
Reproducibility & Open Science

Dr. Rachael Ainsworth
Jodrell Bank Centre for Astrophysics
University of Manchester
@rachaelevelyn

Reproducibility & Open Science

Data Science for Experimental Design
The Alan Turing Institute, 17 October 2018

Dr. Rachael Ainsworth
Jodrell Bank Centre for Astrophysics
University of Manchester
@rachaelevelyn

Dr. Rachael Ainsworth

- Research Associate in Radio Astronomy & Open Science Champion @ JBCA, UoM
 - Mozilla Open Leader (Round 4 Project Lead, Round 5 Mentor & Cohort Host)
 - FOSTER Open Science Trainer
 - HER+Data MCR Organiser
 - Tech Future Female Leaders Cohort 1
-
- Likes meeting new people, learning new things, coffee & travelling.



Outline



- What is Reproducibility?
- What is Open Science?
- Barriers to Open Science
- Why research openly?
- How-to open up your research workflow
- Open Science examples in Astronomy

Barriers to Reproducible Research (and how to overcome them)



- Research fellow at the Alan Turing Institute for Data Science and Artificial Intelligence
- Senior research associate in the Department of Psychiatry, University of Cambridge
- 2016/17 Mozilla Fellow for Science

doi: <https://dx.doi.org/10.6084/m9.figshare.7140050>

Acknowledgements

Dr. Kirstie Whitaker

(e.g. Barriers to reproducible research:

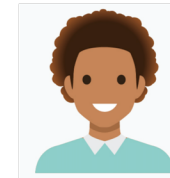
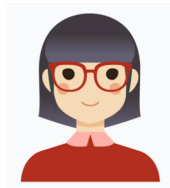
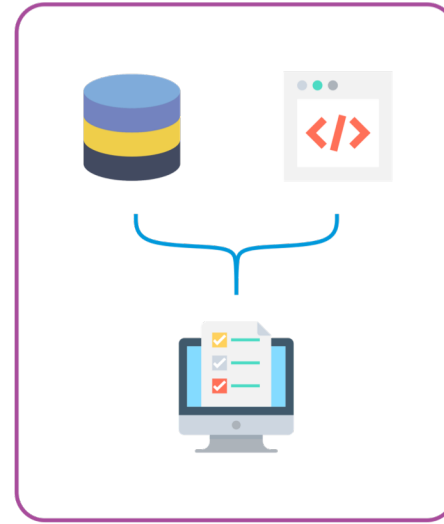
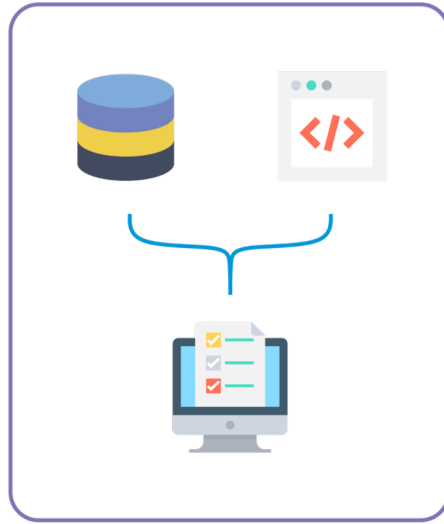
<https://doi.org/10.6084/m9.figshare.7140050.v1>)

Acknowledgements

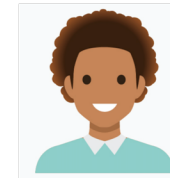
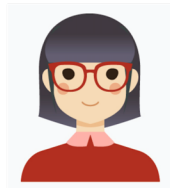
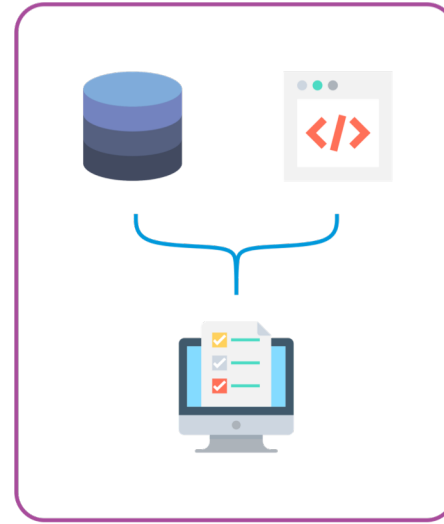
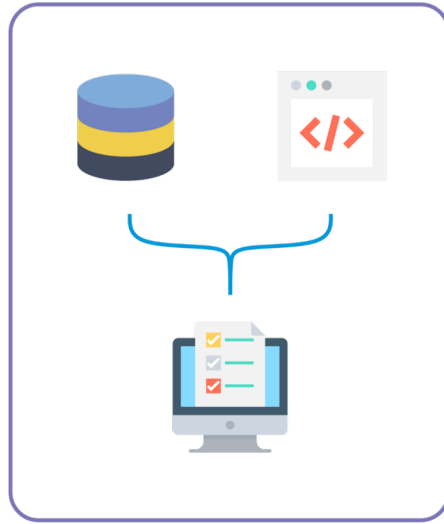
- Dr. Tania Allard (talks on Reproducibility on her GitHub <https://github.com/trallard/Talks>)
- Dr. Jon Tennant (Barriers to Open Science for Junior Researchers <https://doi.org/10.6084/m9.figshare.5383711.v1>)
- FOSTER Open Science (<https://book.fosteropenscience.eu/>)

What is Reproducibility?

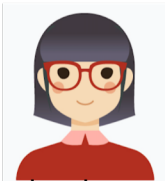
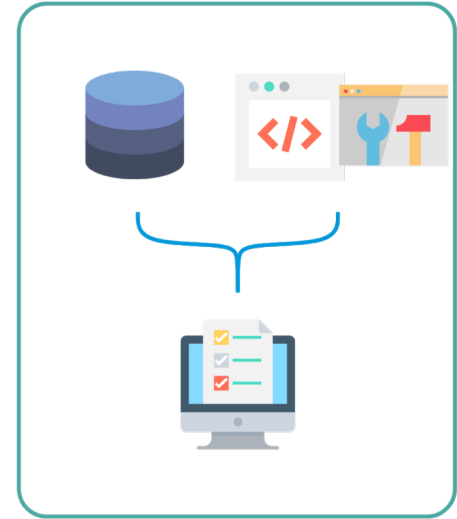
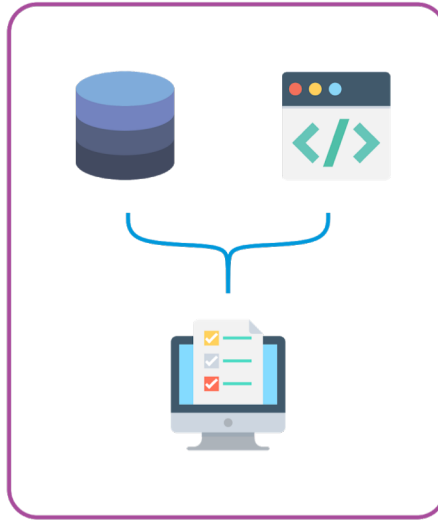
Reproducible



