PASSPORT FOR
OPEN SCIENCE

A PRACTICAL GUIDE FOR PHD STUDENTS

Index

Legend
Underlined text is explained in the glossary.
▼ refers to tools which are given as examples.

Digital version available online: www.ouvrirlascience.fr

Preamble

Open science was born out of the new opportunities the digital revolution offered for sharing and disseminating scientific content. It essentially consists of making research results accessible for all by removing any technical or financial barriers which may hinder access to scientific publications. It also involves opening researchers' 'black boxes' containing the data and methods used for publications to share these as much as possible.

Choosing open science first of all means affirming that research which is mainly financed by public funds must report its results back to the public in as much detail as possible. Openness is a necessary condition for the reproducibility of scientific results and the guarantee of better documented and more substantiated research. Sharing reinforces the cumulative nature of science and encourages its progress.

Open transparent science also helps enhance research's credibility in society and the health crisis of 2020 has indeed reminded us how important this issue is. Finally, open science is the bearer of a profound movement towards democratising knowledge to benefit organisations, companies, citizens and particularly students for whom easy access to knowledge is a condition for success.

Open science policies now have support at the highest level. They are supported by the European Union, which requires open access to publications and data for research it funds, and since 2021, it defines open science as a criteria of scientific excellence. Open science policies are also supported worldwide by the G7 and UNESCO. In France, Frédérique Vidal, the Minister for Higher Education, Research and Innovation, reaffirmed her commitment by launching the second National Plan for Open Science in July 2021.

Ultimately, it is researchers whose commitments and practices embody and bring open science to life. As you begin to prepare your doctorate – the last stage of your education and the first stage of your professional life – use this guide to start a conversation within your research team.

The Passport For Open Science is a guide designed to accompany you in any field of study, at every step of your research, from developing your scientific approach to the dissemination of your research results. It provides a set of tools and best practices that can be directly implemented and is aimed at researchers from all disciplines.

We hope this guide will motivate you and provide the means for you to realise the ambitions of open science by sharing your research results and data with as many people as possible.

Anne-Sophie Barthez
Director General for Higher Education and Employability

Claire Giry
Director General for Research and Innovation

Planning an open approach to scientific work

Using freely accessible resources

You are beginning work on your thesis.
You need access to the publications, articles and data already produced in your field. This is the beginning of your obstacle course...

Access and reuse

The open science movement's aims are to **facilitate access to scientific content and encourage its reuse**. Often we speak of:

• Open-access resources: thanks to their author and/or publisher, these resources can be freely accessed without researchers or their institutions having to pay.

• Free resources: as well as being in open access these are reusable depending on the distribution license involved. For example, Creative Commons licenses allow reuse as long as conditions set by the author are respected. For more information, please see ▼**creativecommons.org**.

WORTH KNOWING

The fact that a resource is in open access is not a guarantee of quality in itself. It needs to be critically evaluated before being used like all documentary resources.

Where should you look for resources?

Open access journal platforms:
Open access journals can have diverse business and editorial models.
▼**OpenEdition Journals** offers 450 online publications in the humanities and social sciences.
▼**Persée** digitises and disseminates entire collections of journals retrospectively.

Open archives: These may be institutional or thematic, and scientific productions are deposited in the archives by researchers themselves for free consultation. Explore ▼**HAL**, the multidisciplinary archive for French research.

Databases for theses or academic works:
These databases aggregate the digital thesis collections of universities and research centres. Visit ▼**Dart-Europe** or ▼**Open Access Thesis and Dissertation (OATD)**.
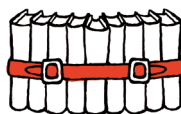
Platforms for preprints or working papers:
The availability of these unpublished articles means researchers can quickly discover the latest research approaches. Discover ▼**arXiv**, an archive for preprints in mathematics, physics and astronomy.

Specialist search engines:
These aggregate open access content to make them easier to discover.
▼**Core (core.ac.uk)** is a search engine specialising in open access academic publications (books, articles, theses, etc.).
▼**Unpaywall** can be installed as a browser extension and offers free access versions of all the articles available in its database.
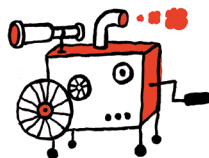
Data warehouses:
These may be multidisciplinary or specialised. Searches can be run for different types of data and they enable the deposit, conservation and sharing of research data. ▼**FAIRsharing.org** lists available data warehouses.

Planning data management

Why manage research data?

From the very start of your research, you will collect, produce and use data. Research Data Management (RDM) contributes to the research process. It covers all activities involved in **collecting, describing, storing, processing, analysing, archiving and accessing data**.

How to manage research data?

Data management needs to be anticipated at the very beginning of a project by creating a Data Management Plan (DMP). This document helps you think about how to organise your data, files and other supporting documents during and after the project. Many research funding agencies including the French National Research Agency (ANR) now require you to provide a DMP.

A DMP is an ongoing document which needs to be created before data collection begins and updated throughout your research project.

