open-access/deals-and-discounts/index.html

If you do not publish open access (OA), check the journal's policy for self-archiving.

- https://v2.sherpa.ac.uk/romeo/

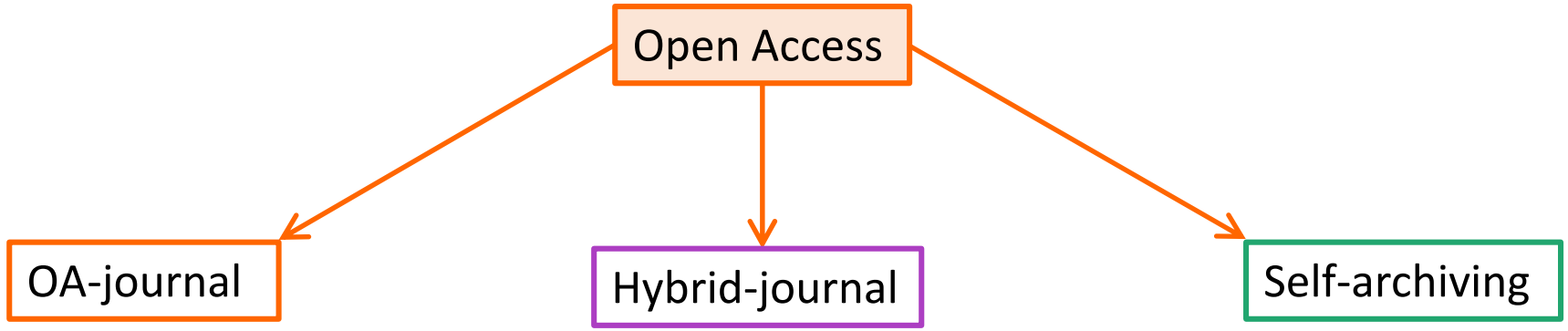
Is it a legitimate journal?

- Check Kanalregisteret; if Gold OA check DOAJ; Read more here: Think. Check. Submit.

Plan S (RCN funds)?

- Use Journal Checker Tool to see if the journal is compliant.

Open publishing: where?



- Without APC = **Diamond OA**
- With APC = **Gold OA**

DOAJ

https://doaj.org/

- Traditional journals → reseracher pays APC to open up an article → library pays access
- With APC
- Majority of them

= **Green OA**

- Publishing in a traditional journal with archiving of one version of your article in DUO via Cristin
- Always check journal's/publisher's rules about which article-version can you self-archive

Sherpa Romeo

https://v2.sherpa.ac.uk/romeo/

APC = Article processing charge

Open publishing

OA-publishing and research visibility

Keep copyrights to your own work by publishing in Open Access journals. Find out your research impact. The course gives you practical support in publishing process and making your research visible.

OA-publishing and research visibility

Nov. 10, 9:00 AM, Zoom

https://www.ub.uio.no/english/courses-events/courses/other/medicine-publishing/

https://www.ub.uio.no/english/writing-publishing/open-access/index.html

Open Access

Norwegian version of this page

Open Access

- Self-archiving
- Plan S
- Publishing deals and discounts
- Publish Open Access

It is the University of Oslo's goal that research results shall be openly available to individuals, the public sector, trade and industry, and the global research community.

Publishing Open Access? →

How do I publish Open Access, and how do I avoid fraud?

Requirements for Open Access →

Open Access requirements from University of Oslo, Plan S / Research Council of Norway, EU and the Government.

Open Access-agreements →

UiOs deals and discounts for Open Access publishing.

Research Data Management →

The UiO policy and guidelines. Help and advice on managing research data.

Self-archiving →

How to self-archive in DUO research archive via Cristin. Information on self archiving and other archives.

About Open Access →

What is Open Access? Which advantages does it give you? The paths to Open Access.

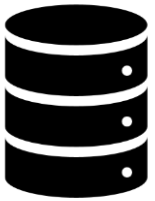
Need help with open access?

