

## OPEN SCIENCE FACTSHEET NO. 2

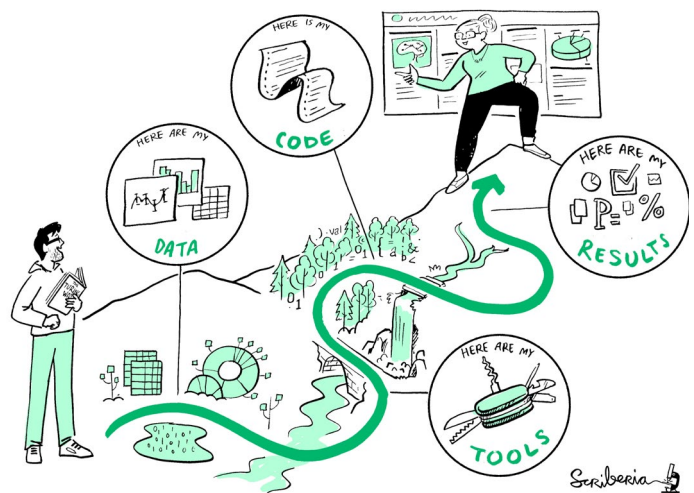
based on the 57th online seminar:  
**Practical Steps Towards Open and Reproducible Research**

### WHAT IS REPRODUCIBILITY?

Research is called reproducible when it is possible to (independently) recreate

- ▶ the same results from
  - ▶ the same data and
  - ▶ same code/analysis
- as used by the original researcher or team of researchers.

### PRACTICAL STEPS TOWARDS REPRODUCIBLE RESEARCH:



*Finding the path towards reproducible research*

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#### Get organized!

- Use a system with version control for collaborative work.
- Use clear, meaningful and systematic file names.

#### Use Open Source Software...

- for your analysis to the reusability and reproducibility of your results.
- In addition to the research data, program code should be made accessible as open source software.

#### Use Version Control...

- to keep track and review the history of your files and go back to old versions if needed.
- Git is the most widely spread tool; it works well in combination with text (e.g. R/python scripts, LaTeX, Markdown).

#### Make your work available online (if possible)

- Make your research data open and FAIR and deposit it together with proper metadata in a repository that assigns persistent identifiers (PIDs).
- Use open source licenses for your own software code.
- Publish your results in Open Access, so everyone can read them and retrace the research process.

# HELMHOLTZ

## Open Science

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#### OVERCOMING CHALLENGES

How can institutions help researchers conduct reproducible research?

- Participate in the discussion, support and develop approaches to reproducible science.
- Offer training opportunities for researchers to acquire the necessary skills to use tools, markdown and/or programming languages.
- Find comprehensive ways to evaluate researchers' output, honoring all the steps of the scientific process.
- Establish a constructive error culture.
- Promote pre-registration of research studies.
- Deploy support staff (data stewards, research software engineers etc.) to reduce workload and provide knowledge and guidance for the researchers.

How can we overcome the fear of misuse of data or code?

- Clean documentation and the use of open licenses increase transparency and regulate the conditions of reuse.
- Through e.g. (open) peer review, misuse can be recognised, made public and be sanctioned.
- In cases of doubt, contact a scientific ombudsperson.
- Appropriate embargo periods for the publication of research data provides the data creators sufficient time to complete analyses and projects with the data.

#### DIVE DEEPER: RESOURCES AND SUPPORT FOR REPRODUCIBLE RESEARCH

- [German Reproducibility Network \(GRN\)](#)
- [The Turing Way](#)
- [The Open Source Initiative](#)
- [Recommendations on the development, use and provision of Research Software](#)
- [GO FAIR Initiative](#)
- [Research Software Engineers](#)
- [Recommendations for guidelines at the Helmholtz centres on handling research data](#)
- [DataLad](#)

#### OUR SPEAKER DR. HEIDI SEIBOLD



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