Collection

Description

Storage

Processing
and analysis

Archiving

Making data available
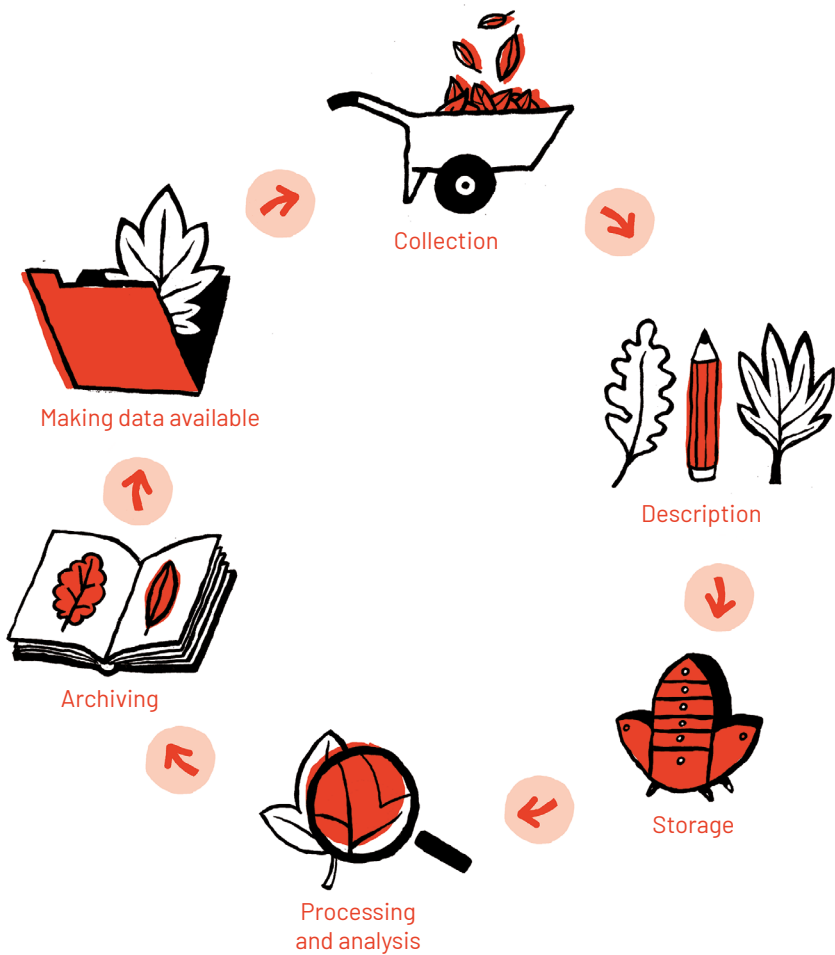
Good data management is useful for you and for others.
It makes it easy to find your data and make them accessible and
reusable by others. At the end of the project, it facilitates the
archiving and dissemination of datasets.

What should a Data Management Plan contain?

Collection and documentation: the objective of this is to describe the type, format and volume of the data you will be collecting. The format of the data produced is usually related to the software you use and has consequences for the possibilities of sharing and long-term archiving. This initial description enables the creation of documentation (metadata) that is useful for understanding your data and that you will continue enriching during the production phase.

Backup and storage: how will the data be stored and saved during your research? Who will be responsible for data recovery if there is an incident?

Legal and security issues: what are the protection rules which apply to your data? What methods will you be using to ensure the protection of personal data or other sensitive data? You should particularly find out about the General Data Protection Regulation (GDPR) and read the legal guide on open data that offers you an analysis of the legal framework in France.

For sharing data at and medium- and long-term preservation, please think about:
- which people might wish to use your data,
- the criteria for choosing the data to be shared,
- the duration of the data's preservation,
- the data warehouse in which you could deposit the data,
- the way to identify your data (persistent identifier/DOI),
- the way to identify the various contributors to the dataset (personal persistent identifier/ORCID).

Responsibilities and resources: specify the roles and responsibilities of the people working on the project especially in the case of collaborative projects involving many researchers, institutions and groups with different working methods.

▼**DMP OPIDoR** provides help with creating data and software management plans.

Also see "Making research data open", page 25

Working in a reproducible way: for yourself, for others

Research is said to be reproducible if all information relating to the project is made accessible...

... thus making it possible for others to reproduce the results obtained.

Reproducibility varies according to disciplines and the methods used. It enables an experimental protocol to be run identically, the reproduction of statistical processing of quantitative data, the reconstruction of the stages of analysis of a corpus of images or texts and so forth.

Carrying out reproducible research means you need to guarantee the accuracy of the methods used and to document all stages of the scientific process to ensure its transparency and traceability.

WORTH KNOWING

Reproducibility of research does not on its own guarantee the quality of research work. Methods are a core issue in the debate about reproducibility. It is important that researchers come to an agreement on common data analysis methods which go further than explanations provided in the methodological sections of articles.

The advantages of a reproducible approach

Errors are easier to identify and correct. You trace and record how your data and/or code evolves from the very start of the project and with each modification. It is much harder and less safe if you have to reconstruct these developments *a posteriori*.

The results you obtain can be more easily explained and justified to peers.
When submitting an article for publication, it will be easier for you to respond to any requests from your reviewers.

Future work is made less uncertain. You give yourself the possibility of reusing data, code, documents, etc. in the future.

How to put this approach into practice

Manage your bibliographical references by using a management tool like ▼**Zotero**. Working according to a reliable bibliographic standard is a common requirement in all disciplines.

Organise data, files and folders: apply file naming conventions, construct folder trees with a consistent, scalable structure, separate raw data from analysed data, etc.

Learn the basics of version control even if your actual research does not require coding skills. Being able to restore a particular version of a document written over a period of several years can be highly valuable.