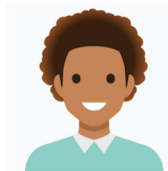
Replicable



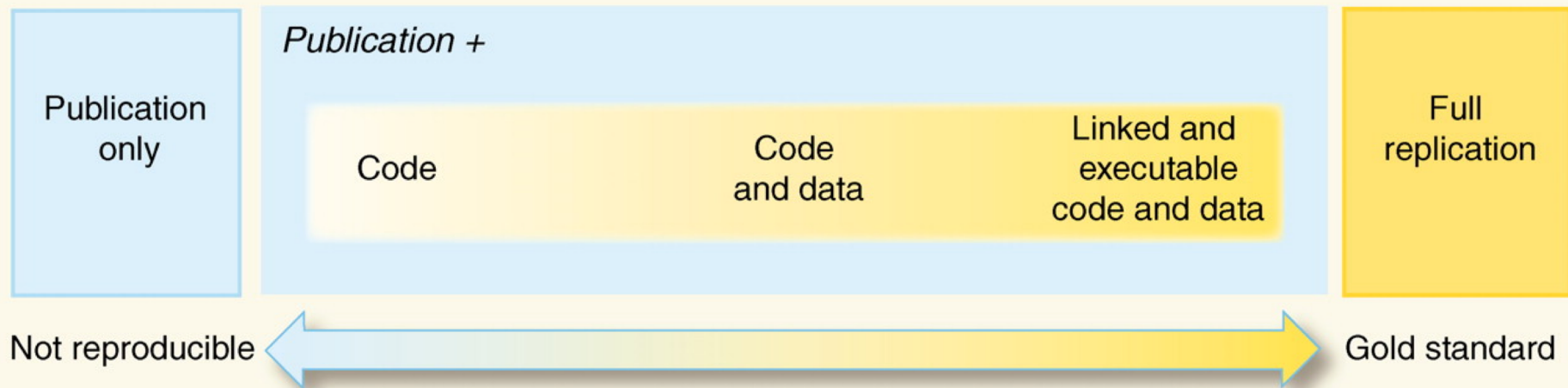
Robust



R Ainsworth - @rachaelevelyn



Reproducibility Spectrum



Peng, 2011 <https://doi.org/10.1126/science.1213847>





Sluggish data sharing hampers reproducibility effort

Initiative trying to validate 50 cancer papers finds difficulty in accessing original study data.

[Richard Van Noorden](#)

03 June 2015

RIO DE JANEIRO, BRAZIL



[Rights & Permissions](#)

An initiative that aims to validate the findings of key cancer papers is being slowed by an unexpected hurdle — problems accessing data from the original studies.



What matters in science — and why — free in your inbox every weekday.

[Sign up](#)

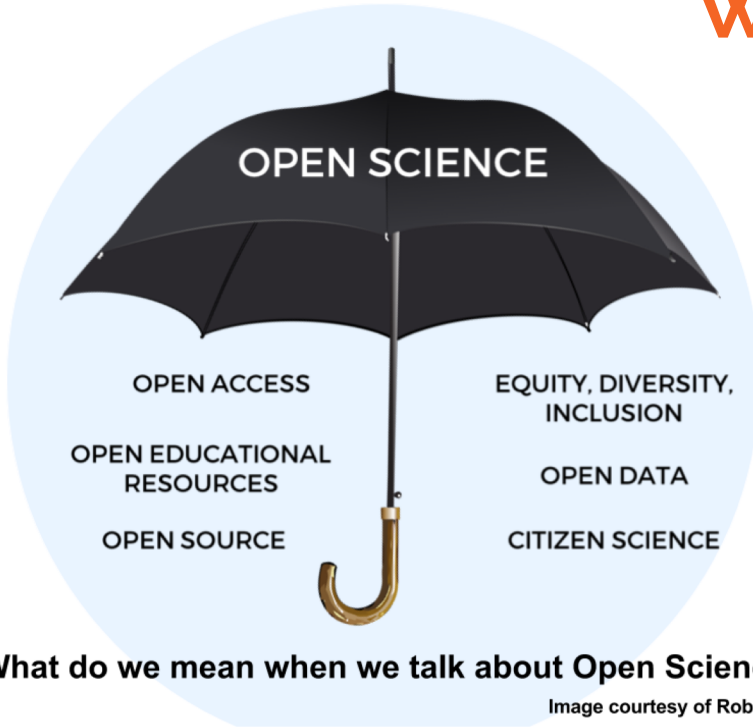
Listen



<https://www.nature.com/news/sluggish-data-sharing-hampers-reproducibility-effort-1.17694>

What is Open Science?

What is Open Science?



What do we mean when we talk about Open Science?

Image courtesy of Robin Champieux

Open Science is the practice of science in such a way that others can collaborate and contribute, where research data, lab notes and other research processes are freely available, under terms that enable reuse, redistribution and reproduction of the research and its underlying data and methods.

[FOSTER, Open Science Definition:
<https://www.fosteropenscience.eu/foster-taxonomy/open-science-definition>]

... but isn't this just science?

Barriers to Open Science

Barriers to Open Science



John R. McKiernan <http://whyopenresearch.org>

- Lack of awareness and training
- Cultural inertia and misinformation
- Challenging the establishment
- Follow the status quo to succeed
- Perceived lack of reward
- Not considered for promotion
- Requires additional skills
- Takes time
- Publication bias towards novel findings



SPRINGER NATURE

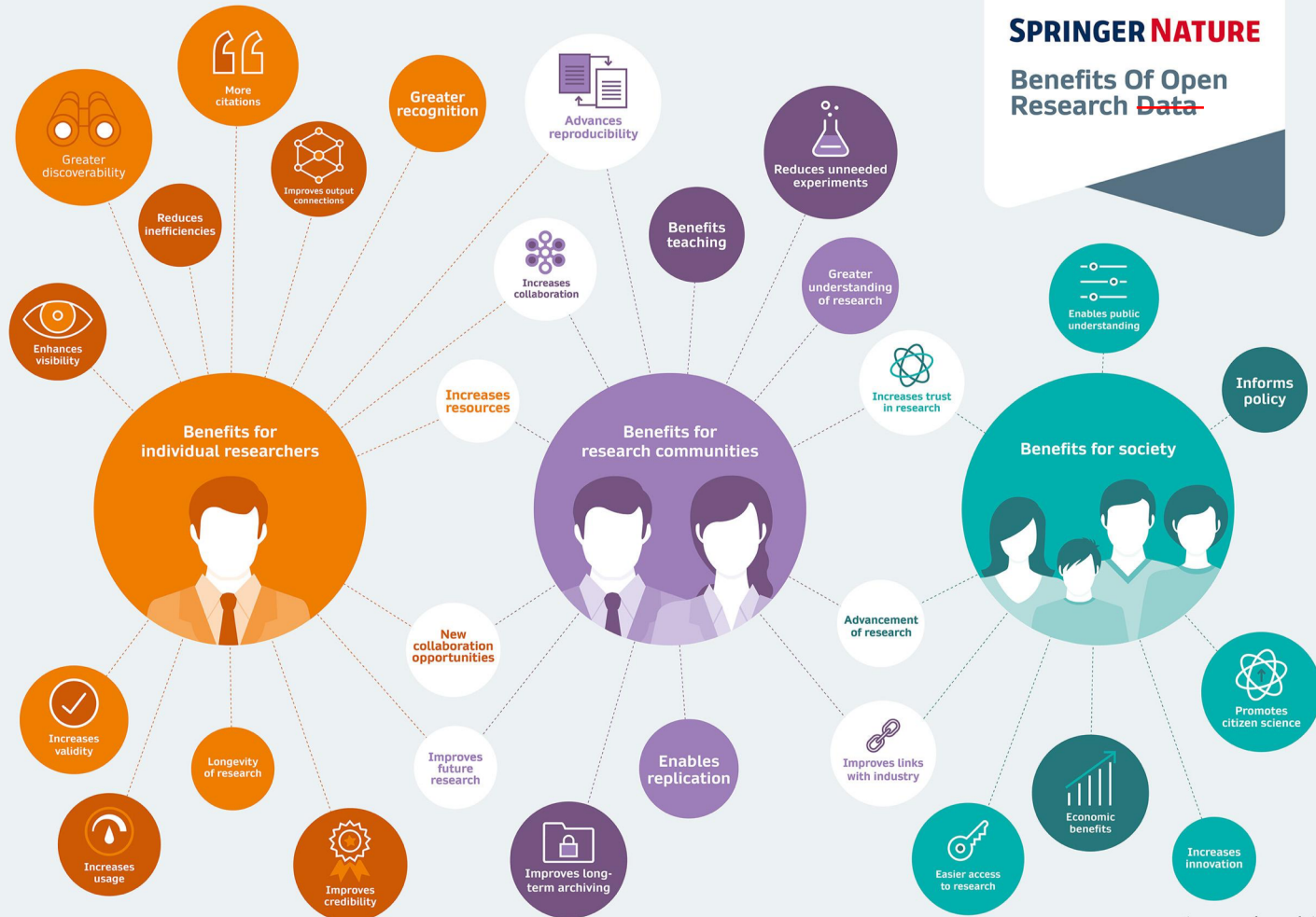
<https://doi.org/10.6084/m9.figshare.5558653>

