

OPEN
EDUCATIONAL
RESOURCES

OPEN
ACCESS

PRE-
REGISTRA-
TION

OPEN
PEER
REVIEW

PRE-
PRINTS

OPEN
DATA

OPEN
SOURCE
RESEARCH
SOFTWARE

CITIZEN
SCIENCE

Open Science in 60 Minutes

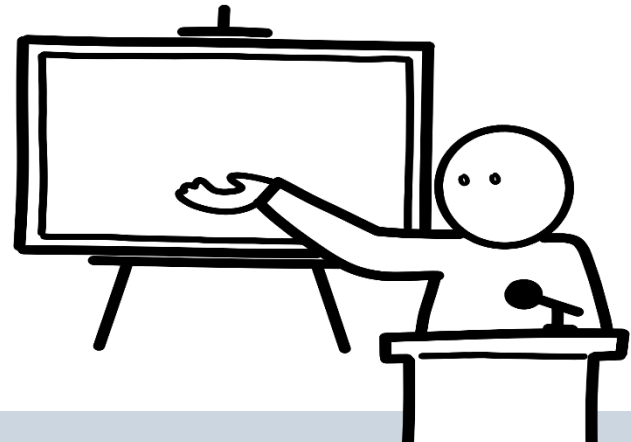
Dr. Christina Riesenweber & Franziska Harnisch

Team Open Access and Academic Publishing

University Library at Freie Universität Berlin

What's on our agenda today?

1. Overview: What is Open Science?
2. Open Access, Open Data, Open Educational Resources
3. What's in it for me?
4. Open Source & Open Research Software, Open Peer Review, Pre-Registration, Citizen Science
5. Boundaries and Challenges
6. Services and Support



What is Open Science?



Melanie Imming, & Jon Tennant. (2018). Sticker open science: just science done right (ENG). Zenodo. <https://doi.org/10.5281/zenodo.1285575>

[Creative Commons Attribution 4.0 International](#)

Central Conflict

What's good for research

How research careers work

Careful research

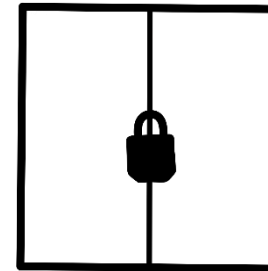
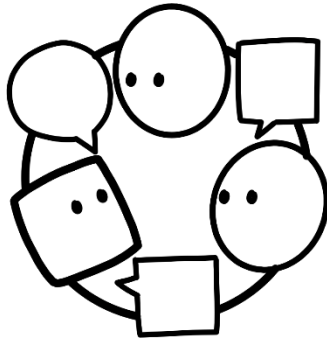
High output

Transparency

Secrecy

Collaboration

Competitiveness



What is Open Science?

Open Science aims to make all parts of the research cycle as accessible as possible for as many people as possible. It applies to all disciplines, the sciences and the humanities, from archaeology to zoology.

Open Science includes (but is not limited to):

- Transparent and reproducible research
- Open access to research publications
- Research data sharing
- Open source research software
- Open educational resources
- Open lab notebooks
- etc.

Open Science Working Group at Freie Universität Berlin
(<https://www.fu-berlin.de/sites/open-science/about-openscience/>)

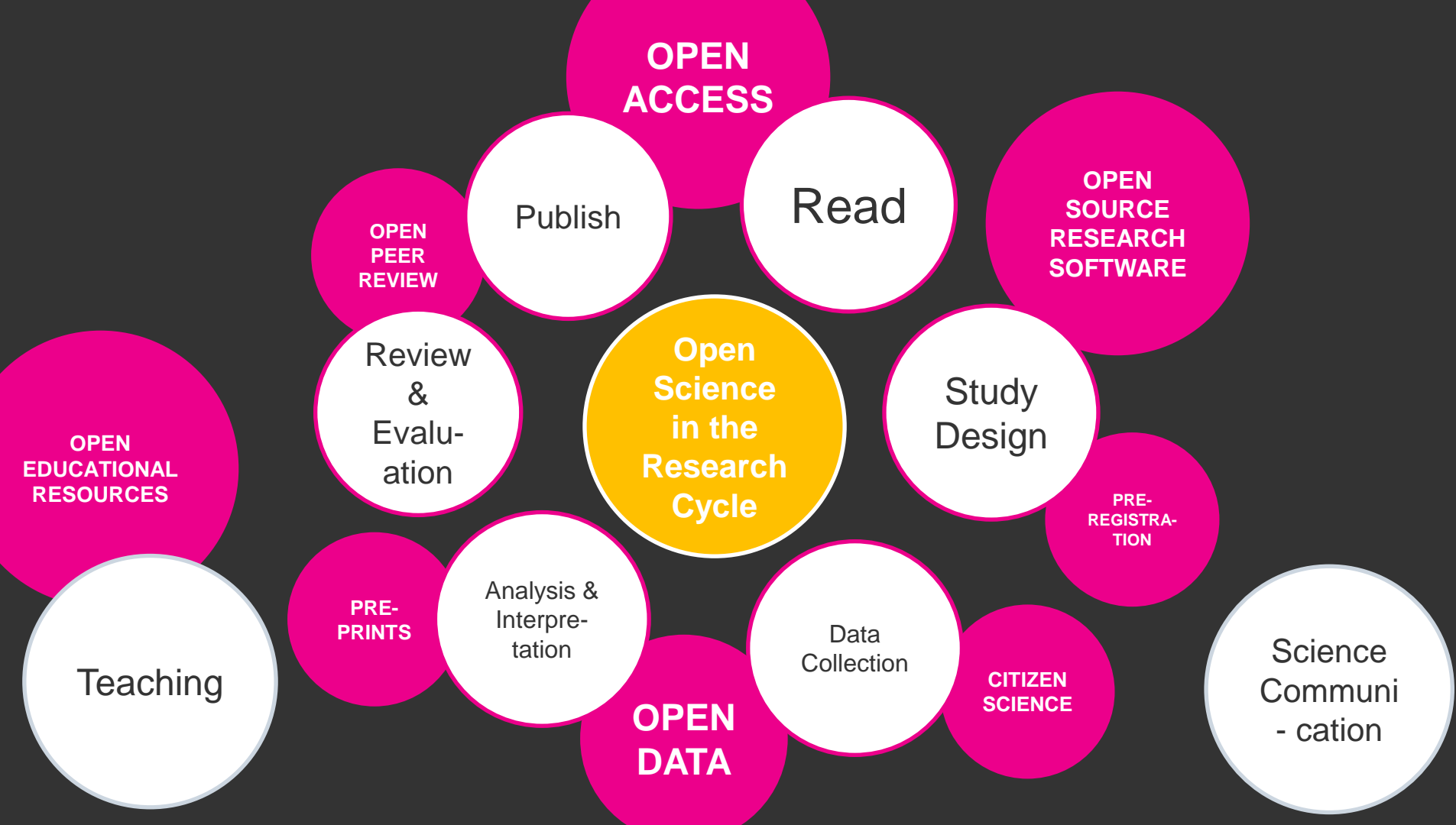
Open Science aims to make all parts of the research cycle as accessible as possible for as many people as possible. It applies to all disciplines, the sciences and the humanities, from archaeology to zoology.

a.k.a.