Send an email to openaccess@ub.uio.no

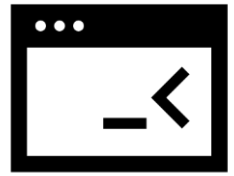
Open research plans

Open materials

Open data



Open analyses

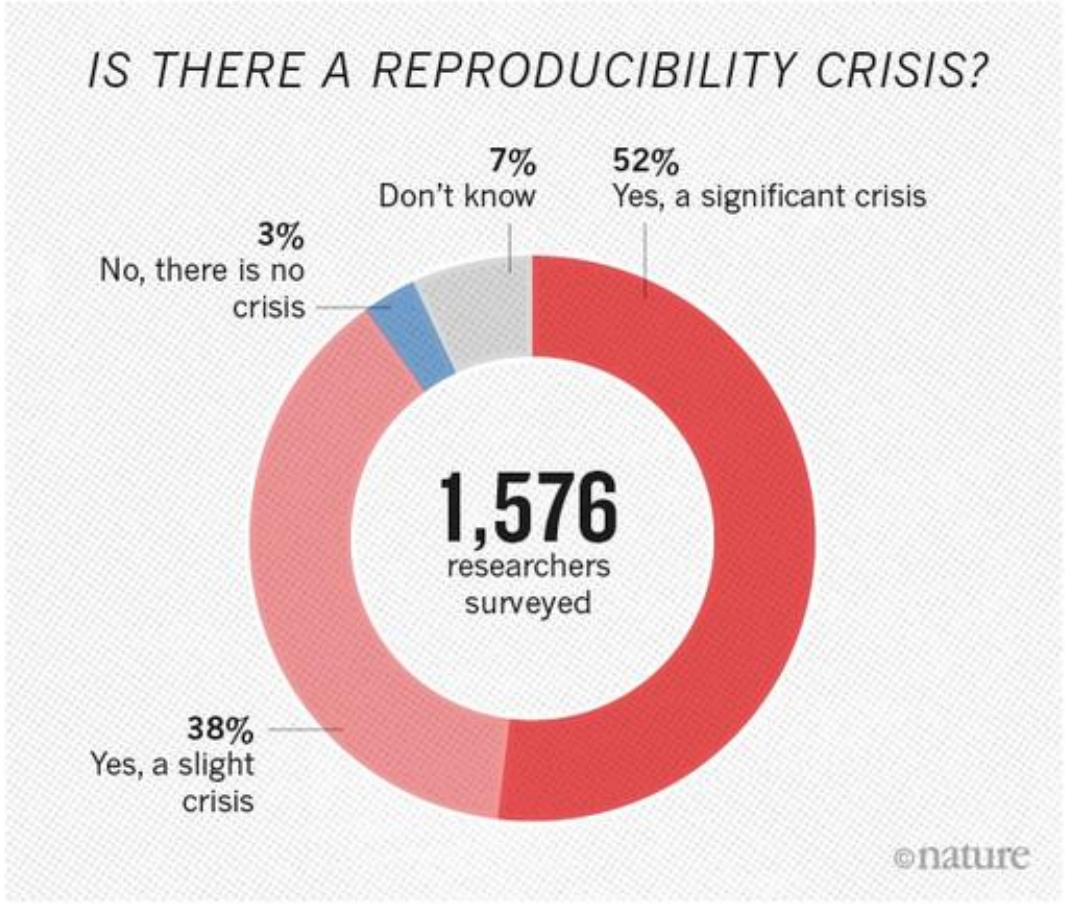


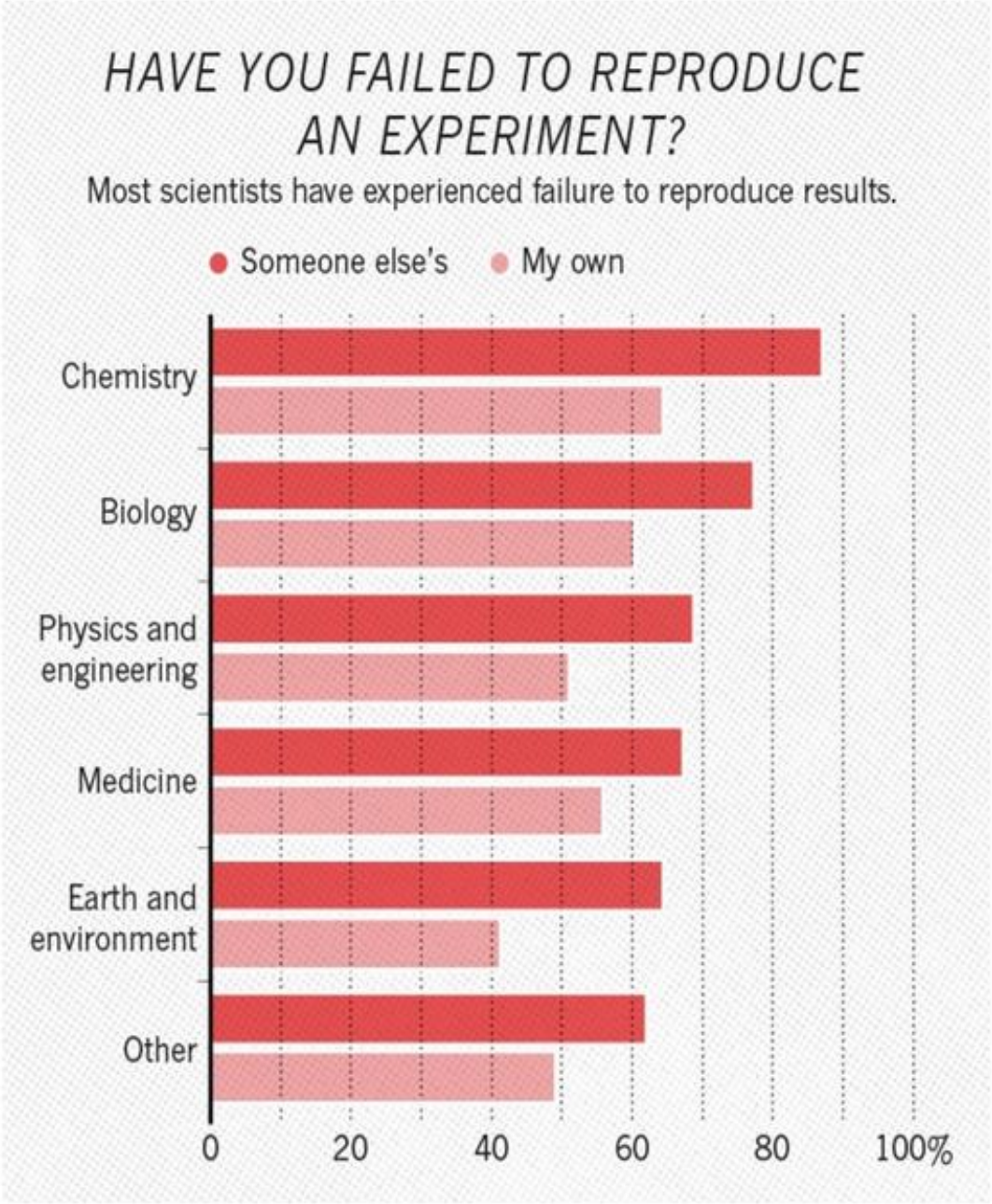