Barriers to Open Science

Fear of

- Scooping or ideas being stolen
- Not being credited for ideas
- Errors and public humiliation
- Risk to reputation
- Reduced scientific quality
- Information overload

Why research openly?





BIOCHEMISTRY AND CHEMICAL BIOLOGY



Point of View: How open science helps researchers succeed



Erin C McKiernan , Philip E Bourne, C Titus Brown, Stuart Buck, Amye Kenall, Jennifer Lin, Damon McDougall, Brian A Nosek, Karthik Ram [see all »](#)
 National Autonomous University of Mexico, Mexico; National Institutes of Health, United States; University of California, Davis, United States; Laura and John Arnold Foundation, United States; BioMed Central, United Kingdom; CrossRef, United Kingdom; University of Texas at Austin, United States; Center for Open Science, United States; University of California, Berkeley, United States [see all »](#)

FEATURE ARTICLE Jul 7, 2016

CITED 66 VIEWS 18,445 [ANNOTATIONS 3](#)

CITE AS: eLife 2016;5:e16800 DOI: 10.7554/eLife.16800

Article

Figures and data

Side by side

► Jump to

Abstract

Open access, open data, open source and other open scholarship practices are growing in popularity and necessity. However, widespread adoption of these practices has not yet been achieved. One reason is that researchers are uncertain about how sharing their work will affect their careers. We review literature demonstrating that open research is associated with increases in citations, media attention, potential collaborators, job opportunities and funding opportunities. These findings are evidence that open research practices bring significant benefits to researchers relative to more traditional closed practices.

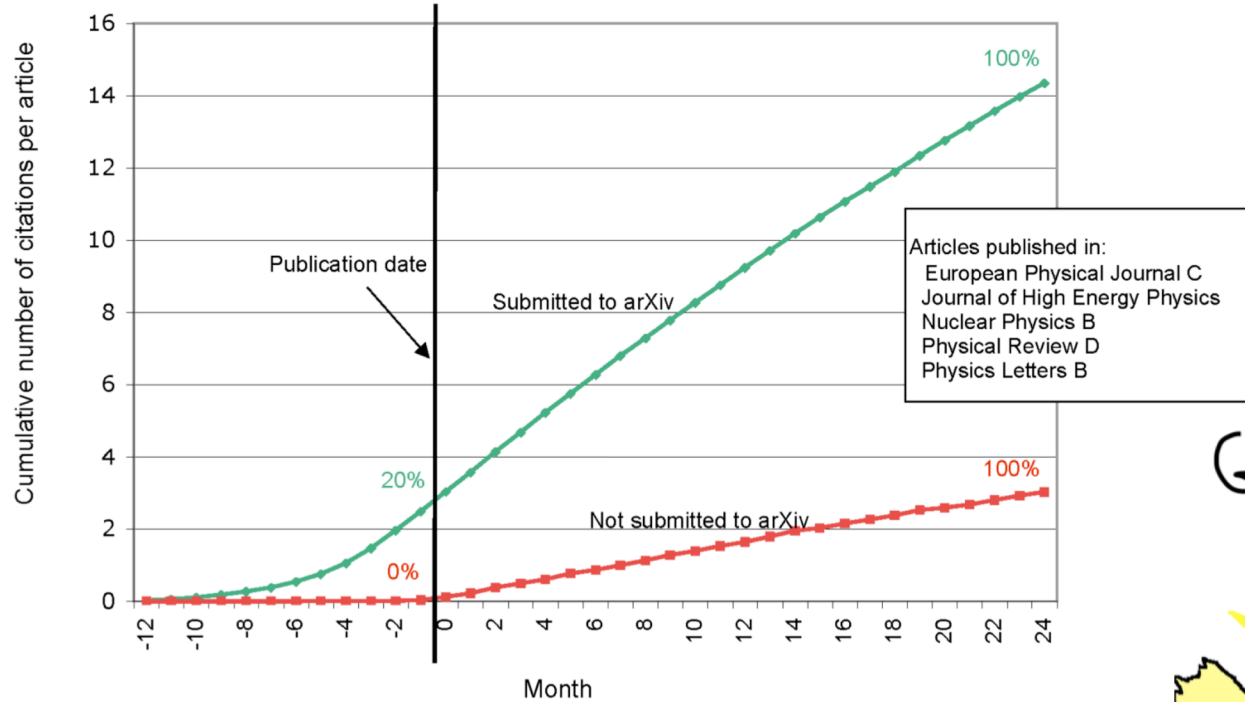
<https://doi.org/10.7554/eLife.16800.001>

OF INTEREST

In the open

PODCAST

Further reading »



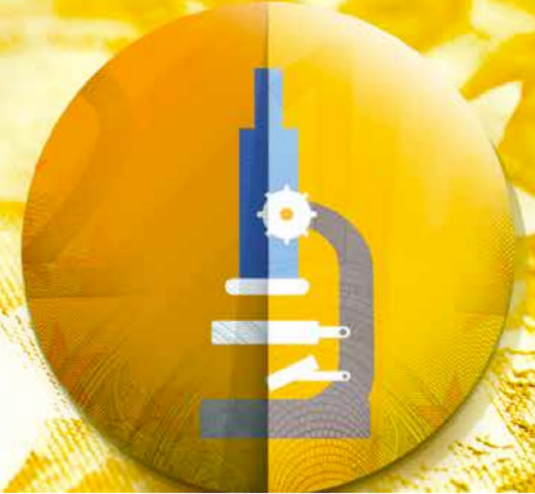
Gentil-Beccot, Mele, Brooks (2009), <https://arxiv.org/abs/0906.5418>



EU BUDGET FOR THE FUTURE

HORIZON EUROPE

#EUBudget #HorizonEU



Open Science will become the modus operandi of Horizon Europe. It will go beyond the open access policy of Horizon 2020 and require open access to publications, data, and to research data management plans.