Open Science

Open Research

Open Scholarship



Common Aspects of Open Science Practices

- ✓ Transparent licenses for re-use
- ✓ Attribute authorship
- ✓ Good metadata
- ✓ Built on previous results and infrastructures
- ✓ *FAIR: Findable, Accessible, Interoperable, Reusable*

#Top3Topics

OPEN
ACCESS

Publish

Read

OPEN
PEER
REVIEW

OPEN
SOURCE
RESEARCH
SOFTWARE

Review
&
Evalu-
ation

Open
Science
in the
Research
Cycle

Study
Design

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EDUCATIONAL
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Analysis &
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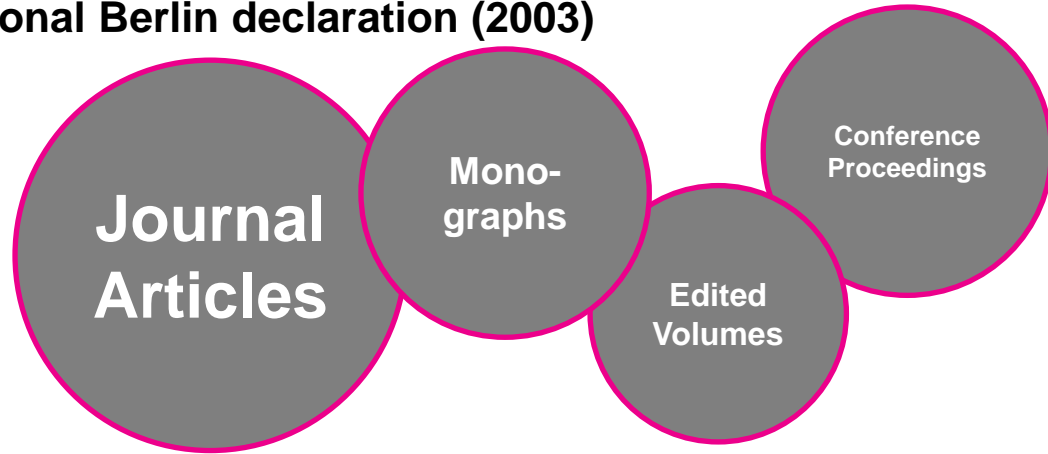
OPEN
DATA

Science
Communi-
- cation

What is Open Access?

Open access definition in the international Berlin declaration (2003)

- free access to scientific knowledge
- right to use, re-use and transmit
- attribution of authorship
- digital standard formats



[Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities](#) (2003)

The Internet has fundamentally changed the practical and economic realities of distributing scientific knowledge and cultural heritage. For the first time ever, the Internet now offers the chance to constitute a global and interactive representation of human knowledge, including cultural heritage and the guarantee of worldwide

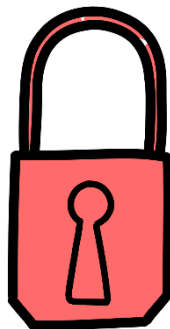
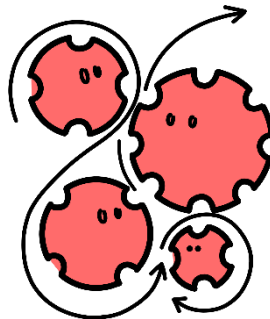
The process of academic publishing

Contribution of research community

- Editorial Board
- Managing Editors
- Content planning
- Authorship
- **Peer Review**
- Copy editing & proof reading
- Layout, typesetting
- etc.



- Author's rights



Services provided by publishers

- Print & distribution
- Online production & distribution
- Abstracting, indexing, marketing
- Copy editing & proof reading
- Layout, typesetting
- etc.

- Exclusive Copyright



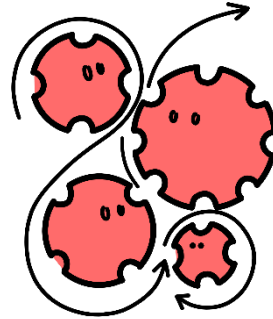
The process of Open Access academic publishing

Contribution of research community

- Editorial Board
- Managing Editors
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- Authorship
- **Peer Review**
- Copy editing & proof reading
- Layout, typesetting
- etc.



- Author's rights & some rights reserved



Services provided by publishers

- Print & distribution
- Online production & distribution
- Abstracting, indexing, marketing
- Copy editing & proof reading
- Layout, typesetting
- etc.
- Non-exclusive publishing rights



Good reasons for Open Access

- ✓ World wide free access
- ✓ Findable for practitioners and policy makers
- ✓ Public funding = public access
- ✓ More visibility, more citation
- ✓ Reduced costs
- ✓ Global justice



Open Access as default: policies and conditions

EU: Open Access as guiding principle (since 2014): [Horizon Europe](#): "Mandatory open access to publications and open science principles are applied throughout the programme."



Plan S and cOAlition S (2018): www.coalition-s.org



Germany (2016): Open Access shall become the default of academic publishing.

<https://www.bmbf.de/bmbf/de/forschung/digitale-wirtschaft/aktuelle-trends/2016-06-01/2016-06-01-open-access-digitalisierung-in-bildung-und-forschung.html>



Wir werden mit Citizen Science und Bürgerwissenschaften Perspektiven aus der Zivilgesellschaft stärker in die Forschung einbeziehen. Open Access und Open Science wollen wir stärken.

Berlin (2015)

60% Open Access (Gold & Green by 2020 for journal articles)

www.open-access-berlin.de



Open Access Policy of Freie Universität (2008/2021)

www.fu-berlin.de/open-access/akteure/oa-policy



The Open Access Policy of Freie Universität (2021)

Freie Universität Berlin shall recommend that all members of the university initially publish their work as open access under an open license, preferably CC BY.

- + recommendation for green OA
- + support and services
- + research data
- + ORCID



Freie Universität Berlin shall encourage members of the university to get involved with recognized open access publication bodies by taking on roles related to publishing, editing, and reviewing.

→ https://www.fu-berlin.de/en/sites/open_access/akteure/oa-policy

Who is paying for Open Access?

Article / Book Processing Charges

The university library of Freie Universität funds

- Publications in genuine open access journals with discipline specific quality standards (e.g. peer review)
- APCs up to 1.680€ (2.000€ incl. vat) – partial funding is not possible
- Members of Freie Universität have to be submitting or corresponding author
- Partial funding for Open Access Books

→ www.fu-berlin.de/en/sites/open_access/finanzierung/
→ open-access@fu-berlin.de

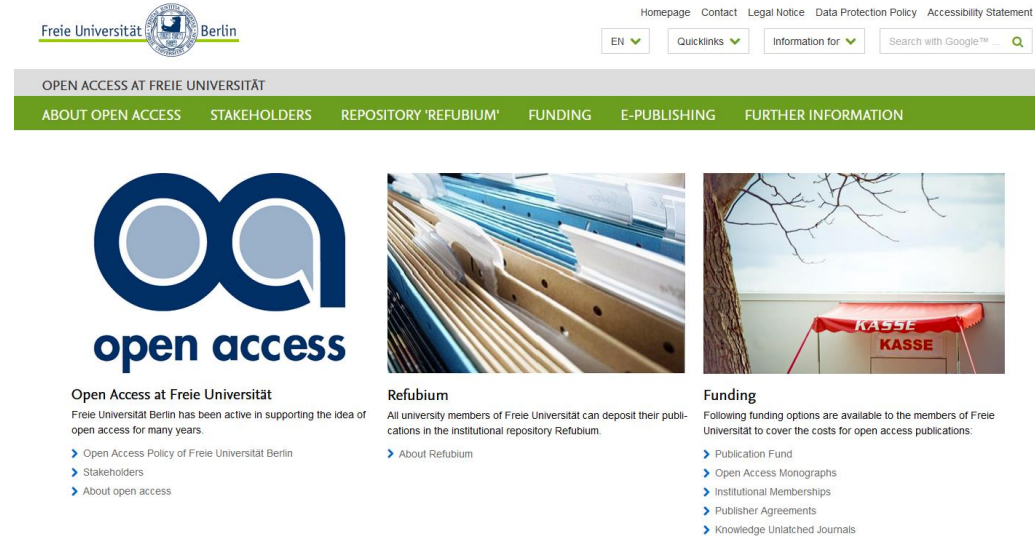
Open Access Infrastructures

The university library of Freie Universität Berlin invests in

- projects to fund open access without author-facing charges (e.g. through www.knowledgeunlatched.org)
- Open Source Software for OA journal publishing (by contributing to [Open Journal Systems](#))
- Scholar-led publishing (e.g. BUA-Project [Berlin Universities Publishing](#))

Open Access Services at Freie Universität

- Consulting, workshops and events
- Funding for OA publication fees (journal articles, books, edited volumes)
- Secondary publication via repository (Refubium)
- Journal Hosting (Open Journal Systems)
- New publication formats (Open Encyclopedia Systems)



The screenshot shows the website header with navigation links: Homepage, Contact, Legal Notice, Data Protection Policy, Accessibility Statement. There are also dropdown menus for 'EN', 'Quicklinks', and 'Information for', and a search bar with 'Search with Google™'. The main navigation bar includes: OPEN ACCESS AT FREIE UNIVERSITÄT, ABOUT OPEN ACCESS, STAKEHOLDERS, REPOSITORY 'REFUBIUM', FUNDING, E-PUBLISHING, and FURTHER INFORMATION.