Automate certain recurring tasks. You will be able to increase the reliability of your results and make writing scientific articles easier because you can vary parameters more easily.

Do you have limited resources? **Think about using collective approaches!** Train yourself in collaborative working methods; use public datasets if these exist.

Do you do data analysis?
Automate your processing and workflows: design scripts to process your data and manage your workflow steps. For example, avoid using spreadsheets for large datasets.

Document your code and data: what is clear when working may be less clear two months later even when you are the author. This is more a question of explaining the end-use of your functionalities rather than describing how they work.

Opt for open-source solutions for greater transparency and guaranteed access.

> To learn more about the methdological principles for open, transparent science, go to the MOOC ▼**Reproducible research: methodological principles for transparent science** (French MOOC with English subtitles: https://www. fun-mooc.fr/en/courses/reproducible-research-methodological-principles-transparent-scie/)

Sacha H., PhD student in electrical engineering,
G2Elab, Grenoble

Before my PhD, I worked as a research engineer on the development of OMEGAlpes, an open source tool for the optimisation of energy systems.
This tool can be used to model and explore different energy scenarios to determine the best solution for a chosen objective.

I had the chance to work on a residency with an artists' collective called Organic Orchestra which was trying to find technological solutions to achieve energy self-sufficiency while reducing the environmental impact of their digital performing arts show. We worked together to identify the constraints and objectives and then propose energy scenarios.

Now I am doing transdisciplinary research on models, methods and tools for a collaborative and open approach to the design of energy components and systems to facilitate the energy transition.

The open aspect of OMEGAlpes was an attractive point for them. They used an open tool to generate knowledge which could be useful to others.

I am convinced of the interest and necessity of open science in facing up to climate change. Where possible, researchers need to open up their articles, data, methods and tools to work effectively together and also in collaboration with citizens, collectives and public authorities.

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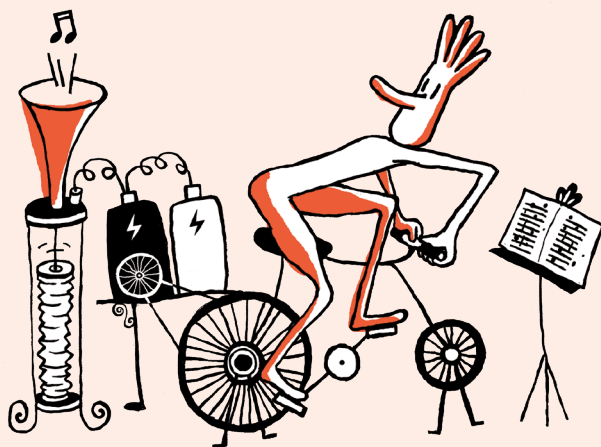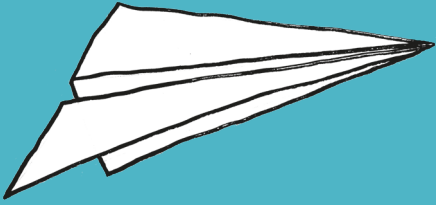
Disseminating research

Disseminating your publications in open access

Open access dissemination involves the **immediate, free and permanent availability of scientific publications on the Internet**. You have several options to disseminate your work in open access - you can publish in an open access journal or deposit your work in an open archive.

These are not mutually exclusive practices and you can combine them to ensure the maximum dissemination of your work while respecting intellectual property regulations.
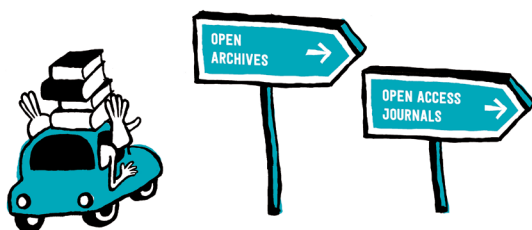
Publishing in an open access journal

In the traditional scientific journal business model, access to articles is reserved for individuals or institutions who have taken out paid subscriptions. Conversely, publishing in an open access scientific journal gives everyone free and immediate access to your article. Different funding models exist to cover publication costs. There are two main categories of such models which are constantly evolving:

- **With costs :** publication costs, often called Article Processing Charges (APCs), are billed. These costs may be paid by your laboratory or home organisation.

HOW MUCH DOES THIS COST?

The cost of an article varies from several hundred to several thousand euros according to the journal. The ▼**Directory of Open Access Journals (DOAJ)** is a worldwide directory which indicates whether a journal requires APCs to be paid and, if so, how much.

- **With no costs:** there are no charges for the author to pay. The journal costs are financed in advance by the organisation that publishes or distributes the publication on the basis of various funding mechanisms (institutional financing, freemium, subscription, etc.).

HYBRID JOURNALS

To increase their revenues, some publishers are retaining the traditional subscription access model while offering the paid option of publishing the article in open access. This amounts to charging an institution twice - once for access to the journal and once for publication of the article.
This controversial business model is often used by major commercial publishers. **It is not advisable to pay these additional costs** especially because you can distribute your article *via* an open archive.

PREDATORY PUBLISHERS: BEWARE OF APPEARANCES

The development of digital technology has led to the emergence of publishers with dubious practices who contact you to promise your work will be rapidly published. These publishers do not guarantee editorial quality and an effective peer review process but they may charge a fee for publication. As well as the financial costs, your scientific credibility will also be damaged. It is sometimes difficult to spot a predatory journal but certain tools can help you to do so. There are also predatory conferences organised in a similar fashion.