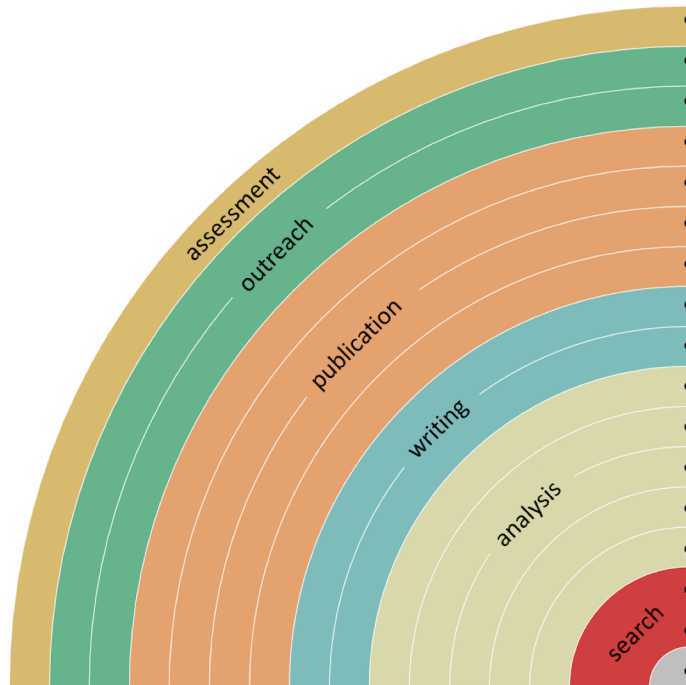
Your primary collaborator is yourself 6 months from now, and your past self doesn't answer emails.

<https://dynamicecology.wordpress.com/2015/02/18/the-biggest-benefit-of-my-shift-to-r-reproducibility/>



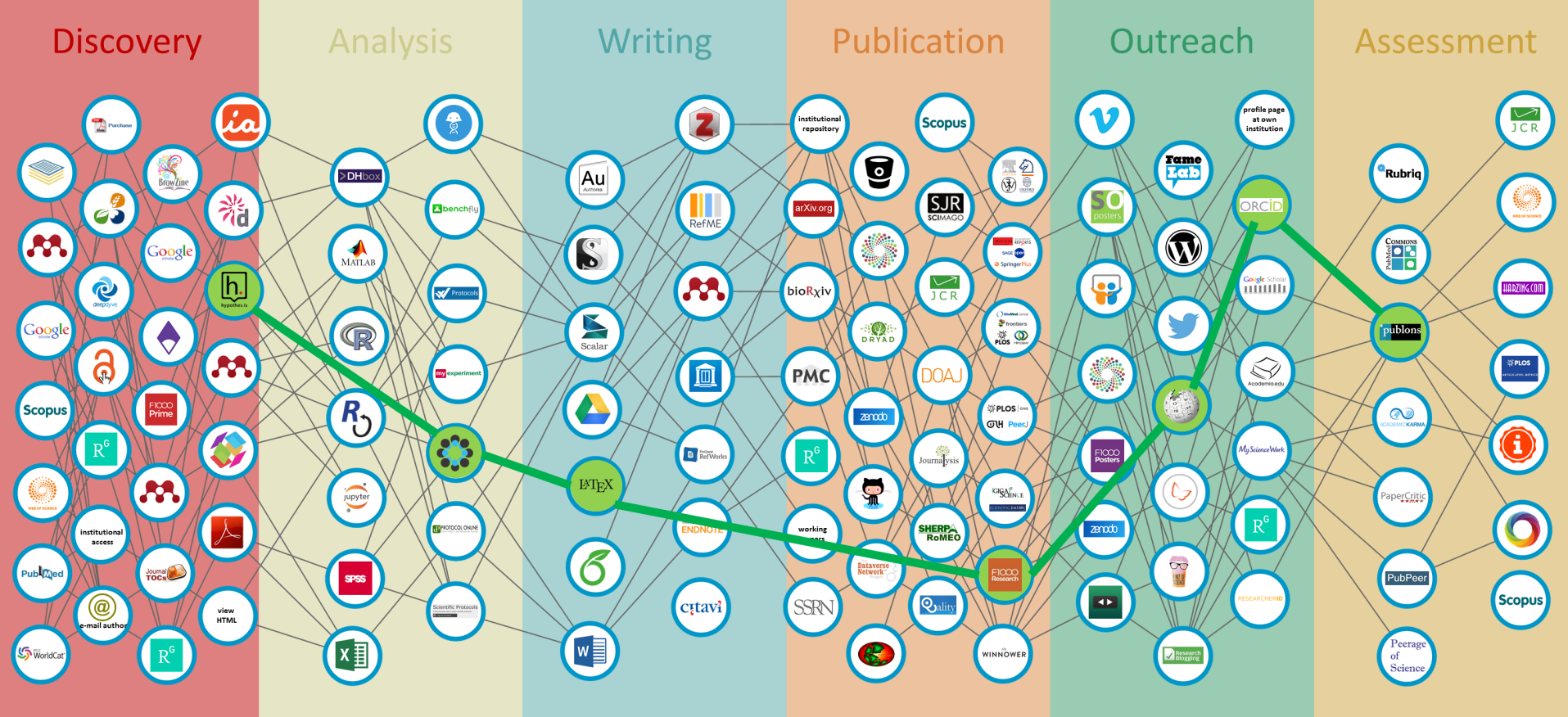
How-to open up your research workflow

You can make your workflow more open by ...



- adding alternative evaluation, e.g. with altmetrics
- communicating through social media, e.g. Twitter
- sharing posters & presentations, e.g. at FigShare
- using open licenses, e.g. CC0 or CC-BY
- publishing open access, 'green' or 'gold'
- using open peer review, e.g. at journals or PubPeer
- sharing preprints, e.g. at OSF, arXiv or bioRxiv
- using actionable formats, e.g. with Jupyter or CoCalc
- open XML-drafting, e.g. at Overleaf or Authorea
- sharing protocols & workfl., e.g. at Protocols.io
- sharing notebooks, e.g. at OpenNotebookScience
- sharing code, e.g. at GitHub with GNU/MIT license
- sharing data, e.g. at Dryad, Zenodo or Dataverse
- pre-registering, e.g. at OSF or AsPredicted
- commenting openly, e.g. with Hypothes.is
- using shared reference libraries, e.g. with Zotero
- sharing (grant) proposals, e.g. at RIO