Open Access at Freie Universität
 Freie Universität Berlin has been active in supporting the idea of open access for many years.
 > Open Access Policy of Freie Universität Berlin
 > Stakeholders
 > About open access

Refubium
 All university members of Freie Universität can deposit their publications in the institutional repository Refubium.
 > About Refubium

Funding
 Following funding options are available to the members of Freie Universität to cover the costs for open access publications:
 > Publication Fund
 > Open Access Monographs
 > Institutional Memberships
 > Publisher Agreements
 > Knowledge Unlatched Journals

Contact:

Christina Riesenweber, Birgit Schlegel & teams

open-access@fu-berlin.de

www.fu-berlin.de/open-access

OPEN DATA

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**OPEN
DATA**

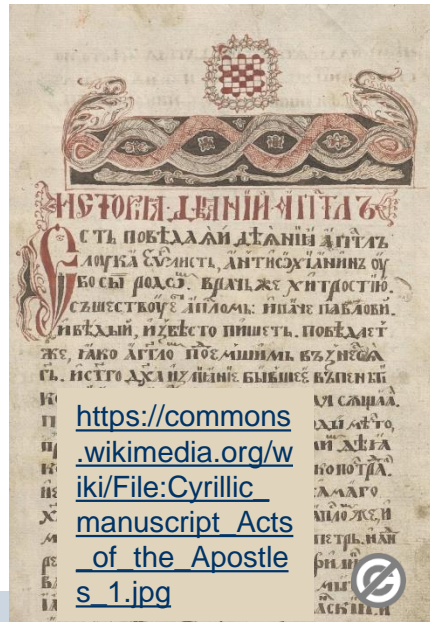
**Science
Communi-
- cation**

Research Data: Definition

Research data are

- **all research-related analog data, documents, and objects** that are to be digitized in the course of a given research process as well as “born digital” (i.e., originally created in a digital medium) data, documents, and objects
- **produced in the course** of a research process
- and/or that are the **object or result** of such a process.
- Research data are also defined as any data that **facilitate the documentation, transparency**, and – depending on the research area – **replication** of research outcomes (metadata).

Freie Universität Berlin. 2021. „Research Data Policy of Freie Universität Berlin“.
<https://doi.org/10.17169/refubium-32141>.

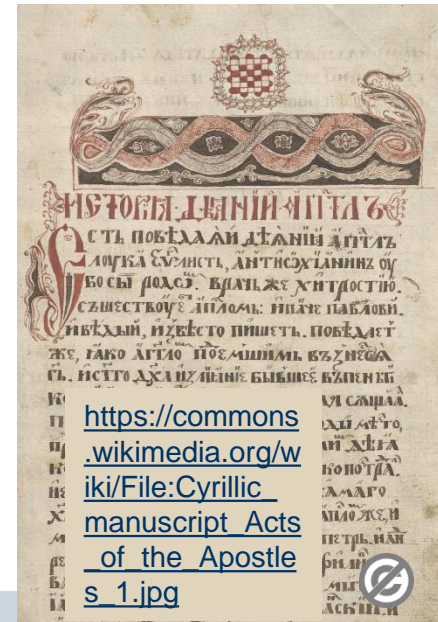


Research Data: Examples

- Measurements
- Lab results
- Audiovisual information
- Texts
- Survey data
- Objects from collections
- Samples
- Methodical test procedures
- Questionnaires
- Software

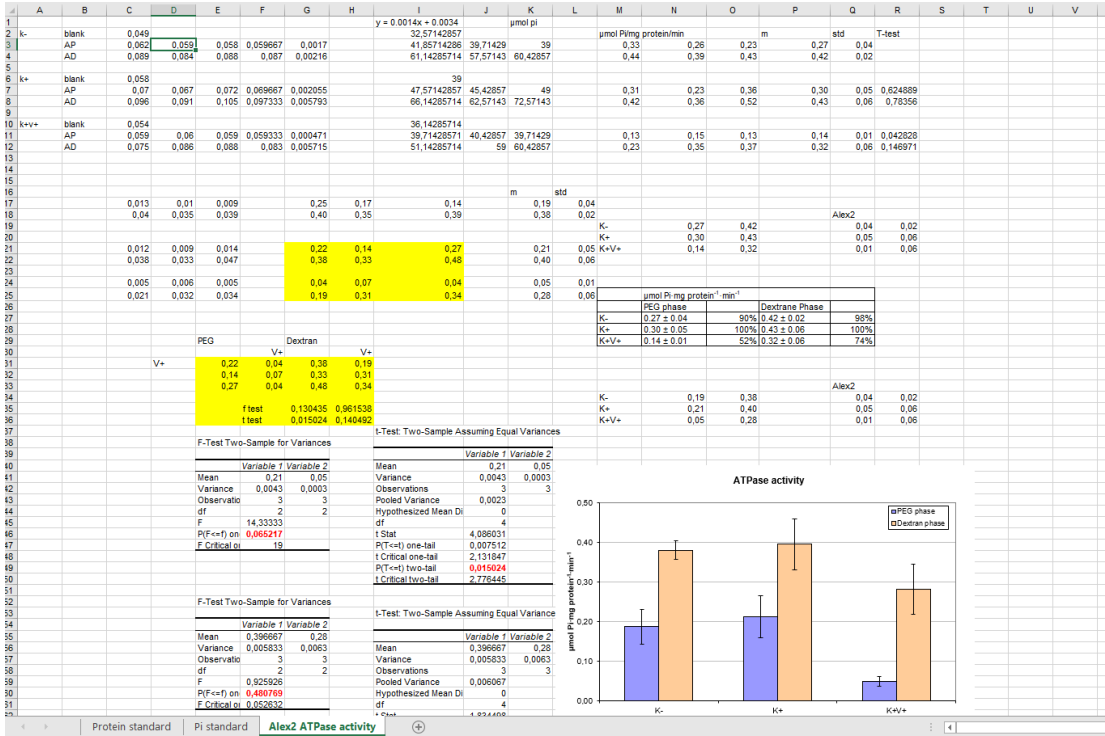
→ Deutsche Forschungsgemeinschaft (DFG). 2015.
„Guidelines on the Handling of Research Data“.

www.dfg.de/download/pdf/foerderung/grundlagen_dfg_foerderung/forschungsdaten/guidelines_research_data.pdf