▼**Think. Check. Submit.:** This website gives access to a set of checklists to help you assess the reliability of the journal in which you plan to publish your work.

Depositing in an open archive

An open archive allows you to disseminate your scientific work whether it has been published or not. Depositing in an open archive repository is not a substitute for the process of publication in a journal. An open archive guarantees permanent preservation and broad accessibility which is not the case with academic social networks like ResearchGate or Academia.

This is not limited to articles alone – you can also submit a thesis, book chapter, poster, dataset, report, lecture, conference paper, an HDR dissertation or a report.

Open archives can be disciplinary, institutional or national. If you have not been given specific guidelines, you can ask your organisation's library for advice on choosing the most appropriate repository.

▼**bioRxiv**, a preprints archive in biology, or ▼**RePEc**, a platform for working papers in economics.
▼**Archimer**, the institutional archive of the French Research Institute for Exploitation of the Sea (IFREMER).
▼**HAL**, the multidisciplinary archive for French research.

▼**OpenDOAR** lists open archives worldwide.

WORTH KNOWING

Open archives generally provide help for those depositing work in the form of online guides or video tutorials.

You can deposit different versions of an article:

- The <u>preprint or author's version</u> (the version submitted for publication): the version sent to a journal by the authors prior to the peer review process.

- The <u>author accepted manuscript</u> (AAM): the version including revisions resulting from the peer-reviewing process but without the publisher's final layout.

- The <u>version of record</u> (final published version, publisher's PDF): the article with the final layout of the editor as published in the journal. The publisher may have exclusive rights to the distribution of this version, depending on the terms of the publishing contract you signed.

What are my rights?

Whichever distribution method you choose, open-access publication stipulates that intellectual property rules must be respected.

- As author, you possess all moral and economic rights to your scientific text until you sign a publishing contract under which you will assign some of these rights to the publisher of your text.

- For scientific articles, if your research is at least half publicly funded (including your salary if you are a contractual PhD student), under the <u>French Law for a Digital Republic</u> dated October 7th 2016 (article 30) you may disseminate certain versions of your article in open access particularly by depositing it in an open archive. This applies to the preprint and the author accepted manuscript. Publishers may set an <u>embargo</u> period during which this is restricted but the law limits this embargo to 6 months for articles in science, technology and medicine and 12 months for articles in the humanities and social sciences.

- For other forms of publication, the publishing contract or the publisher's policy applies legally. You can use ▼**SHERPA/RoMEO** to find out about publishers' open access policies.

> **WORTH KNOWING**
>
> Would you like to deposit a publication in an open archive or distribute data with a license which allows its reuse? You should talk about this with your co-authors.

Ségolène V., a young doctor in archaeology,
University of Paris 1

I specialise in geoarchaeology and study the human occupation of caves based on the presence of soot in limestone concretions.

While I was working on my thesis, I developed a pioneering method in my discipline called fuliginochronology which makes it possible to establish very precise records (with an annual resolution) of the occupation of cavities.

I can also archive my work on a permanent basis which also means I can prove the anteriority of my work in this new field if necessary.

Open access dissemination of my thesis means that I can make accessible contents that have not all been published and achieve visibility for this method which remains little-known. I like being able to access other people's theses so I make mine available too.

I'm currently working for my laboratory along with other researchers to develop a collaborative database on the ArchéoScopie platform. In it, I classify my photos taken under a microscope. Sharing this data enhances the visibility of the researchers who produced them, enables everyone to reuse the images (rather than having to endlessly reinvent the wheel!), provides examples for teaching purposes and acts as a platform for scientific exchanges and discussions.
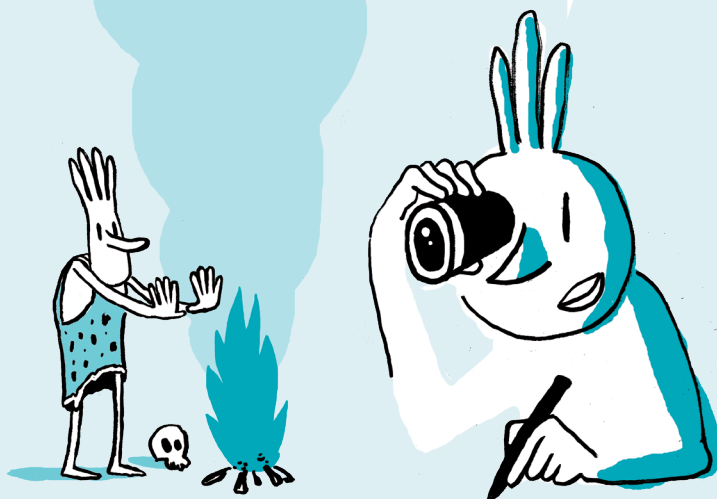
Making your thesis freely accessible

Depositing your thesis

PhD students and doctors are covered by the provisions of the decree dated May 25th 2016 which set out the **national framework for doctoral studies** (training, awarding the PhD). Your digital thesis must be submitted to your institution.

Your institution will then take care of the permanent archiving and referencing of your thesis in the Sudoc national catalogue and the ▼**theses.fr** portal.

Disseminating your thesis

After your thesis has been submitted and processed, it will be disseminated online:

● **freely on the Internet if you give your consent** in the contract you sign with the institution where you defend the thesis;

● otherwise, **restricted access** will be given within the French university community (compulsory).