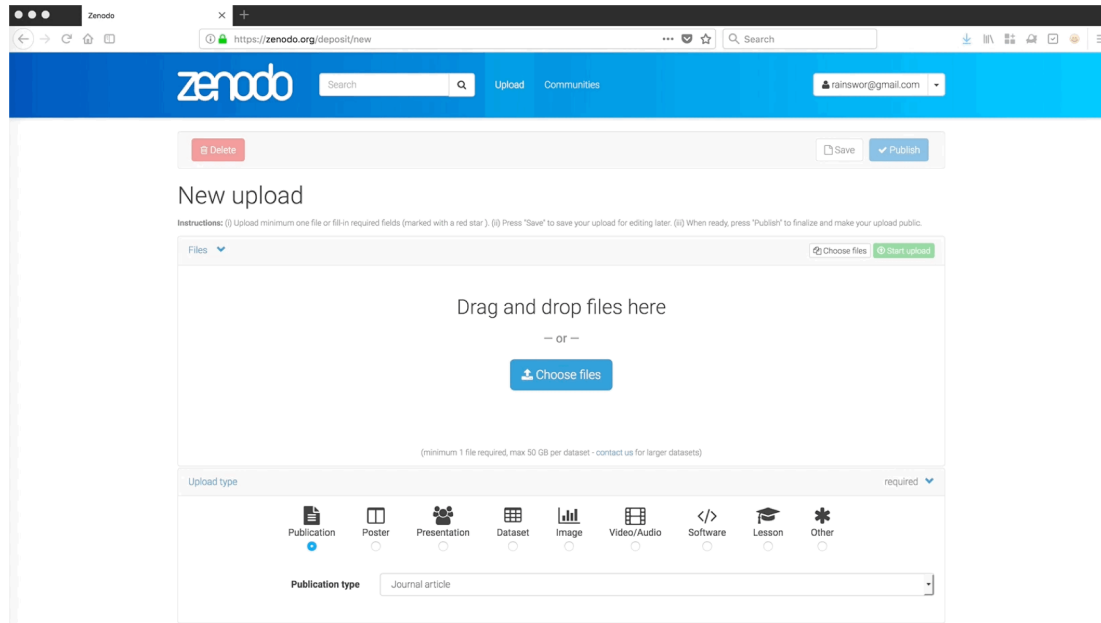


Jeroen Bosman and Bianca Kramer - <https://101innovations.wordpress.com/workflows/>

Make your articles Open Access via Gold route by publishing OA or
Green route by self-archiving in repositories such as:



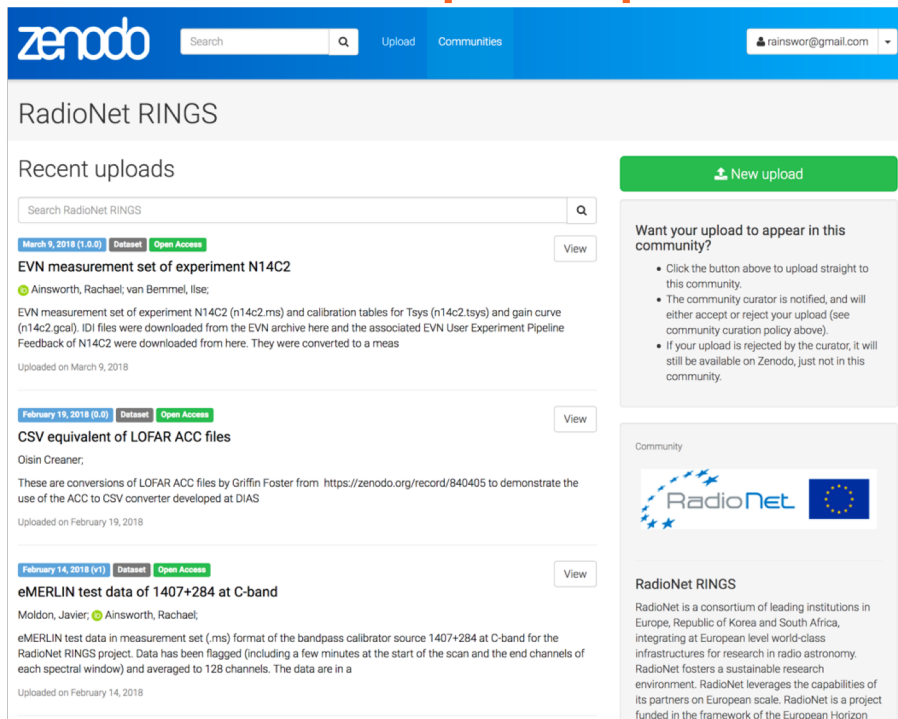
Share research outputs such as data, posters, & slides in Open Repositories such as figshare & Zenodo



Catch-all repositories that enable 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

Share research outputs such as data, posters, & slides in Open Repositories such as figshare & Zenodo



zenodo Search Upload Communities rainswor@gmail.com

RadioNet RINGS

Recent uploads

Search RadioNet RINGS

March 9, 2018 (1.8.0) Dataset Open Access View

EVN measurement set of experiment N14C2

Ainsworth, Rachael; van Bemmelen, 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

Olsein 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

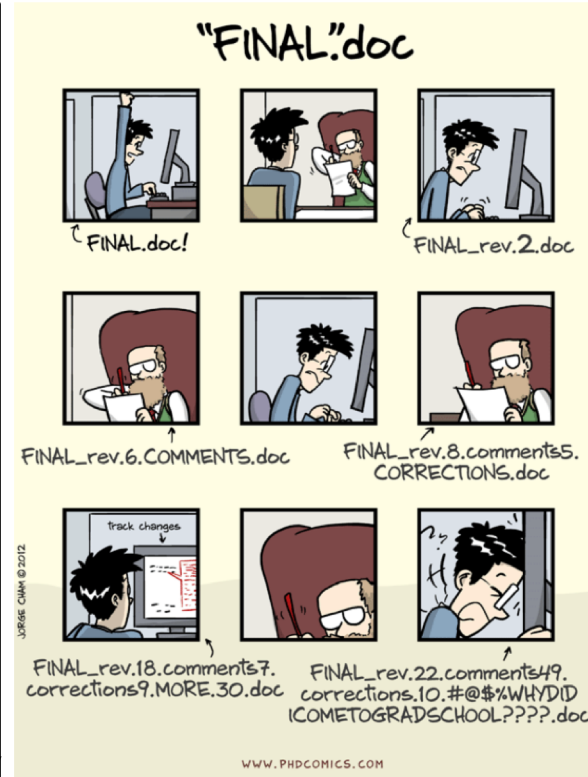
RadioNet RINGS

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

Catch-all repositories that enable 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

Share code & maintain version control using platforms such as Bitbucket & 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

Share code & maintain version control using platforms such as Bitbucket & GitHub

The screenshot shows the GitHub profile of Rachael Ainsworth (rainsworth). The profile includes a bio: "Radio Astronomer & Open Science Champion at the Jodrell Bank Centre for Astrophysics, Mozilla Open Leader, Cohort 4C #RebelFoxes". It lists 11 repositories, 65 stars, 17 followers, and 35 following. The "Popular repositories" section shows six projects: ROSA (Resources for Open Science in Astronomy), rainsworth.github.io (personal website), GMRT-TAU_catalogue (A GMRT survey of regions towards the Taurus Molecular Cloud), Spectral-Energy-Distributions (SED data from radio to sub-mm wavelengths), awesomeCV (My CV using the awesome CV template), and paper_scripts (A collection of scripts used to make plots in my publications). The "Contributions in the last year" section shows a calendar grid with green squares indicating contributions. The "Contribution activity" section shows a jump to the year 2017.

- 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

Choose a license for your code, data or other output that allows others to use, modify & share your work, subject to conditions such as attribution.

Which of the following best describes your situation?



I need to work in a community.

Use the [license preferred by the community](#) you're contributing to or depending on. Your project will fit right in.

If you have a dependency that doesn't have a license, ask its maintainers to [add a license](#).



I want it simple and permissive.

The [MIT License](#) is short and to the point. It lets people do almost anything they want with your project, including to make and distribute closed source versions.

[Babel](#), [.NET Core](#), and [Rails](#) use the MIT License.



I care about sharing improvements.

The [GNU GPLv3](#) also lets people do almost anything they want with your project, *except* to distribute closed source versions.

[Ansible](#), [Bash](#), and [GIMP](#) use the GNU GPLv3.

What if none of these work for me?

My project isn't software.

[There are licenses for that.](#)

I want more choices.