Example: Measurements

Measurements and analysis of enzymes

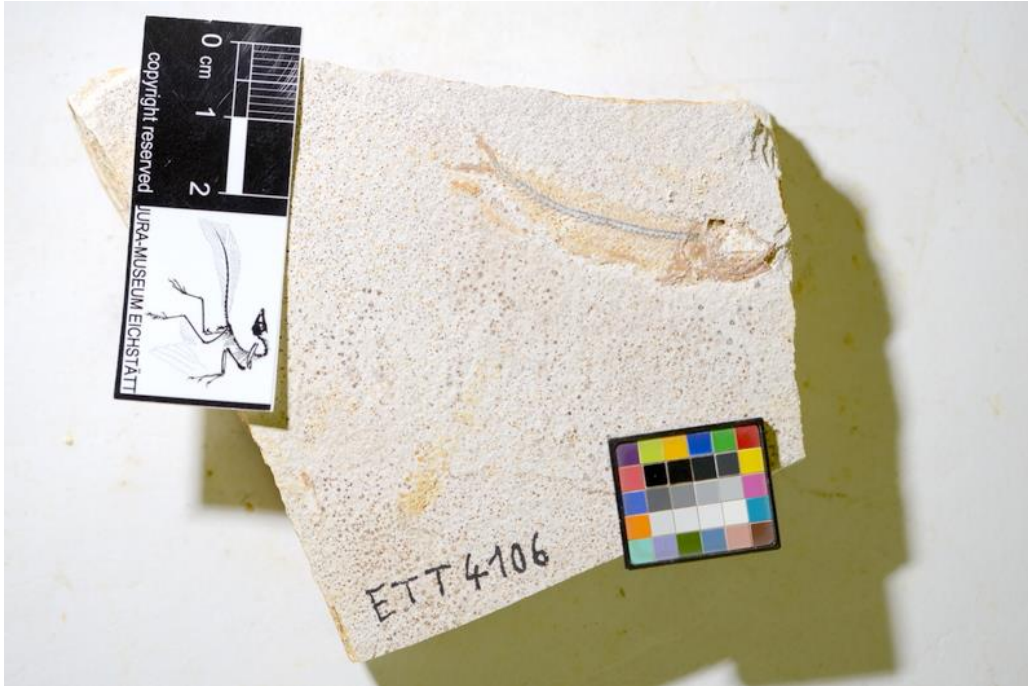


Ma, Haiyan; Krock, Bernd; Tillmann, Urban; Bickmeyer, Ulf; Graeve, Martin; Cembella, Allan (2011): Files of figures 2, 3 and table. PANGAEA, <https://doi.org/10.1594/PANGAEA.769889>

Supplement to: Ma, H et al. (2011): Mode of action of membrane-disruptive lytic compounds from the marine dinoflagellate *Alexandrium tamarense*. Toxicon, 58(3), 247-258, <https://doi.org/10.1016/j.toxicon.2011.06.004>

Example: Object from collection

Digitized image of a fossil fish



Staatliche Naturwissenschaftliche Sammlungen Bayerns. The Fossil Fish Collection at the Jura-Museum Eichstätt. Occurrence dataset
<https://doi.org/10.15468/qi5so7> [accessed via GBIF.org on 2020-12-03.
<https://www.gbif.org/occurrence/1638367077>

Open Data

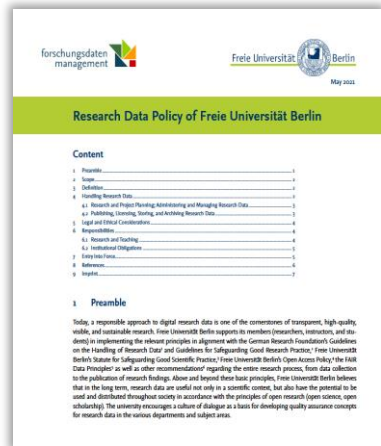
Open data is data that can be freely used, shared and built-on by anyone, anywhere, for any purpose.

[\(https://blog.okfn.org/2013/10/03/defining-open-data/\)](https://blog.okfn.org/2013/10/03/defining-open-data/)

Our focus: Research Data
of all disciplines



Recommendations for Handling Research Data at Freie Universität Berlin



- Structuring, archiving, and making data accessible according to FAIR principles and in accordance with subject-specific practice and research ethics principles.
- Recommendation: document data generation, preparation, indexing and analysis, methods and tools.
- Describe data with metadata as early as possible
- **Minimum storage period for research data is usually ten years**
 - If possible, publish data
 - Archiving of data that cannot be published (ZEDAT service)
- Publication in **subject-specific repositories** with persistent identifiers, open licenses (e.g. CC0 or CC-BY), in open file formats.

Freie Universität Berlin. 2021. „Research Data Policy of Freie Universität Berlin“. <https://doi.org/10.17169/refubium-32141>.

FAIR Data Principles

Findable

Metadata and data should be easy to find for both humans and computers. Machine-readable metadata are essential for automatic discovery of datasets and services

Accessible

Once the user finds the required data, she/he/they need to know how they can be accessed, possibly including authentication and authorisation.

Interoperable

The data usually need to be integrated with other data. In addition, the data need to interoperate with applications or workflows for analysis, storage, and processing.

Reusable

The ultimate goal of FAIR is to optimise the reuse of data. To achieve this, metadata and data should be well-described so that they can be replicated and/or combined in different settings.

<https://www.go-fair.org/fair-principles/>



European
Commission

European Commission

Freie Universität



Berlin

Open Research Data Pilot in Horizon
2020 (<https://www.openaire.eu/how-to-comply-to-h2020-mandates-for-data>)

"as open as possible, as closed as necessary"

Information for ERC grantees
(11.08.2021, version 4.0.) [Open
Research Data and Data Management
Plans](#)

Team Research Data Management

Consulting

- Creating data management plans
- Publication of research data
- Archiving
- Metadata and documentation

Skill Development

- Trainings and workshops

Building Infrastructure

- Refubium: data publication
- DOI, ORCID uvm.

Manuals and Templates



Research Data at Freie Universität Berlin

The digital transformation has fundamentally altered research processes, methods, and procedures. Huge quantities of data are produced by numerous departments at Freie Universität Berlin every day. Many disciplines and projects use data as the basis or object of their research, not to mention analyzing, visualizing, and presenting them. Researchers are not only faced with the challenge of managing these data, but also making them usable and accessible in the long term, as well as making them available to others for subsequent use. The respective services, tools, and instructions are key to research data management, which today forms one of the core aspects of scientific practice.

Both advisory and training formats are being continuously enhanced to support researchers in this process.

One of the central research data management services at Freie Universität Berlin is the institutional repository "Refubium", where university members can publish and store their research data.



We offer advice on all aspects of research data management



Sibylle Söring, Team Lead

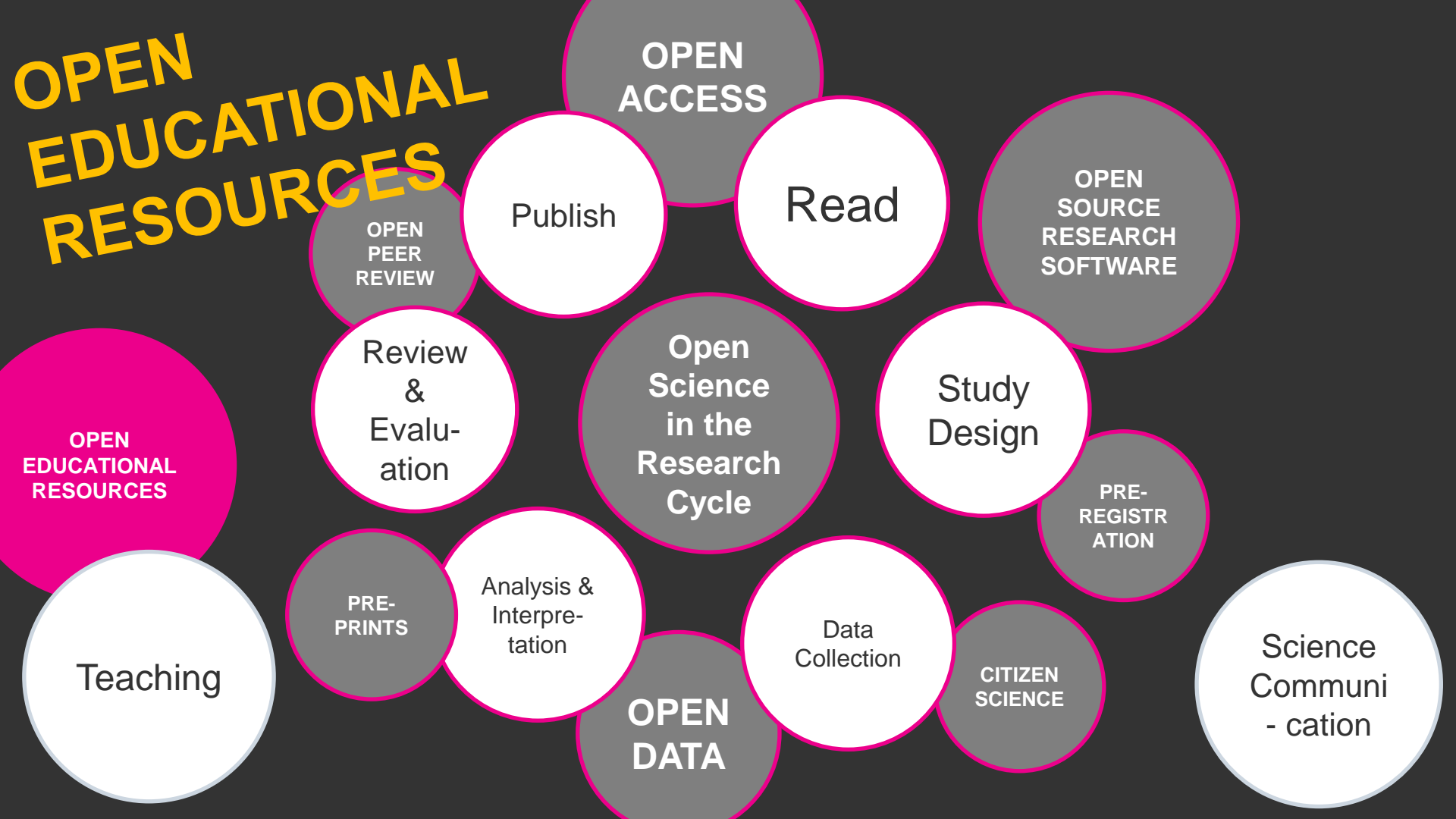
Esther Asef, Research Data Management Consultant