You can defer the online dissemination of your thesis by putting it under an embargo period during which the file will only be available within the university community.

Theses may not be disseminated if they are deemed to be confidential. Confidentiality is decided by the head of the institution rather than the PhD student and the thesis will be defended behind closed doors. There is always a limit to the confidentiality period.

The institution where you defend the thesis defines the open archive (for example, HAL-TEL) used to disseminate your thesis. You can also deposit your thesis in an open archive yourself.

The dissemination of your thesis requires you to respect:

● the intellectual property code: If your thesis contains works covered by property rights, you must obtain authorisation from the rights holders to reuse and disseminate these. Works in the public domain are not concerned by this provision;

● the General Data Protection Regulation (GDPR): any personal data concerning third parties in your thesis must be anonymised or pseudonymised.

The stages of depositing and disseminating

1. You defend your thesis.

2. You make all requested corrections and have your thesis approved.

DISSEMINATION IN OPEN ACCESS

CONFIDENTIAL THESIS

DISSEMINATION RESTRICTED TO THE UNIVERSITY COMMUNITY

3. You submit the final version of your thesis and sign the dissemination contract.

4. The university library takes care of processing and disseminating your thesis. You can also deposit your thesis yourself in an open archive.

HAL
archives-ouvertes.fr

sudoc

theses.fr

CINES

Why choose open access for your thesis?

Wide dissemination of a thesis is considered a best practice today and is very much encouraged.

- Your work will be much more visible and downloaded and cited more by other researchers and students.

- This facilitates your integration into the academic community (consultation by a selection panel).

- A thesis that is more widely disseminated is much better protected against plagiarism than a work with more restricted dissemination.

- Download statistics can encourage publishers to propose publishing projects. You should however be careful with requests from companies that present themselves as publishing houses but do not actually offer any quality editorial work on the text of your thesis.

- Your thesis will have a permanent and validated online consultation address.

CAN I DISSEMINATE MY THESIS IF I HAVE AN OFFER OF PUBLICATION?

Disseminating your defended thesis is not an obstacle to publication. However, you may have objective reasons for temporarily restricting its dissemination particularly if rapid publication is planned for an article. In this case, it advisable to wait for some time before opening access to the thesis. Discuss this with your thesis director or the jury.

Publishing a monograph based on your thesis is a long-term project which requires editorial work, rewriting and adaptation. The original defended version of a thesis is never published as is, which means that disseminating it is not a problem in any way.
Ask your publisher or thesis director for advice.

Minh-Châu N., PhD student in phonetics,
Sorbonne Nouvelle Paris 3 University

I am a phonetician. I study the sounds of languages, particularly little-studied Vietnamese dialects.

During my master's degree, I made field visits to the province of Phú Thọ to collect and record data from the little-documented dialect of Kim Thượng Mường, namely phonological and lexical contents, stories, dialogues and songs.

The article has been cited and downloaded but will gradually be replaced by new work. However the primary data is of unlimited value.

With two other researchers, I published an article which is available on HAL. The datasets have been deposited online in the CNRS Pangloss rare language sound collection.

I have continued working on my PhD in open science mode. As well as phonetic study, part of my work consists of preparing all the data recorded for long-term conservation in Pangloss. I am happy to contribute in this way to the preservation of my home country's languages!
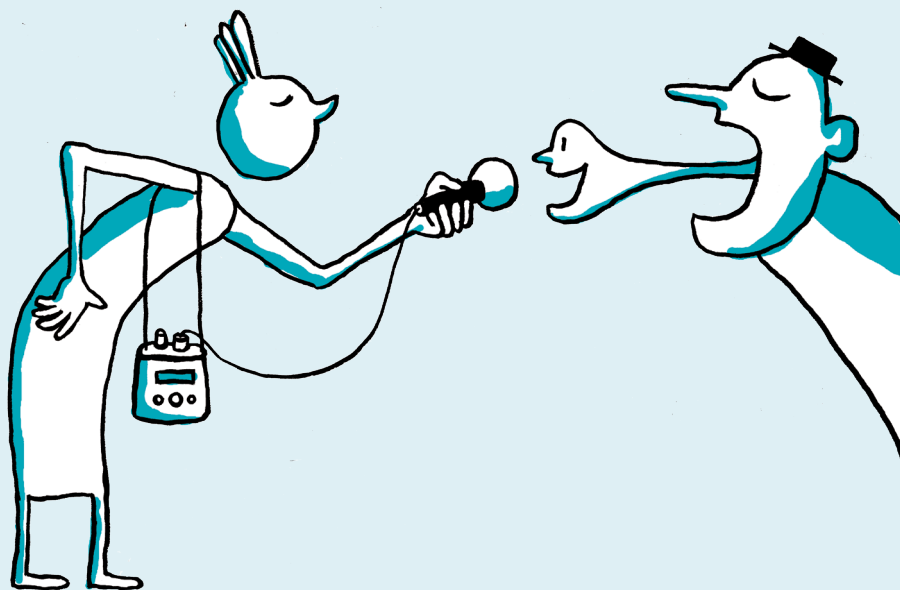
Making research data open

A key principle to keep in mind is that data should be "as open as possible and as closed as necessary". In other words, data should be widely disseminated but restrictions on access may be justified in certain situations.

Why disseminate research data?