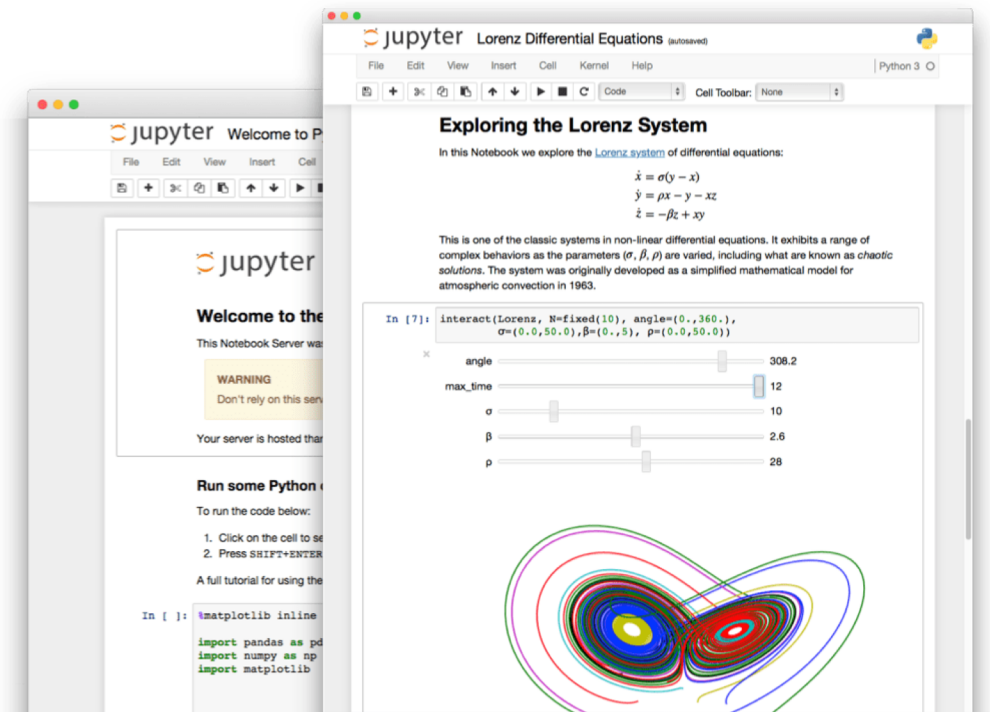
[More licenses are available.](#)

I don't want to choose a license.

[Here's what happens if you don't.](#)

<https://choosealicense.com/>

Share analyses using Open Notebooks such as Jupyter & RStudio



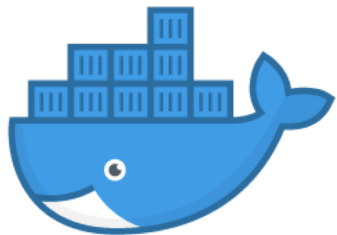
Open Notebooks are documents that contain equations, visualisations, narrative text and live code that can be executed independently and interactively, with output visible immediately beneath the input.

They bring together analysis descriptions and results, which can be executed to perform the data analysis in real time.

Added value:

- Transparency in the analysis of the data
- Reproducibility
- Documentation of the entire workflow

Package data, code & analyses using Containers such as Docker & Singularity



docker



A container image is a lightweight, standalone, executable package of software that includes everything needed to run an application: code, runtime, system tools, system libraries and settings.

Containers can be used to package entire scientific workflows, software and libraries, and even data. This means that you don't have to ask your cluster admin to install anything for you - you can put it in a container and run.

Need to share your code? Put it in a container and your collaborator won't have to go through the pain of installing missing dependencies.

(<https://www.docker.com/>; <https://www.sylabs.io/>)

Don't have time to build your own container? Test out Binder!



Turn a GitHub repo into a collection of
interactive notebooks

Have a repository full of Jupyter notebooks? With Binder, open those notebooks in an executable environment, making your code immediately reproducible by anyone, anywhere.

A screenshot of the Binder web interface. At the top, it says 'Build and launch a repository'. Below this, there are two input fields: 'GitHub repository name or URL' and 'Git branch, tag, or commit'. To the right of the first field is a 'GitHub' dropdown menu. Below these fields is a 'Path to a notebook file (optional)' input field with a 'File' dropdown menu. A blue 'launch' button is to the right of the path field. Below the input fields is a blue box with the text 'Copy the URL below and share your Binder with others:'. Underneath this is a text input field with the placeholder 'Fill in the fields to see a URL for sharing your Binder.' and a clipboard icon. At the bottom, there is another blue box with the text 'Copy the text below, then paste into your README to show a binder badge:'. To the right of this text are two small buttons labeled 'launch' and 'binder', followed by a right-pointing arrow.

- Makes it simple to generate reproducible computing environments from a Git repository.
- Generates a Docker image from this repository which will have all the components that you specify along with the Jupyter Notebooks inside.
- You will be able to share a URL with users that can immediately begin interacting with this environment via the cloud.
- Binder's goal is to enable as many analytic workflows as possible.



400+ Tools and innovations in scholarly communication

web-based tools a researcher can use

authors: Bianca Kramer & Jeroen Bosman (and you?)

contact: @MsPhelps & @JeroenBosman, both at Utrecht University Library

url: https://docs.google.com/spreadsheets/d/1KUMSeq_Pzp4KveZ7pb5rddcssk1XBTiLHniD0d3nDqo

friendly url: <http://bit.ly/innoscholcomm-list>

related to poster: <http://dx.doi.org/10.6084/m9.figshare.1286826>

part of project: <https://101innovations.wordpress.com/>

background: This is a shared database that grew out of the "101 innovations in scholarly communication" project. When we published the 101 list of selected innovations our database already contained some 200 innovations/tools. The 101 selection was strictly on innovativeness and thus did not contain recent tools if they were not innovative compared to older ones with the same functionality, even if the more recent ones were more popular or well-known. The database shared here has dropped that strict innovativeness criterion and thus contains multiple tools offering basically the same functionality. The masterfile that this database is derived from is still being worked on. Additional fields may become available here in a later stage.

how to use: The second worksheet tab of this file contains data on over 600 tools and innovations in scholarly communication. You can find tools by workflow phase (see also below) and find some details on each of the tools. You are also warmly invited to add tools or give suggestions/corrections/updates for field values. Please use the "green" user input columns and leave the data itself as it is. When adding, you are welcome to leave your name, but it is not required. Please do not sort/hide/move rows or columns. If you need to do that, please make your own copy of the worksheet to work on.

publication date: 20150301, last updated 20170209

availability: 20150301 through at least 20151231; from 20160101 until transfer to a more permanent open and free home

license: CC-BY 4.0

All the Tools!