Heinz-Alexander Fütterer, Research Data Management Consultant

E-Mail: forschungsdaten@fu-berlin.de

www.fu-berlin.de/en/sites/forschungsdatenmanagement

OPEN EDUCATIONAL RESOURCES



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Communi-
cation

Open Educational Resources

“Open Educational Resources (OER) are teaching, learning and research materials in any medium – digital or otherwise – that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions.”

UNESCO definition (<https://en.unesco.org/themes/building-knowledge-societies/oer>)

This includes:



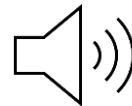
texts



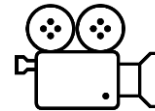
books



images



audio



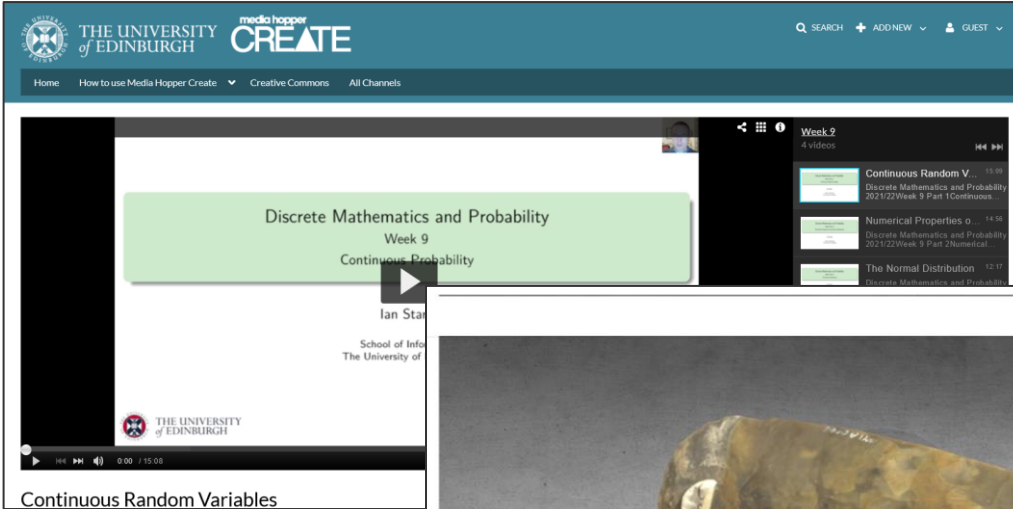
video



whole courses

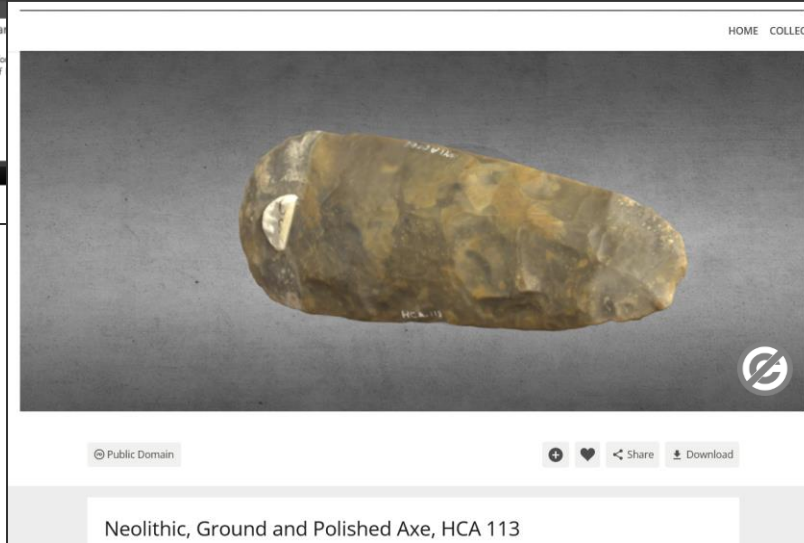


Examples for OER



Continuous Random Variables

Video, Ian Stark, University of Edinburgh
(https://media.ed.ac.uk/playlist/dedicated/235737823/1_1b5zkwxw/1_k6a33miw)



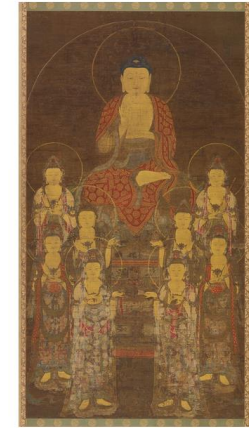
Public Domain

Neolithic, Ground and Polished Axe, HCA 113

3D model, europeana
(https://www.europeana.eu/en/item/181/share3d_197)

Buddha Amitabha (Amita) and the Eight Great Bodhisattvas

National Museum of Asian Art



Image, Smithsonian
(https://www.si.edu/object/buddha-amitabha-amita-and-eight-great-bodhisattvas:fsg_F1906.269)

Where to find OER – some examples

Repositories:

OER Commons:

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

europeana:

<https://www.europeana.eu>

Wikimedia Commons:

https://commons.wikimedia.org/wiki/Main_Page

Museums and galleries:

Smithsonian Open Access:

<https://www.si.edu/openaccess>

MET:

<https://www.metmuseum.org/art/collection> (Open Access Artworks)

Rijksmuseum Amsterdam:

<https://www.rijksmuseum.nl/nl/rijksstudio>

Open Educational Resources at Freie Universität Berlin

watch this space:

<https://www.fu-berlin.de/sites/open-science/>

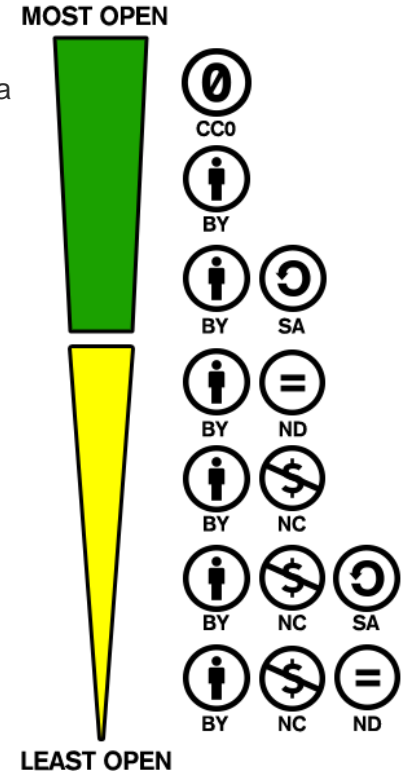
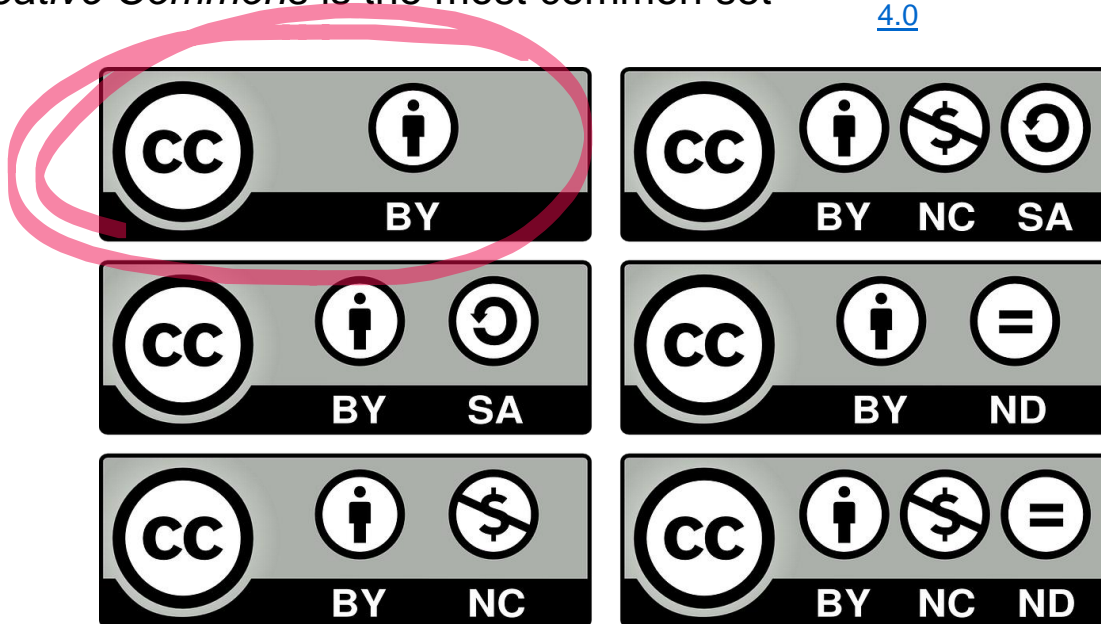
Thanks to Sascha Eckhold!

Spotlight: Open Licensing

A lot of open licenses exist (i. e. GNU, MIT)

Creative Commons is the most common set

[Creative Commons License Spektrum](#) by Saddhim at Wikimedia Commons licensed under [CC-BY 4.0](#)



What's in it for me?

OPEN ACCESS

Publish

Read

OPEN SOURCE RESEARCH SOFTWARE

OPEN PEER REVIEW

Review & Evaluation

Open Science in the Research Cycle

Study Design

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PRE-REGISTRATION

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CITIZEN SCIENCE

Science Communication

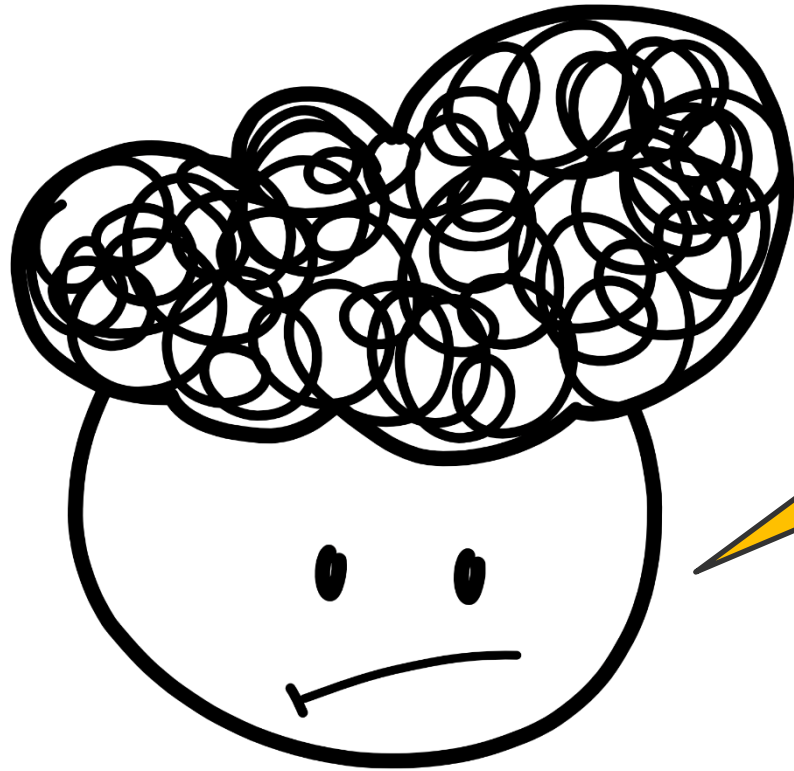
OPEN DATA

Teaching

Advantages of Open Science

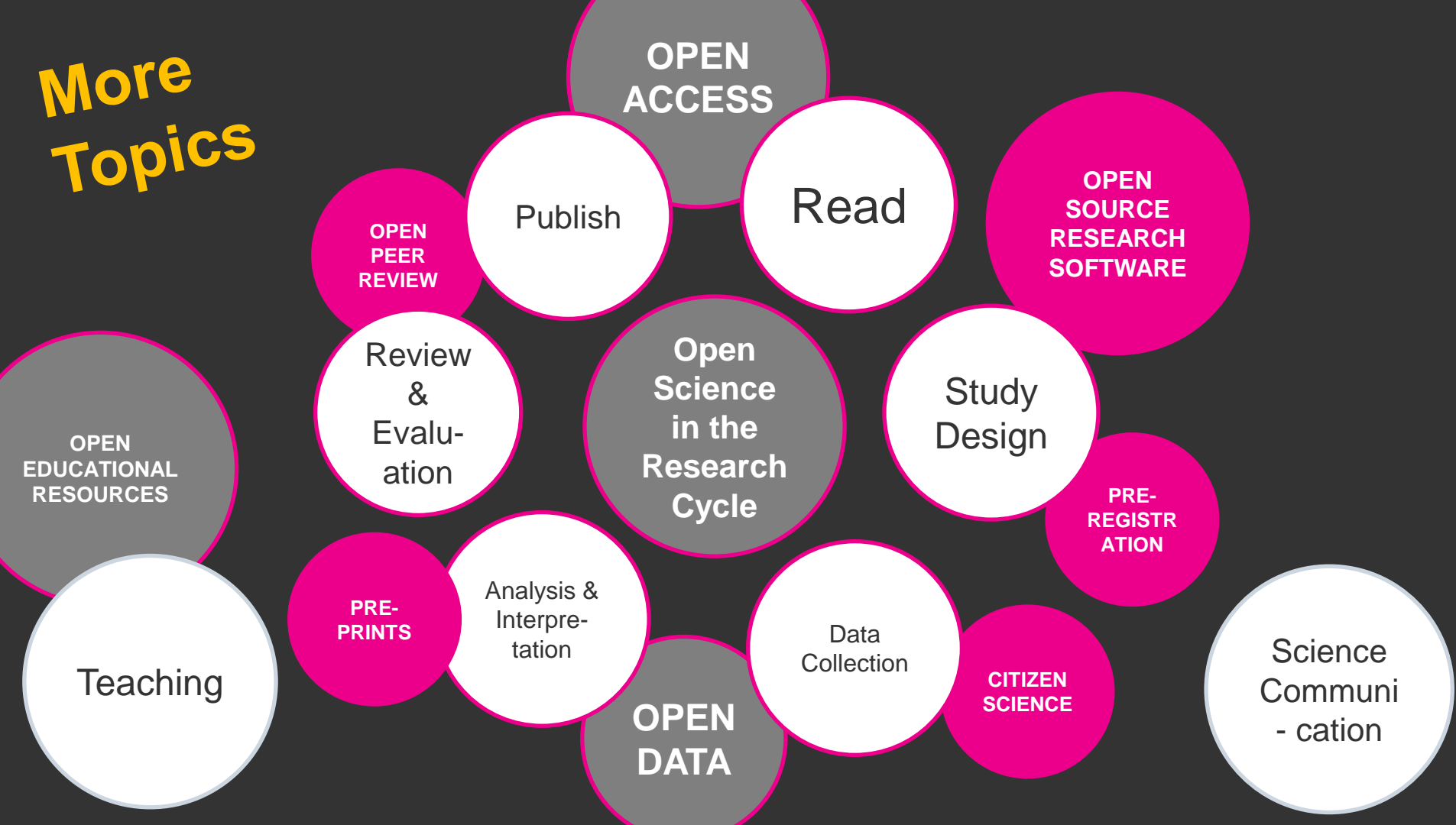
- ✓ Re-usability not just of results, but also of processes
- ✓ Reproducibility & Replicability → builds trust in research
- ✓ Allows for collaborative research more easily → global community
- ✓ Allows for attribution of more research-related activities
- ✓ Build on previous results and infrastructures
- ✓ Access is not tied to funding
- ✓ Technology transfer and new applications

**OPEN SCIENCE:
JUST
SCIENCE
DONE RIGHT**



What's
on your mind
right
now?