FOR SHARED TRANSPARENT RESEARCH

Making data open at the international level allows all researchers to **re-use datasets produced by others**. The available datasets can also be exploited en masse thanks to data mining technologies (Text & Data Mining, TDM).

The cost of creating, collecting and processing data can be very high. Bad data practices may cost a significant amount, estimated at €10 billion per year in Europe (European Commission, 2018).

Research financed with public funding must be open to all. Opening up data increases citizens' trust and enables them to get involved, especially in participatory science.

Putting your data online helps **increase the visibility of your work and enables you to be cited more often**. According to a study published in the journal PLOS ONE, the dissemination of data linked to a publication increases the citations of the article by 25% (Colavizza, Hrynaszkiewicz, Staden et al., 2020).

Making your data available provides a **better guarantee of research transparency** and helps you guard against errors and fraud.

TO COMPLY WITH AN OBLIGATION

The French Law for a Digital Republic assimilates research data with public data. Research data are now included "by default" in the principle of open data just like data produced by the French civil service. In principle, **research data must be published on the Internet and made freely reusable**. There are certain exceptions related to the protection of personal data and privacy (GDPR) or intellectual property rights and also to respecting industrial and commercial secrets.

The funders of your research work may also stipulate that your data must be disseminated.

Finally, a publisher may require your data to be deposited in a data warehouse to validate your work and disseminate your article.

How to disseminate your data well

RESPECT THE FAIR PRINCIPLES

The aim of the **Findable** principle is to facilitate the discovery of data by humans and computer systems and requires the description and indexing of data and metadata.

The **Accessible** principle encourages the long-term storage of data and metadata and facilitating their access and/or downloading by specifying the conditions of access (open or restricted) and use (license).
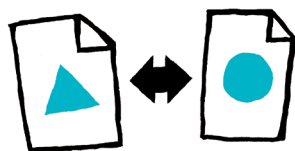
The **Interoperable** principle can be broken down as follows – data should be downloadable, usable, intelligible and combinable with other data by humans and machines.

The **Reusable** principle highlights the characteristics that make data reusable for future research or other purposes (education, innovation, reproduction/transparency of science).

Source: *Produire des données FAIR*. In Dzalé Yeumo, E., L'Hostis, D., Cocaud, S. *Gestion et partage des données scientifiques*. INRA [Internet]. 9/08/2018 [consulted on May 15th 2020]. Available at https://www6.inrae.fr/datapartage/Produire-des-donnees-FAIR

TO CHOOSE THE RIGHT DATA WAREHOUSE YOU SHOULD CHECK:

- the warehouse's conditions of use including licenses,
- the types and formats of data accepted,
- whether it is possible to deposit several versions of a dataset,
- the guarantees offered in terms of archiving and long-term access.

Depositing in a data warehouse can be free or may come at a cost depending on the warehouse's specific business model. In some cases, the operating costs of the warehouse are paid for by institutions.

▼**Zenodo**: generalist warehouse for European research
▼**Dryad**: datadryad.org for life sciences, agronomy, geosciences
▼**re3data.org**: registry of data warehouses in all disciplines

YOU CAN ALSO OPT TO PUBLISH YOUR DATA IN A DATA PAPER

A data paper is a scientific article devoted to the description of a dataset. It can be published in a data journal which only publishes such articles or in a conventional journal. In both cases, it is subject to peer review.

The objective of publishing a data paper is to make the scientific community aware of the existence of an original dataset which can be reused by other researchers and in other scientific contexts.

A data paper generally includes the following elements:

- access to the dataset itself in the form of attached files or a persistent link to a data warehouse;

- a detailed description (metadata) of the dataset (production context, authors, rights attached, etc.).

Preparing for after your thesis, join the movement

Deeply rooted public policies

Open science arose in the 2000s thanks to an initiative led by committed researchers and is now a firmly rooted component of public policies.
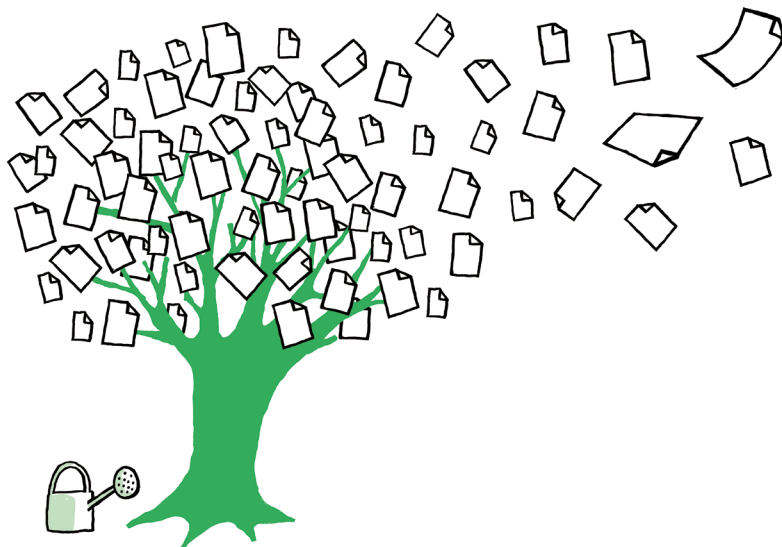
France commits to open science!

2016, French Law for a Digital Republic
This law provides a legal framework for the dissemination in open access of work published in a journal and defines the principle that administrative data should be open by default.

