

Open Science in Astronomy

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MANCHESTER
1824

The University of Manchester



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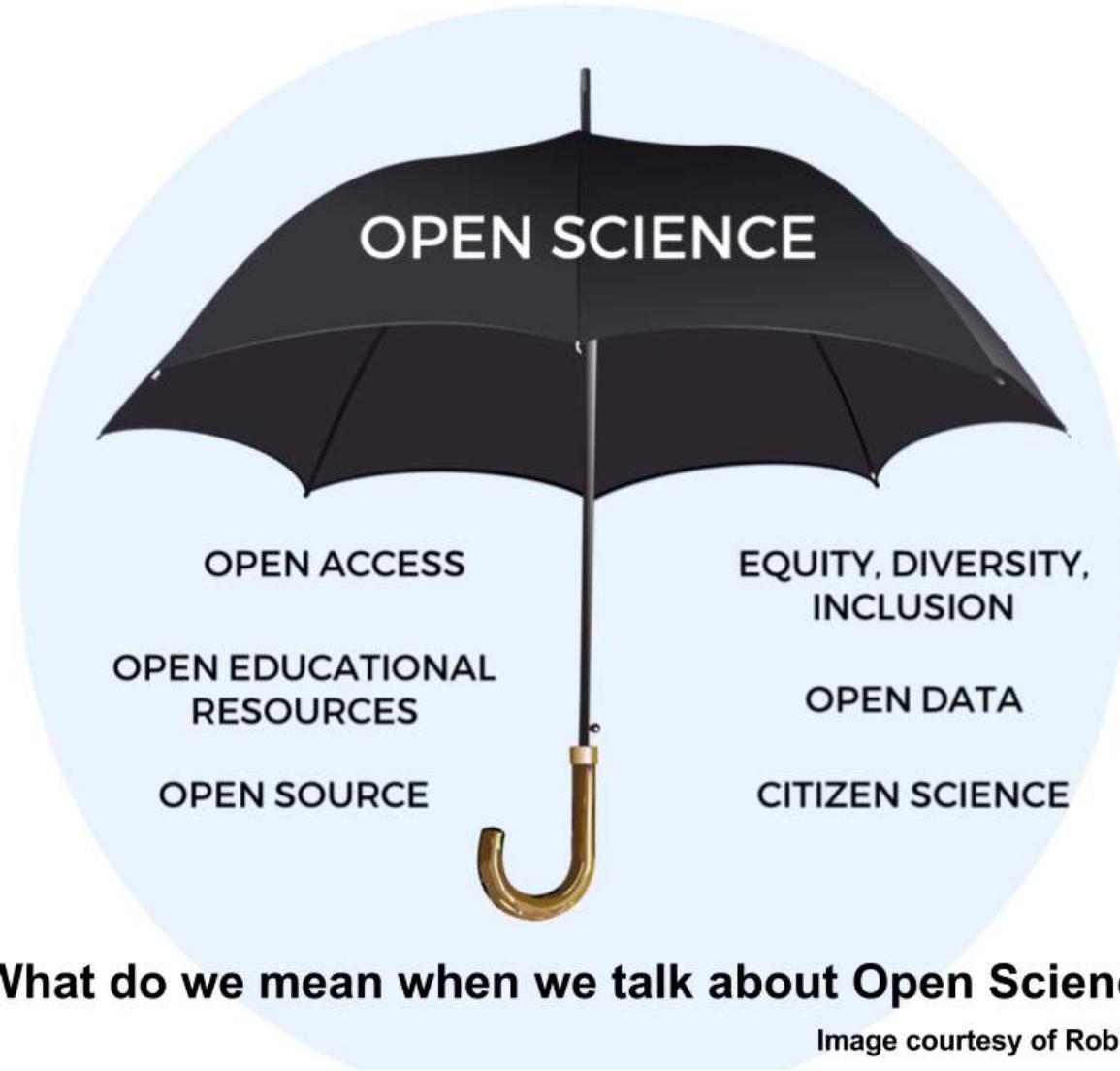
Outline

- What is Open Science?
- Barriers to Open Science
- Why research openly?
- Platforms to help you open up your research workflow
- Mozilla Open Leaders project: Resources for Open Science in Astronomy
- Open Science projects in Astronomy

What is Open Science?

The concept of transparency at all stages of the research lifecycle, combined with free and open access to data, publications, source code, etc. to ensure that anyone can fully reproduce your results.

...but isn't this just science?