More Topics



Open Source & Open Research Software

"Open source software is software with source code that anyone can inspect, modify, and enhance." <https://opensource.com/resources/what-open-source>

You are probably already using Open Source Software!

linux, jitsi, gitlab, wikipedia, vlc player, gimp

Open Science Practices include:

- use Open Source Software (<https://opensource.com/alternatives>)
- make transparent which Software you use
- publish Research Software you create

Use Cases at Freie Universität:

- UB hosts Open Journal Systems (https://www.fu-berlin.de/en/sites/open_access/e-publishing/index.html)
- computer science and physics hosts instances of jitsi (<https://www.physik.fu-berlin.de/service/it/news/Matrix-und-Jitsi.html>)
- gitlab (https://gitlabph.physik.fu-berlin.de/users/sign_in)

Pre-Registration

Preregistration is the practice of registering the hypotheses, methods, and/or analyses of a scientific study before it is conducted. ([Nosek et al, 2018](#))

- Registered Reports are a form of empirical journal article in which methods and proposed analyses are pre-registered and peer-reviewed prior to research being conducted
- enable the transparency of the research cycle, as already the methodology and hypothesis are peer reviewed and published
- it can also be a tool to ensure the publication of null results, which strengthens the collaborative character of science



(<https://www.cos.io/initiatives/registered-reports>)

Citizen Science

Citizen science refers to projects that actively involve the general public in the scientific endeavour [...]. Citizen scientists can be involved in all stages of research, acting as collaborators, contributors or project leaders. via <https://forrt.org/glossary/citizen-science/>

Alternatively called: community science, crowd science, civic science

**Example: Audobon Society
Christmas Bird Count
Citizen Science Since 1900**

<https://www.audubon.org/conservation/science/christmas-bird-count>

**Example: Frühblüher Challenge
at Freie Universität Berlin *Blühender
Campus***

<https://www.fu-berlin.de/en/sites/nachhaltigkeit/stabstelle/kommunikation/aktuelles/220209-Fruehblueher-Challenge.html>

- **A publicly available version of any type of scientific manuscript/research output preceding formal publication**
- usually hosted on a repository (e.g. arXiv) that facilitates dissemination by sharing research results quickly
- Preprint repositories typically provide persistent identifiers (e.g. DOIs) to preprints.
- Preprints can be published at any point during the research cycle, but are most commonly published upon submission (i.e. before peer-review).
- Accepted and peer-reviewed versions of articles are also often uploaded to preprint servers, and are called postprints.

(via <https://forrt.org/glossary/preprint/>)

Open Peer Review

- A scholarly review mechanism providing **disclosure of any combination of author and referee identities**
- to one another or publicly
- at any point during or after the peer review or publication process.
- It may also refer to the removal of restrictions on who can participate in peer review and the platforms for doing so.
- Note that ‘open peer review’ has been used **interchangeably to refer to any, or all, of the above practices.**

(via <https://forrt.org/glossary/open-peer-review/>)

**So why don't we
all do it
all the time?**

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Communi-
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OPEN
DATA

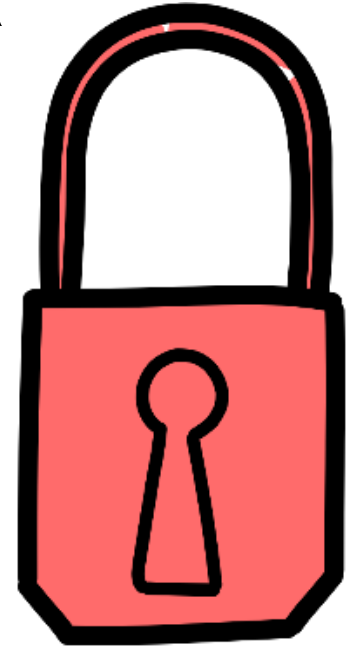
Teaching

Not ACTUALLY Limits of Open Science

- OS does *not* mean lack of quality control and peer review
- OS does *not* enable intellectual theft and scooping
- OS *prevents* hoarding results and data for later research
- OS *prevents* bad research practices like
 - HARKing (Hypothesizing After Results are Known)
 - p-Hacking (performing statistical tests until desired results show up)

Limits of Open Science

- data protection, e.g. concerning personal data (medical data, protected information)
- copyright and restrictive licensing
- economic prospects
- time and other resources are limited
- limited acknowledgment and credit (lack of rewards in the research community)



→ as open as possible, as closed as necessary

What needs to change?

What's good for research

How research careers work

Careful research

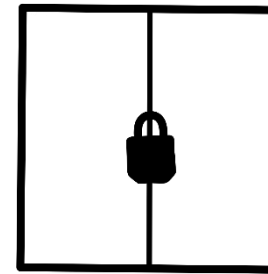
High output

Transparency

Secrecy

Collaboration

Competitiveness



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ACCESS

Publish

Read

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SOURCE
RESEARCH
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HELP!

?

OPEN
EDUCATIONAL
RESOURCES

Review
&
Evalu-
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Open
science
the
Research
cycle

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Help 1: Tools

101 Innovations

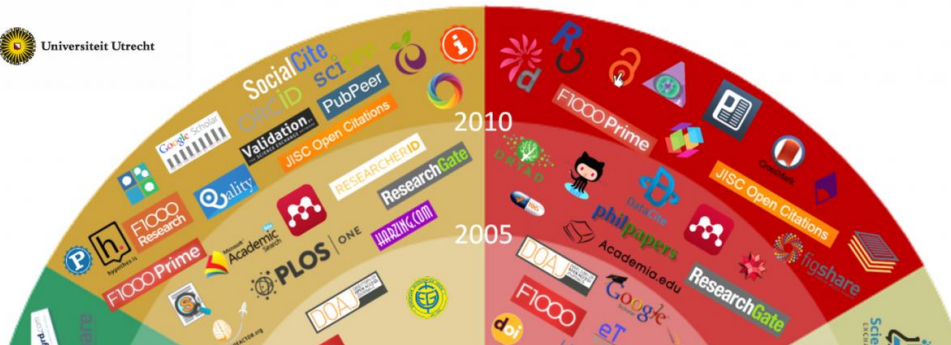
"We created an overview of current and expected developments and models to get a grip on the abundance and variety of research tools used."

<https://101innovations.wordpress.com/>

Open Science Framework

"OSF is a free, open source web application that connects and supports the research workflow. Researchers use OSF to collaborate, document, archive, share, and register research projects, materials, and data."

<https://osf.io>



Help 2: International Infrastructures

European Open Science Cloud

The ambition of the European Open Science Cloud is to provide European researchers, innovators, companies and citizens with a federated and open multi-disciplinary environment where they can publish, find and re-use data, tools and services for research, innovation and educational purposes.

<https://eosc-portal.eu/about/eosc>



**EUROPEAN OPEN
SCIENCE CLOUD**

Help 3: Find Community

In your discipline

- Actively communicate and network #OpenScience
- Research for Open Science in your field, e.g. <https://osf.io/3r8hb/>

At your organization

- e.g. via <https://reproducibilitea.org>
- Open Science Working Group at Freie Universität Berlin

Help 3: Community

Open Science Working Group at Freie Universität Berlin

We are a group of researchers, educators, students, and librarians who are interested in promoting Open Science at Freie Universität Berlin.