2018, 2021, First, then Second National Plan for Open Science
This Plan covers a broader field, defining a programme of actions organised around four objectives: generalise open access to publications; structure, share and open research data; open and promote source code produced by research; transform practices to make open science the default principle. The Plan is designed to dovetail with European and international dynamics. It provides for the organisation of training courses to disseminate best practices and encourages institutions to adopt open science policies.

The French National Research Agency (ANR)

The ANR now stipulates that funding will only be allocated if the principles of open science are respected including full and immediate access to publications (articles) resulting from calls for projects launched from January 1st 2021 onwards. A data management plan is also required.

And at the European level?

Horizon Europe

This funding programme starts on January 1st 2021 and consolidates the open science policy introduced under the Horizon 2020 programme. It includes the obligation to disseminate open access publications and strongly encourages the dissemination of data according to FAIR principles and an associated data management plan.

The Plan S

The 'Plan S' is a product of the cOAlition S which brings together research funding agencies committed to the development of open science. Its guiding principle is the free and immediate dissemination of publications funded by these agencies in journals, on open access platforms or in open archives. It will come into effect as of January 2021.

HRS4R

The HR Excellence in Research (HRS4R) label is awarded by the European Commission to institutions that have signed the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers and is a condition for obtaining European funding. The Charter for Researchers contains a section on "Ethics and good professional practices" which includes open science practices.

Evaluating research differently

Open science represents a profound change in science and research which means it is currently questioning evaluation practices.

Reinventing peer review

Peer review is a prerequisite for any publication and a guarantee of the reliability of scientific results. The process is usually organised by the journal or the publisher who submits the manuscript to other researchers in the same field as the author and who are not known to the author. However, this system is currently having difficulties particularly because reviewers may be competitors of the author. Conversely, some reviewers sometimes work on research themes which are too far removed from the article needing review. Generally speaking, peer review is not an infallible solution – since the 2000s there has been an increase in the publication of fraudulent or questionable articles because of data manipulation or plagiarism (Grieneisen & Zhang, 2012; Fang, Steen & Casadevall, 2013).

Open science has brought about **the emergence of Open Peer Review practices** with two main methods: the names of reviewers are made public and/or the review is carried out on a platform that enables all users to comment on the article. This practice has been made easier by the existence of pre-publication platforms like ▼**arXiv** and ▼**bioRxiv** which journals can use to collect comments.

> **Example**
> The ▼**Peer Community in** platform organises the peer review of pre-publications deposited in an open archive which can lead to the obtention of a certificate of validation. Journals can thus publish articles freely without having to ask for reviewers.

In certain disciplines such as biology-health, the pre-registration of hypotheses and protocols (registered reports) in registers or journals has led to practices changing. Peer review is carried out in two stages which reduces the effect of publication bias (tendency to publish only positive results) and spotlights the research process.

The evaluation of researchers with regard to open science

The desire to modify the evaluation process is particularly based on the Declaration of San Francisco (DORA) of 2013 and its first recommendation – the use of metrics based on journals, such as impact factor, should be avoided in evaluating researchers.
The new standards for the evaluation of researchers constructed according to the principles of open science must:
- encourage the unhindered dissemination of scientific production,
- take all aspects of research activity into account.

Example
The new CNRS roadmap provides for results themselves to be evaluated rather than publications. The data, codes of any software developed and pre-publications must be provided to the reviewers and the productions must be accessible in HAL when possible.

Finally, these new standards must take open science into account by promoting the following new practices:

- the open access dissemination of results including when these are negative,
- the publication of work which consists of reproducing experiments,
- the publication of a research notebook describing the stages in the construction of its scientific approach,
- the online availability of a database of textual or iconographic sources,
- submitting research protocols to peer review prior to experiments, etc.
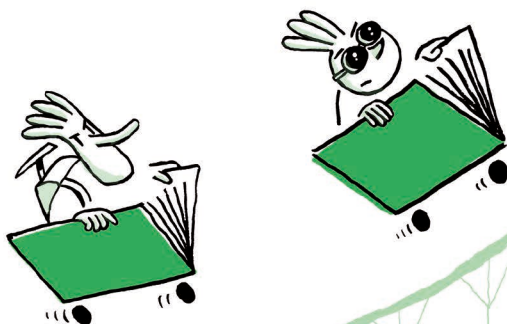
Act now

When you can, submit your publications to open access journals.

Deposit your publications in an open archive:
- Keep the latest version approved by peers but not yet formatted by the publisher.
- Ask your co-authors for approval.
- Deposit the latest version approved by the peer reviewers in an open archive.

Take part in discussions within your disciplinary community about pre-publications deposited in open archives.

Document and share research data and/or the source code you developed:
- Store data using a perennial system or format in compliance with your team or institution's policy.
- Document the data with metadata so that they are reusable.
- Deposit the datasets associated with your publications in an online repository.
- Deposit your codes in a dedicated perennial open archive like ▼**Software Heritage**.

Follow the evolutions of open science and get involved!

ANY QUESTIONS ?

This guide to open science has provided you with an overview of all the relevant issues and avenues to be explored for your thesis work. If you wish to take this further, please do not hesitate to contact your university's departments who can answer your questions, provide you with individual support and offer you training in these subjects. Your contacts:

- your doctoral school (in the first instance) and/or your home laboratory;

- your institution's joint documentation service / university library (for training, depositing your thesis subject, management of the open archive portal, access to documentation, etc.);

- the URFIST network (Regional Scientific and Technical Information training Unit) which provides on-site or distance learning courses.