For a list of tools to help you open up your research workflow, see <http://bit.ly/innoscholcomm-list> and for examples on how to connect some of these open science science tools into workflows, see


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

Open Science in Astronomy

VizieR

VizieR provides access to the most complete library of published astronomical catalogues and data tables available on line organized in a self-documented database. Query tools allow the user to select relevant data tables and to extract and format records matching given criteria. Currently, 17767 catalogues are available. [more info](#)

Free text search: catalogue name, author, ... **Find catalogues**

Position: position or object name 10 **Find catalogues** 

Go to the classic form **Advanced search**

VizieR

- How to publish my catalog
- Help and tutorials
- View large catalogs
- Index of catalogues

Other related services

- TAP/VizieR
- Photometry viewer
- CDS cross-match service
- VizieR images, spectra, services

Simple browsing modes

- By hierarchical organisation
- By acronyms or abbreviations
- By popularity
- Recently entered into VizieR

arXiv.org

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](#) [Search](#) [Form interface](#) [Catchup](#)

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
 See cumulative "What's New" pages. Read robots beware before attempting any automated download

Physics

- Astrophysics ([astro-ph new](#), [recent](#), [find](#))
 includes: Astrophysics of Galaxies; Cosmology and Nongalactic Astrophysics; Earth and Planetary Astrophysics; High Energy Astrophysical Phenomena; Instrumentation and Methods for Astrophysics; Solar and Stellar Astrophysics
- Condensed Matter ([cond-mat new](#), [recent](#), [find](#))
 includes: Disordered Systems and Neural Networks; Materials Science; Mesoscale and Nanoscale Physics; Other Condensed Matter; Quantum Gases; Soft Condensed Matter; Statistical Mechanics; Strongly Correlated Electrons; Superconductivity
- General Relativity and Quantum Cosmology ([gr-qc new](#), [recent](#), [find](#))
- High Energy Physics - Experiment ([hep-ex new](#), [recent](#), [find](#))
- High Energy Physics - Lattice ([hep-lat new](#), [recent](#), [find](#))
- High Energy Physics - Phenomenology ([hep-ph new](#), [recent](#), [find](#))
- High Energy Physics - Theory ([hep-th new](#), [recent](#), [find](#))
- Mathematical Physics ([math-ph new](#), [recent](#), [find](#))
- Nonlinear Sciences ([nlin new](#), [recent](#), [find](#))
 includes: Adaptation and Self-Organizing Systems; Cellular Automata and Lattice Gases; Chaotic Dynamics; Exactly Solvable and Integrable Systems; Pattern Formation and Solitons
- Nuclear Experiment ([nucl-ex new](#), [recent](#), [find](#))
- Nuclear Theory ([nucl-th new](#), [recent](#), [find](#))
- Physics ([physics new](#), [recent](#), [find](#))
 includes: Accelerator Physics; Applied Physics; Atmospheric and Oceanic Physics; Atomic Physics; Atomic and Molecular Clusters; Biological Physics; Chemical Physics; Classical Physics; Computational Physics; Data Analysis, Statistics and Probability; Fluid Dynamics; General Physics; Geophysics; History and Philosophy of Physics; Instrumentation and Detectors; Medical Physics; Optics; Physics Education; Physics and Society; Plasma Physics; Popular Physics; Space Physics
- Quantum Physics ([quant-ph new](#), [recent](#), [find](#))

Open Data:

- Raw data via instrument archives
- Surveys through VizieR
- Meta-data through Simbad

Open Source:

- Projects and tools such as Astropy

Open Access:

- arXiv! Started in August 1991 and provides open access to 1,445,302+ e-prints in (Astro)Physics and many other fields



Constraining Redshifts of Unlocalised Fast Radio Bursts

C. R. H. Walker, Y.-Z. Ma, R. P. Breton

(Submitted on 4 Apr 2018)

The population of fast radio bursts (FRBs) will continue to diverge into two groups depending on their method of discovery: those which can be localised, and those which cannot. Events potentially less useful for astronomical and cosmological purposes due to limited localisation will accumulate with the advent of new facilities and continued efforts by, e.g., the SUPERB collaboration, which may require afterglows or multi-wavelength counterparts for sub-arcsecond localisation. It is important to exploit these sources to their maximum scientific potential. We perform analysis of FRB dispersion measures (DMs), considering different theoretical FRB progenitors with view to place more rigorous constraints on FRB redshifts, in particular for large statistical samples, via their DMs. We review FRB DM components, and build redshift-scalable probability distributions corresponding to different progenitor scenarios. We combine these components into a framework for obtaining FRB DM probabilities given their redshifts. Taking into account different possibilities for the evolution of progenitors across cosmic time we invert this model, thus deriving redshift constraints. Effects of varying FRB progenitor models are illustrated. While, as expected, host galaxy DM contributions become decreasingly important with increasing redshift, for AGN-like progenitor scenarios they could remain significant out to redshift 3. Constraints are placed on redshifts of catalogued FRBs with various models and increasingly realistic models may be employed as general understanding of FRBs improves. For localised FRBs, we highlight future prospects for disentangling host and intergalactic medium DM components using their respective redshift scaling. We identify a use for large samples of unlocalised FRBs resulting from upcoming flux-limited surveys, such as with CHIME, in mapping out the Milky Way contribution to the DM.

Comments: 13 pages, 8 figures, submitted for publication in Astronomy & Astrophysics on 04/04/2018

Subjects: High Energy Astrophysical Phenomena (astro-ph.HE)

Cite as: arXiv:1804.01548 [astro-ph.HE]
(or arXiv:1804.01548v1 [astro-ph.HE] for this version)

Submission history

From: Charles Walker [\[view email\]](#)

[v1] Wed, 4 Apr 2018 18:03:06 GMT (897kb,D)

Download:

- PDF
- Other formats (license)

Current browse context:

astro-ph.HE

< prev | next >
new | recent | 1804

Change to browse by:

astro-ph

References & Citations

- INSPIRE HEP (refers to | cited by)
- NASA ADS

Google Scholar

Bookmark (what is this?)



4.4. Concluding remarks

We present a framework for exploration of the statistical relationship between FRB redshifts and dispersion measures, which provides the basis for:

1. Qualitative assessment of host galaxy contributions to FRB DMs using realistic models. We find that all our host models may contribute large amounts of DM ($> 400 \text{ pc cm}^{-3}$) in the rest frame, and as expected, that DM_{host} is most significant for FRBs of lower source redshifts, becoming negligible as redshift increases. For the most extreme scenarios where FRBs originate close to galactic centers, this component still contributes significantly to overall $P(\text{DM}|z_s)$ profiles out to $z_s = 3$.
2. More rigorous uncertainties to be placed on FRB redshifts than are currently standard practice. By consulting $P(z_s|\text{DM})$ probability distributions created from our (or similar) models, this may additionally provide an innovative way to narrow down the potential host galaxies for unlocalised FRBs, and allow insight into FRB progenitors to be drawn from large source populations. A repository containing our Python code and examples may be found online at <https://doi.org/10.5281/zenodo.1209920>.
3. The disentanglement of individual FRB dispersion measure components. For example, the MW components for given sightlines could be extracted from DM_{obs} by comparing DM probability distributions from a flux-limited survey (e.g. CHIME) at different sky locations and looking for system-

<https://arxiv.org/abs/1804.01548>

[Log in](#)
[Sign up](#)

[Upload](#)
[Communities](#)

April 2, 2018

[Software](#)
[Open Access](#)

mbcxqcw2/EEModel: Master DOI release

mbcxqcw2

Updated zenodo DOI link to always link to the latest github version

Preview

EEModel-v1.03.zip

mbcxqcw2-EEModel-268b3da

ExcessElectronLib.py

ExcessElectronModel.ipynb

FRBCat_FRB_DMs.csv

README.md

cosmo_consts.py

host_galaxies

OB_FRBs_list.txt

elliptical_FRBs_list.txt

mpg_FRBs_list.txt

old_FRBs_list.txt

young_FRBs_list.txt

lin_mp_files

planck_lin_mp0.0.dat

planck_lin_mp0.1.dat

planck_lin_mp0.2.dat

planck_lin_mp0.3.dat

planck_lin_mp0.4.dat

Files (39.6 MB)

Name	Size
mbcxqcw2/EEModel-v1.03.zip	39.6 MB

7 views

0 downloads

See more details...