We welcome like-minded people from all disciplines and parts of the university to exchange open science views, news, and skills.



Find us here: www.fu-berlin.de/sites/open-science/

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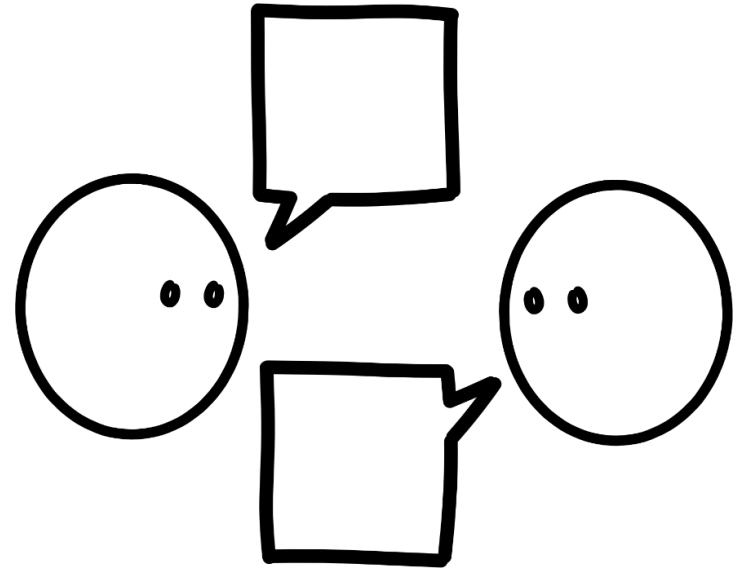
Open Science Working Group

at Freie Universität Berlin

www.fu-berlin.de/sites/open-science

Mailinglist:

<https://lists.fu-berlin.de/listinfo/Open-Science-Working-Group-FU>



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- [Foster](#)
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- [ZBW Podcast & ZBW Open Science Magazin](#)
- <https://forschungstrom.tv/>



The CARE Principles for Indigenous Data Governance

"The current movement toward open data and open science does not fully engage with Indigenous Peoples rights and interests. Existing principles within the open data movement (e.g. FAIR: findable, accessible, interoperable, reusable) primarily focus on characteristics of data that will facilitate increased data sharing among entities while ignoring power differentials and historical contexts. The emphasis on greater data sharing alone creates a tension for Indigenous Peoples who are also asserting greater control over the application and use of Indigenous data and Indigenous Knowledge for collective benefit."



<https://www.gida-global.org/care>

- great for networking and connecting
- don't upload files
- link to open access publications instead

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FACEBOOK SIGN UP

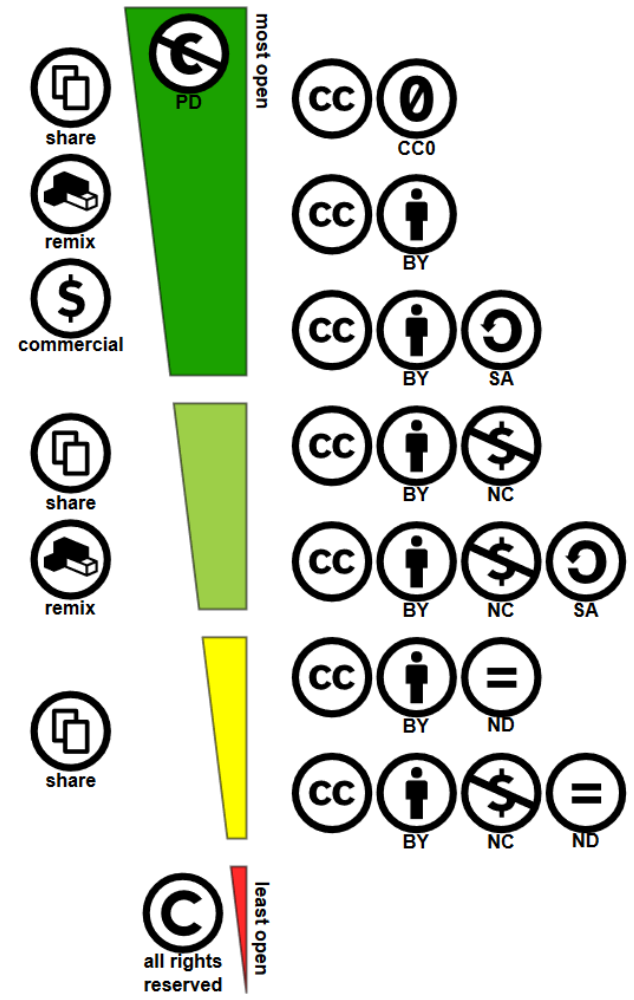
How open is it?

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Example for Open Cultural Data

<https://codingdavinci.de>

{ CODING }
{ DA VINCI }

Coding da Vinci, the first German hackathon for open cultural data, is a platform for innovative projects that release the creative potential of our digital cultural heritage.

The potential of open cultural data

... is shown by the creative digital projects made by, to date, over 2000 hackathon participants, on the basis of hundreds of datasets contributed by almost 200 cultural institutions.



325 Institutions

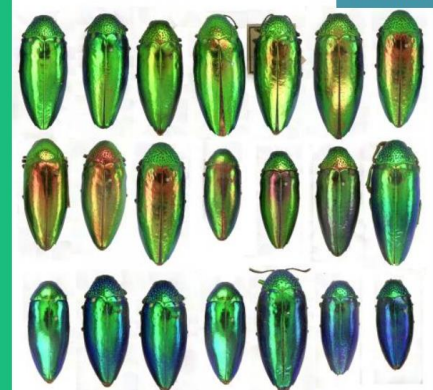


454 Data sets



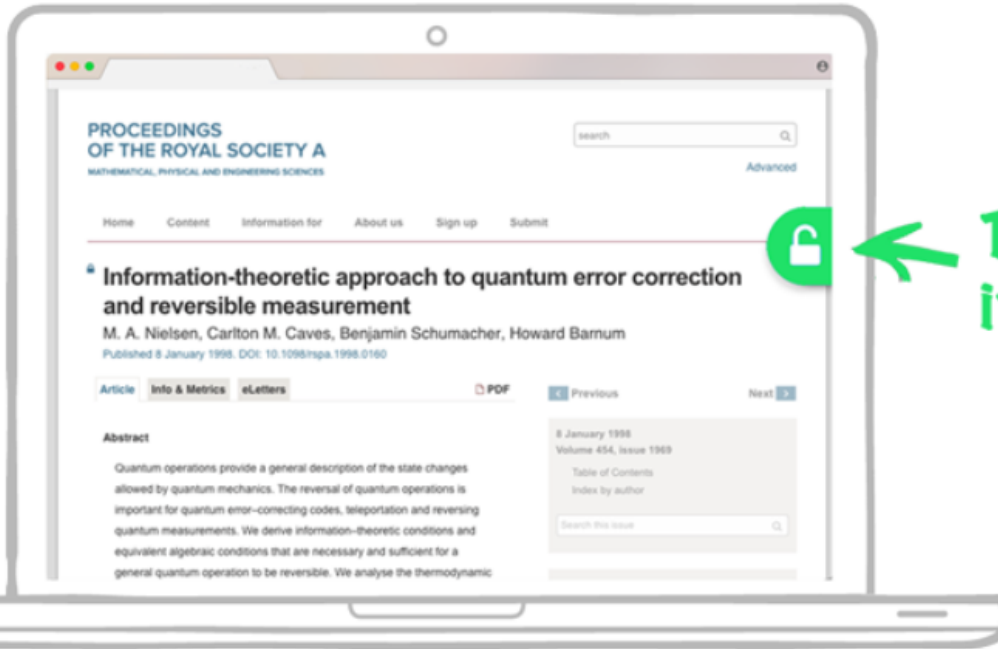
172 Projects

Funniest hack



Everyday research tools

<http://unpaywall.org>



 This means it's free.

<https://kopernio.com>