Going further

GENERAL RESOURCES

Ouvrir la science : Ressources
Resources and guides distributed by the Committee for Open Science.
https://www.ouvrirlascience.fr/category/ressources/

Second National plan for open science
This document presents the French action plan set up by the Ministry
of Higher Education, Research and Innovation.
https://www.ouvrirlascience.fr/deuxieme-plan-national-pour-la-science-ouverte/

FOSTER Open Science
A portal providing online training on open science (in English) created by FOSTER,
a consortium of academic and research institutions in 6 European countries,
funded by the European Union. https://www.fosteropenscience.eu

CoopIST (Cooperating on scientific and technical information)
A CIRAD website providing many technical fact sheets on different aspects of open science.
https://coop-ist.cirad.fr/

The Couperin site on open science in France
The Couperin consortium provides links and guides concerning several aspects of open
science including the dissemination of open access publications.
https://openaccess.couperin.org

DoRANum (Research data: digital learning)
A set of free reusable resources (fact sheets and videos) which help with research data
management provided by the URFIST network and Inist-CNRS. https://doranum.fr/

SPECIFIC RESOURCES

Publications and legal issues
Committee for Open Science. *Je publie, quels sont mes droits ?* 2nd edition. 2020.
Available at www.ouvrirlascience.fr.

Reproducibility
DESQUILBET, Loïc, GRANGER, Sabrina, HEJBLUM, Boris, *et al.*
Vers Une Recherche Reproductible. Bordeaux : Urfist de Bordeaux, 2019.
https://hal.archives-ouvertes.fr/hal-02144142

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Data management
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Glossary

APC (article processing charges)
Charges for publishing immediately in open access which may be billed to the author (or his or her institution). See Open access publications.

Article: preprint or author's version
The version of an article sent to a journal by the authors prior to the peer review process.

Article: Accepted author manuscript
The version of an article including revisions resulting from the peer review process but without the publisher's final layout.

Article: version of record
The version of an article with the editor's final layout as published in the journal.

Data Management Plan (DMP)
An ongoing plan written at the start of a research project which sets out how the data will be managed covering its collection, documentation, and storage, as well as managing sensitive data, conditions for opening or sharing data, etc.

Data warehouse
These may be multidisciplinary or thematic in one disciplinary field. In them, datasets are deposited, documented, and disseminated. A warehouse provides better archiving and wider access to data than a laboratory server or other local solutions.

Distribution license
The license defines the conditions for distribution and reuse of any scientific content (example: Creative Commons).

Embargo
Period during which a scientific production cannot be disseminated in open access. In the case of state-funded scientific publications, the French Law for a Digital Republic limits the embargo period after which the written work can be openly disseminated regardless of contracts with publishers (see the French law for a Figital Republic). Authors of theses may define an embargo period during which the thesis is only available within the academic community.

FAIR (principles)
The aim of the FAIR principles is to make data findable, accessible, interoperable and reusable.

French Law for a Digital Republic
This 2016 law provides a legal framework for depositing certain versions of journal articles in open access repositories if at least half of the funding of the research in question came from the public sector.
By putting research data in the category of public data, this law creates a legal obligation for such data to be freely disseminated.

General Data Protection Regulation (GDPR).
The legal framework defined by the European Union for the management of personal data. It may be consulted at: https://www.cnil.fr/fr/comprendre-le-rgpd

Metadata
Information which enables the standardised description of data or digital documents (e.g. a digital photo's date and GPS coordinates). The quality of metadata ensures sharing and the possibility to reuse data.

Open access
Content in open access is accessible to all with no barriers: no authentication requirements, no resources under an embargo, no paid access, etc. This may concern scientific publications, data, code, etc.
There are several ways of disseminating open access publications. For example, self-archiving scientific productions in an open archive (sometimes called green open access) or publishing in an open access journal with or without APCs (sometimes called gold open access).

Open access publication
A journal or book that has been directly disseminated in open access. These books and journals have varied business models such as public subsidies, payments by authors' institutions (see APCs), financial contributions from academic societies or university libraries and so forth. Find out more about the ▼**Directory of Open Access Journals (DOAJ)** and the ▼**Directory of Open Access Books (DOAB)**.

Open archive
Researchers deposit their work directly in thematic or institutional archives so that it can be consulted by all with no barriers.

Persistent identifier
A unique stable reference for a digital object or subject such as a dataset, article or author. For example a digital object identifier (DOI), or an Open Researcher and Contributor ID (ORCID).

Personal data
Data concerning an individual who is identified or identifiable.

Predatory publishers or journals
Publishers or journals with dubious peer reviewing or business practices.

Reproducibility
The capacity of another researcher to obtain the same results using the same methods and data. This highlights the importance of the methods used to produce such results.

Research data
Factual records (numerical scores, textual records, images and sounds) used as primary sources for scientific research, and that are commonly accepted in the scientific community as necessary to validate research findings.

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Credits

Thanks

The *Passport For Open Science* is a guide designed to accompany you at every step of your research, from developing your scientific approach to the dissemination of your research results. It provides a set of tools and best practices that can be directly implemented and is aimed at researchers from all disciplines.

We hope this guide will motivate you and provide the means for you to realise the ambitions of open science by sharing your research results and data with as many people as possible.

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