Barriers to Open Science

From Tennant, Jon (2017):
Barriers to Open Science for
junior researchers.
<https://doi.org/10.6084/m9.figshare.5383711.v1>

- Fear of
 - Scooping or ideas being stolen
 - Not being credited for ideas
 - Errors and public humiliation
 - Risk to reputation
 - Reduced scientific quality
 - Information overload
- Lack of awareness and training
- Cultural inertia and misinformation
- Challenging the establishment
- Follow the status quo to succeed
- Perceived lack of reward



<https://doi.org/10.6084/m9.figshare.5558653>

Why research openly?

Making research results more accessible contributes to better and more efficient science, and to innovation in the public and private sectors (EU Commission, Horizon 2020).

McKiernan+ (2016, DOI: 10.7554/eLife.16800) demonstrated that open research is associated with increases in citations, media attention, potential collaborators, job opportunities and funding opportunities.



Open Access

- Gold route: Royal Society Open Science journal
 - Open access, open data & open peer review
 - Author retention of copyright & liberal reuse rights via CC BY 4.0
- Green route: arXiv.org
 - Provides open access to 1,329,580+ e-prints in (Astro)Physics & many other fields
 - Started in August 1991
 - Consider posting pre-prints (vs post-prints) to arXiv to gain community insight before peer review!

The screenshot shows two side-by-side web pages. On the left is the Royal Society Publishing website for 'ROYAL SOCIETY OPEN SCIENCE'. It features a red header with 'THE ROYAL SOCIETY PUBLISHING' and social media links. Below the header is a search bar and a link to 'Advanced'. The main content area includes a brief description of the journal, a navigation bar with 'Home', 'Content', 'Information for', 'About us', 'Sign up', and 'Submit', and three tabs: 'LATEST ARTICLES', 'MOST READ', and 'MOST CITED'. Under 'LATEST ARTICLES', there are two entries: 'Landslides and dam damage resulting from the Jiuzhaigou earthquake (8 August 2017), Sichuan, China' by Bo Zhao, Yun-sheng Wang, et al., and 'Modelling cointegration and Granger causality network to detect long-term equilibrium and diffusion paths in the financial system' by Xiangyun Gao, Shuai Huang, et al. A sidebar for 'Cornell University Library' is visible. On the right is the arXiv.org homepage, featuring a large red banner at the top with the text 'arXiv.org'. Below the banner, there's a 'FEATURED' section with a red arrow pointing left, followed by a list of news items: 'Open access to 1,329,580 e-prints in Physics, Mathematics, Computer Science, Quantitative Biology, Quantitative Finance, Statistics, Electrical Engineering and Systems Science, and Economics', 'Subject search and browse: Physics', '15 Nov 2017: arXiv.org performance issues resolved', '13 Nov 2017: arXiv.org currently experiencing unexpected performance issues', '31 Oct 2017: 2017 holiday schedule announced', and 'See cumulative "What's New" pages. Read robots beware before attempting any automated download'. A 'Physics' section follows, listing various sub-fields and their descriptions, such as Astrophysics, Condensed Matter, General Relativity and Quantum Cosmology, High Energy Physics, Mathematical Physics, Nonlinear Sciences, Nuclear Experiment, Nuclear Theory, Physics, and Quantum Physics.

Chat to Alice Power
at the Royal Society
Publishing stand in
the Exhibition Hall!

Open repositories



figshare
credit for all your research



GitHub

Open Science Framework
A scholarly commons to connect the entire research cycle





A catch-all repository that enables researchers, scientists, projects & institutions to:

- Share research results in a wide variety of formats including text, datasets, audio, video & images across all fields of science
- Display their research results & get credited by making the research results citable & integrating them into existing reporting lines to funding agencies like the EU
- Easily access & reuse shared research results

The screenshot shows the Zenodo deposit new page. At the top, there is a navigation bar with links for 'Upload' and 'Communities'. A user's email address, 'rainswor@gmail.com', is visible in the top right corner. Below the navigation, there is a red 'Delete' button and two buttons for 'Save' and 'Publish'. The main area is titled 'New upload' with instructions: '(i) Upload minimum one file or fill-in required fields (marked with a red star). (ii) Press "Save" to save your upload for editing later. (iii) When ready, press "Publish" to finalize and make your upload public.' There is a 'Files' dropdown menu and a 'Choose files' button. A large central area says 'Drag and drop files here' with a 'Choose files' button below it. A note states '(minimum 1 file required, max 50 GB per dataset - contact us for larger datasets)'. Below this, there is a 'Upload type' section with various options: Publication (selected), Poster, Presentation, Dataset, Image, Video/Audio, Software, Lesson, and Other. Under 'Publication type', 'Journal article' is selected. A 'required' dropdown is also present.