Available in

Publication date:

April 2, 2018

DOI:

DOI: 10.5281/zenodo.1211089

Related identifiers:

Supplement to:

<https://github.com/mbcxqcw2/EEModel/tree/v1.03>

License (for files):

Other (Open)

Versions

Version v1.03	10.5281/zenodo.1211089	Apr 2, 2018
Version v1.0.2	10.5281/zenodo.1210129	Mar 30, 2018
Version v1.0.1	10.5281/zenodo.1210114	Mar 30, 2018
Version v1.0.0	10.5281/zenodo.1209921	Mar 29, 2018

Cite all versions?

You can cite all versions by using the DOI 10.5281/zenodo.1209920. This DOI represents all versions, and will always resolve to the latest one. [Read more.](#)

Share

Cite as

mbcxqcw2. (2018, April 2). mbcxqcw2/EEModel: Master DOI release (Version v1.03). Zenodo. <http://doi.org/10.5281/zenodo.1211089>

Start typing a citation style...

<https://zenodo.org/record/1211089>

[Pull requests](#)
[Issues](#)
[Marketplace](#)
[Explore](#)

mbcxqcw2 / EEModel

[Watch](#) 1
 [Unstar](#) 1
 [Fork](#) 0

Code

Issues

Pull requests

Projects

Wiki

Insights

Extragalactic Electron Model

17 commits

1 branch

4 releases

1 contributor

Tag: v1.03

New pull request

Create new file

Upload files

Find file

Clone or download

mbcxqcw2 Updated readme with all version zenodo doi

Latest commit 268b3da on Apr 2

host_galaxies	adding files	6 months ago
lin_mp_files	adding files	6 months ago
ExcessElectronLib.py	Updated ExcessElectronLib with Planck references	6 months ago
ExcessElectronModel.ipynb	updated notebook to link with extra host data	6 months ago
FRBCat_FRB_DMs.csv	added FRB list from FRBCat	6 months ago
README.md	Updated readme with all version zenodo doi	6 months ago
cosmo_consts.py	updated cosmology constants	6 months ago
linear_growth_factor.py	adding files	6 months ago
requirements.txt	changing requirements.txt	6 months ago
runtime.txt	added runtime document for python 2.7 binder compatibility	6 months ago

README.md

EEModel

A framework for analysing the excess dispersion measure (DM) component of extragalactic Fast Radio Bursts (FRBs).

Allows testing of different host galaxy and intergalactic medium (IGM) models and constraining of FRB redshifts via their DMs.

The model makes use of FRBCat (Petroff et al., 2016; arXiv:1601.03547; <http://frbcatalog.org/>), CAMB (<https://camb.info/>) and Planck Collaboration (arXiv:1502.01589) data.

A jupyter notebook containing the model and examples of its use can be launched using Binder:

[launch](#)
[binder](#)

The model is citable via Zenodo:

[DOI: 10.5281/zenodo.1209920](#)

<https://github.com/mbcxqcw2/EEModel/tree/v1.03>



Error loading mbcxqcw2/EEModel/master!
See logs below for details.

Build logs

show

Here's a non-interactive preview on nbviewer while we start a server for you. Your binder will open automatically when it is ready.

```
jupyter
nbviewer

EEModel / ExcessElectronModel.ipynb

In [1]: %reset
import matplotlib
print "Done."

Once deleted, variables cannot be recovered. Proceed (y/[n])? y
/home/charlie/anaconda2/lib/python2.7/site-packages/matplotlib/font_manager.py:273: UserWarning:
warnings.warn('Matplotlib is building the font cache using fc-list. This may take a moment.')
Done.

Imports

In [2]: #standard imports
import numpy as np
from matplotlib import pyplot as plt
from scipy.interpolate import interp1d as iid

#other imports
from linear_growth_factor import L
from HMC_search import findnormal
from ExcessElectronLib import Prob_IDM # IDM distribution
from ExcessElectronLib import Convolve # Convolution function
from ExcessElectronLib import NormConv as Normalise # Normalisation function for P(DM|Z)
from ExcessElectronLib import WorstTranspose # Normalisation function for P(s|DM)
from ExcessElectronLib import find_maxest # function to find maxest value in discrete array to s,
from ExcessElectronLib import FindErrorRange # function to find min/max bounds for a PDF

print 'Imports done.'
Imports done.

Import Host Galaxy Distributions

In [3]: #####
#####
#####

##FOR STARS##
print "OB..."
OB_data=np.loadtxt('./host_galaxies/OB_FRBs_list.txt')
OB_DMs = zip(*np.array(OB_data))[0][:]

##YOUNG PULSARS##
print "YPER..."
YPER_data=np.loadtxt('./host_galaxies/young_FRBs_list.txt')
YPER_DMs = zip(*np.array(YPER_data))[0][:]
```

<https://mybinder.org/v2/gh/mbcxqcw2/EEModel/master>

Papers which cite


Constraining Redshifts of Unlocalised Fast Radio Bursts

[Q view this list in a search results page](#)

 FULL TEXT SOURCES

| arXiv



 Add paper to a library ▼

- | | | | | | |
|---|--|---------|---|---|---|
| 1 | 2018MNRAS.480.3907V | 2018/11 |  |  |  |
| | Probing the origin of extragalactic magnetic fields with Fast Radio Bursts | | | | |
| | Vazza, F.; Brügggen, M.; Hinz, P. M. and 3 more | | | | |
| 2 | 2018arXiv180904074M | 2018/09 |  |  |  |
| | Finding the Missing Baryons with Fast Radio Bursts and Sunyaev-Zeldovich Maps | | | | |
| | Muñoz, Julian B.; Loeb, Abraham | | | | |
| 3 | 2018arXiv180407291R | 2018/04 |  |  |  |
| | Measuring the circum- and inter-galactic baryon contents with fast radio bursts | | | | |
| | Ravi, Vikram | | | | |

Per Page: **25** 50 100 200 500

◀ prev

1

of 1

next ▶

- 4 April – submitted to journal
- 6 April – deposited to arXiv
- 9 April – received referee report
- 3 citations in 6 months – not even officially published yet!

Overwhelmed? Start small.

Start by changing your own actions

My original pledge to be open (2014):

- I will not edit, review, or work for closed access journals.
- I will blog my work and post preprints, when possible.
- I will publish only in open access journals.
- I will not publish in Cell, Nature, or Science.
- I will pull my name off a paper if coauthors refuse to be open.



If I am going to 'make it' in science, it has to be on terms I can live with.

My new pledge to be open

- I will not edit, review, or work for closed access journals.
- I will blog my work and post preprints, when possible.
- I will publish only in open access journals.
- I will not publish in Cell, Nature, or Science.
- I will pull my name off a paper if coauthors refuse to be open.
- I will share my code, when possible.
- I will share my raw and processed data, when possible.
- I will practice open notebook science, when possible.
- I will ask my professional society to support open access.
- I will speak out about my choices.



So...how's all that going?

Erin McKiernan, My pledge to be open (Yeah, how's that going?), 2015

<https://www.slideshare.net/RightToResearch/keynote-erin-mckiernan-my-pledge-to-be-open-yeah-hows-that-going?>

Summary

Open Science is about 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. Also to get more citations ;)

Further reading on evidence-based benefits of Open Science:

- 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))
- 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))

Contact me:

- Twitter: @rachaelevelyn
- Github: @rainsworth
- Email: rachael.ainsworth@manchester.ac.uk