Open publishing

Open methods, data and analyses are essential for reproducibility

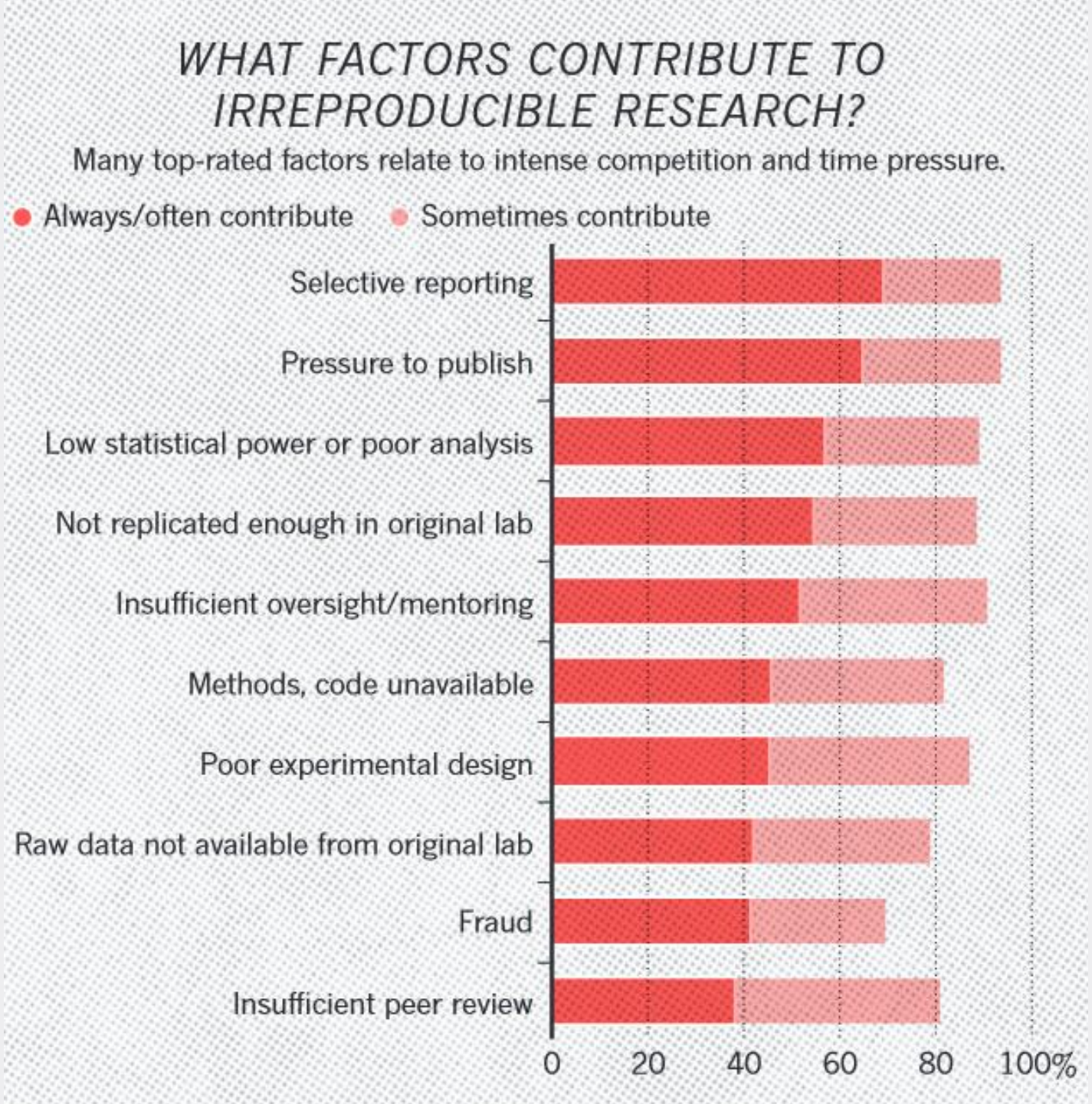
Reproducibility means obtaining identical results with the same data