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- Display their research results & get credited by making the research results citable & integrating them into existing reporting lines to funding agencies like the EU
- Easily access & reuse shared research results

zenodo

Search

Upload Communities [rainswor@gmail.com](#)

RadioNet RINGS

Recent uploads

Search RadioNet RINGS

[March 9, 2018 \(1.0.0\)](#) [Dataset](#) [Open Access](#) [View](#)

EVN measurement set of experiment N14C2

Ainsworth, Rachael; van Bemmel, Ilse;

EVN measurement set of experiment N14C2 (n14c2.ms) and calibration tables for Tsys (n14c2.tsys) and gain curve (n14c2.gcal). IDI files were downloaded from the EVN archive here and the associated EVN User Experiment Pipeline Feedback of N14C2 were downloaded from here. They were converted to a meas

Uploaded on March 9, 2018

[February 19, 2018 \(0.0\)](#) [Dataset](#) [Open Access](#) [View](#)

CSV equivalent of LOFAR ACC files

Oisin Creaner;

These are conversions of LOFAR ACC files by Griffin Foster from <https://zenodo.org/record/840405> to demonstrate the use of the ACC to CSV converter developed at DIAS

Uploaded on February 19, 2018

[February 14, 2018 \(v1\)](#) [Dataset](#) [Open Access](#) [View](#)

eMERLIN test data of 1407+284 at C-band

Moldon, Javier; Ainsworth, Rachael;

eMERLIN test data in measurement set (.ms) format of the bandpass calibrator source 1407+284 at C-band for the RadioNet RINGS project. Data has been flagged (including a few minutes at the start of the scan and the end channels of each spectral window) and averaged to 128 channels. The data are in a

Uploaded on February 14, 2018

New upload

Want your upload to appear in this community?

- Click the button above to upload straight to this community.
- The community curator is notified, and will either accept or reject your upload (see community curation policy above).
- If your upload is rejected by the curator, it will still be available on Zenodo, just not in this community.

Community

RadioNet

RadioNet RINGS

RadioNet is a consortium of leading institutions in Europe, Republic of Korea and South Africa, integrating at European level world-class infrastructures for research in radio astronomy. RadioNet fosters a sustainable research environment. RadioNet leverages the capabilities of its partners on European scale. RadioNet is a project funded in the framework of the European Horizon

GitHub

- Git is an open source program for tracking changes in text files (version control)
- GitHub is a code hosting platform for version control & collaboration. It lets you & others work together on projects from anywhere
- Open & reproducible science/code/research!
- Online portfolio & webpage for your research
- Archive your repo & make citable with Zenodo

THIS IS GIT. IT TRACKS COLLABORATIVE WORK ON PROJECTS THROUGH A BEAUTIFUL DISTRIBUTED GRAPH THEORY TREE MODEL.

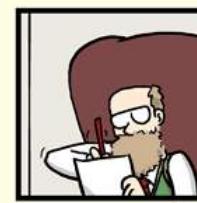
COOL. HOW DO WE USE IT?

NO IDEA. JUST MEMORIZIZE THESE SHELL COMMANDS AND TYPE THEM TO SYNC UP. IF YOU GET ERRORS, SAVE YOUR WORK ELSEWHERE, DELETE THE PROJECT, AND DOWNLOAD A FRESH COPY.



<https://xkcd.com/1597/>

"FINAL".doc



JORGE CHAM © 2012



WWW.PHDCOMICS.COM

GitHub

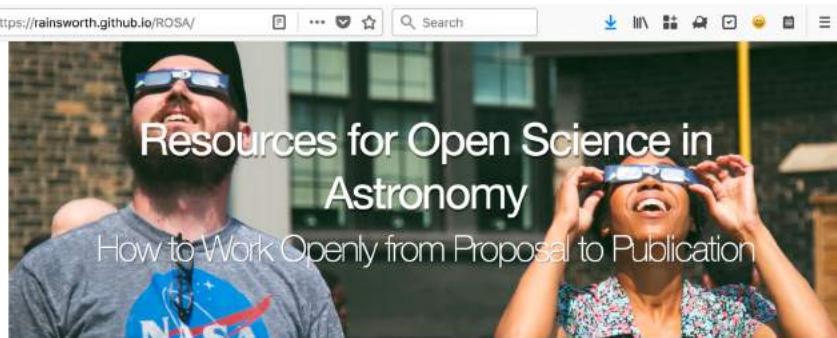
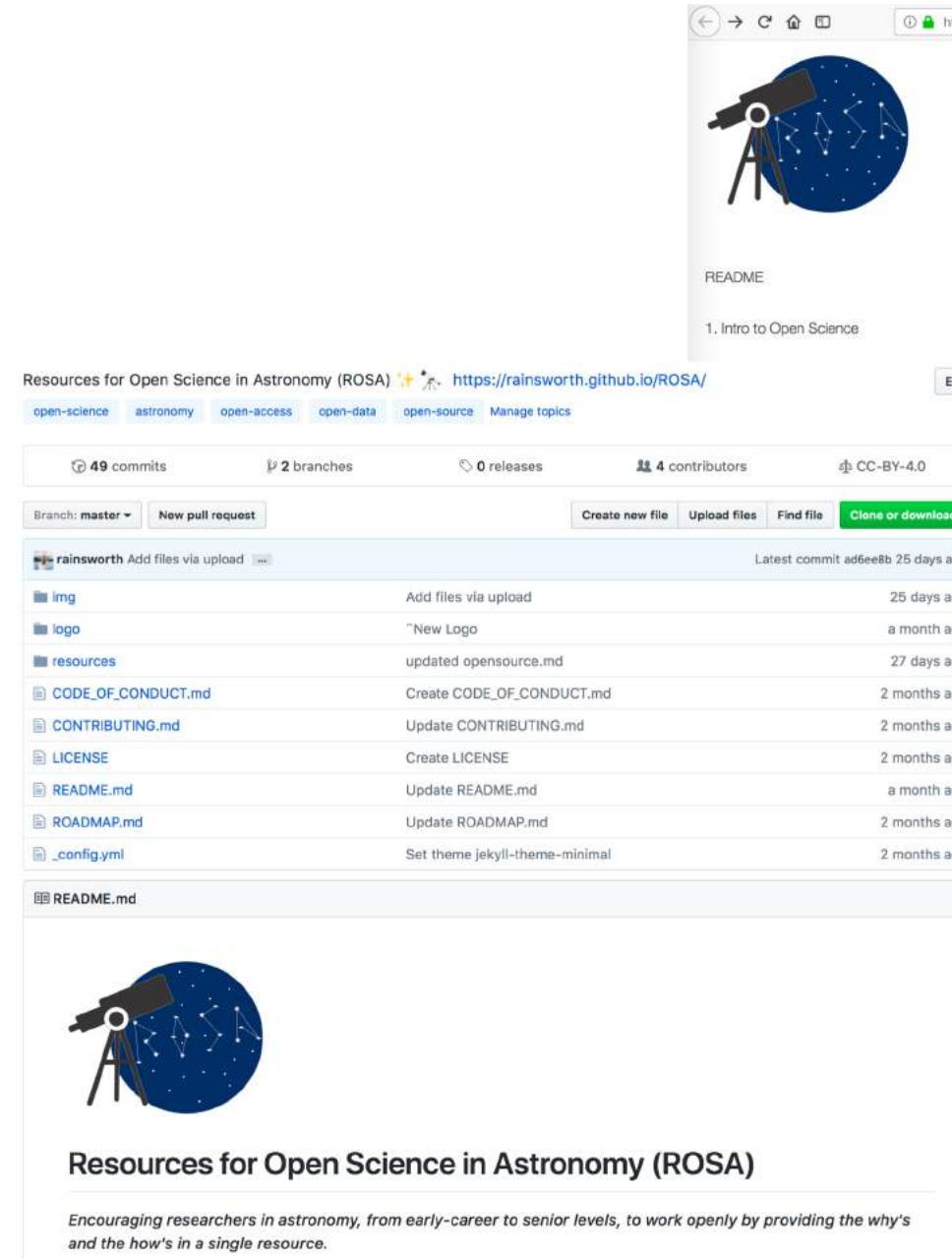
- Git is an open source program for tracking changes in text files (version control)
- GitHub is a code hosting platform for version control & collaboration. It lets you & others work together on projects from anywhere
- Open & reproducible science/code/research!
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- Archive your repo & make citable with Zenodo