Replication means obtaining similar results with new data





https://www.nature.com/articles/533452a



https://www.nature.com/articles/533452a

What can be done?

- Be **transparent** about your research plans, methods, procedures, and analyses (e.g. by preregistering your studies)
- Share the exact research **materials** you use (if you can)
- Share your **data** (ideally raw data if you can)
- Make sure you have good **documentation** for all stages of your research process: methods, data, analyses/code
- **Verify** your own work: try to reproduce your own results (or have others do it)

Reproducible does not (have to) mean fully **open**

As open as possible, as closed as necessary

NORRN

OUR MISSION | TERMS OF REFERENCE | CODE OF CONDUCT | MEMBERS | CONTACT

Welcome to Norway's Reproducibility Network

Towards open & reproducible science

JOIN US

Our Mission

The Norwegian Reproducibility Network (NORRN) is a peer-led network that aims **to promote and enable rigorous, robust and transparent research practices in Norway**. We attempt to achieve this goal by establishing appropriate training activities, designing, and evaluating research improvement efforts, disseminating best practices, and working with stakeholders to ensure coordination of efforts across the sector. NORRN's activities span multiple levels, including researchers, librarians, institutions, and other stakeholders (e.g., funders and public authorities).

https://www.norrn.no/

ReproducibiliTea

ReproducibiliTea is a global journal club initiative that focuses on discussing papers and ideas about improving science, reproducibility and open research. Our local ReproducibiliTea at the University of Oslo is open to both staff and students at UiO across all departments.

Subscribe to our mailing list: https://sympa.uio.no/uio.no/subscribe/open-science-oslo

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https://www.ub.uio.no/english/libraries/dsc/open-repro-research/reproducibilitea/index.html

Open Science Lunch

Each last Thursday of the month at 12:00 we invite you to join us for a lunch seminar to hear about how to make your research more open. We will discuss research transparency and visibility, open publishing, data sharing, and more!

Upcoming

Time and place: Oct. 27, 2022 12:00 PM–1:00 PM, Hybrid: Georg Sverdrups hus and Zoom Add to calendar

Open Science Lunch: Enabling reuse of non-digital data

Learn about how we can increase reuse of non-digital data such as plants, fossils or organ tissues.

Time and place: Nov. 24, 2022 12:00 PM–1:00 PM, Hybrid: Georg Sverdrups hus and Zoom Add to calendar

Open Science Lunch: CRediT your co-authors

Learn about CRediT - a new international standard for transparent assignment of individual research contributions.

https://www.ub.uio.no/english/courses-events/events/open-science-lunch/

Open Access Week 2022

UNIVERSITY OF OSLO

https://www.ub.uio.no/english/courses-events/events/all-libraries/2022/open-access-week-2022.html

https://www.ub.uio.no/english/libraries/dsc/

Norwegian version of this page

Digital Scholarship Centre

At the Digital Scholarship Centre (DSC) you get guidance on how you can make the best possible use of digital tools and methods in your research and communication activities.

Open Access →

Information about open access publishing, publisher agreements, self-archiving, requirements, and guidelines.

Open and reproducible research →

Make your research more transparent and reproducible.

Research Data Management →

Managing your data both during and after a research project.

Text-mining →

Information about digital tools for searching, mining, and analysing textual data.

Systematic search →

Information about systematic literature searching, how to get started, and how to get help.

Visualisation →

Use of visual methods to explore, communicate and understand data.

Carpentry@UiO →

Offers workshops in foundational digital skills such as coding and data management.

Reference management →

Styles, tools, and information on reference management.

Thank you!

Questions?

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