The screenshot shows a GitHub profile page for user 'rainsworth'. At the top, there's a header with the GitHub logo, a search bar, and navigation links for 'Pull requests', 'Issues', 'Marketplace', and 'Explore'. Below the header is a profile picture of a woman with long red hair standing by a lake with mountains in the background. To the right of the picture are statistics: 'Overview' (Repositories: 11, Stars: 65, Followers: 17, Following: 35), 'Popular repositories' (ROSA, rainsworth.github.io, GMRT-TAU_catalogue, Spectral-Energy-Distributions, awesomeCV, paper_scripts), and a 'Contribution activity' chart showing contributions per day over the last year. The ROSA repository is described as 'Resources for Open Science in Astronomy (ROSA)' and includes icons for GitHub, Twitter, and a star. The rainsworth.github.io repository is described as a 'personal website using the indigo theme' and includes an 'HTML' icon. The GMRT-TAU_catalogue repository is described as a 'GMRT survey of regions towards the Taurus Molecular Cloud at 323 and 608 MHz' and includes icons for Python and TeX. The Spectral-Energy-Distributions repository is described as 'SED data from radio to sub-mm wavelengths for a number of well-studied YSOs' and includes a TeX icon. The awesomeCV repository is described as 'My CV using the awesome CV template' and includes a TeX icon. The paper_scripts repository is described as 'A collection of scripts used to make plots in my publications.' and includes a Python icon.

moz://a

Open Leaders Round 4 project:
Resources for Open Science in
Astronomy (ROSA)

- github.com/rainsworth/ROSA
- An open project to compile & tailor open science best practices from around the web into a how-to kit for astronomers to research openly from proposal to publication.
- A guide to help astronomers comply with Horizon 2020 open science mandates!



Welcome to the Resources for Open Science in Astronomy (ROSA) project webpage! ROSA is an open project to compile and tailor open science best practices from around the web into a how-to kit for astronomers to research openly from proposal to publication. Please note that this webpage is therefore under construction.

The project will result in two products:

- a general open science resource kit that can be adapted to any field,
- and one specifically tailored for astronomy: ROSA.

ROSA was born out of Round 4 of the Mozilla Open Leaders program. The project is being developed on GitHub so that anyone can contribute content, resources, tutorials, insight and experience, which will undergo curation and tailoring to create field-specific guides. The end product aims to be a well-documented guide on *why* you should research openly *how*.

[GET STARTED ▶](#)

Mozilla Global Sprint

Join this fun, two-day collaborative hackathon May 10-11 to contribute to this or many other open projects!

<https://mzl.la/global-sprint>

Open Projects in Astronomy

The collage includes:

- The Astropy Project**: Logo featuring a red spiral galaxy icon and the text "The Astropy Project".
- A stylized illustration of a brain with a green arrow pointing upwards.
- A yellow sun-like icon with radiating lines.
- A GitHub organization page for the **LOFAR telescope**, showing 10 repositories, 1 person, and 0 projects. It includes a purple spiral icon and a link to <http://astron.nl/radio-observatory/lofar-data-processing/software-processing-tools/software-processing-tools>.
- Trillian**: An all-sky, multi-wavelength astronomy computational engine, shown with a colorful nebula background and the text "Trillian" overlaid.
- An illustration of a globe divided into four quadrants, each showing a different astronomical dataset (e.g., temperature maps), with the words "Open" and "Astronomy" written along the curve.

Summary

- Open Science is making research outputs freely available and accessible for others to use in order to increase efficiency, maximize impact, encourage collaboration, and promote inclusion, equity and diversity in science. (You also get more citations.)
- Further reading:
 - Tennant JP, Waldner F, Jacques DC *et al.* The academic, economic and societal impacts of Open Access: an evidence-based review. *F1000Research* 2016, 5:632 (doi: [10.12688/f1000research.8460.3](https://doi.org/10.12688/f1000research.8460.3))
 - McKiernan EC, *et al.* Point of View: How open science helps researchers succeed. *eLife* 2016;5:e16800 (doi: [10.7554/eLife.16800](https://doi.org/10.7554/eLife.16800))
- Contact:
 - Email - rachael.ainsworth@manchester.ac.uk
 - GitHub - [@rainsworth](https://github.com/rainsworth)
 - Twitter - [@rachaelevlyn](https://twitter.com/rachaelevlyn)
 - Resources for Open Science in Astronomy:
<https://github.com/rainsworth/ROSA/>