

Open Science

in Eco/Evo

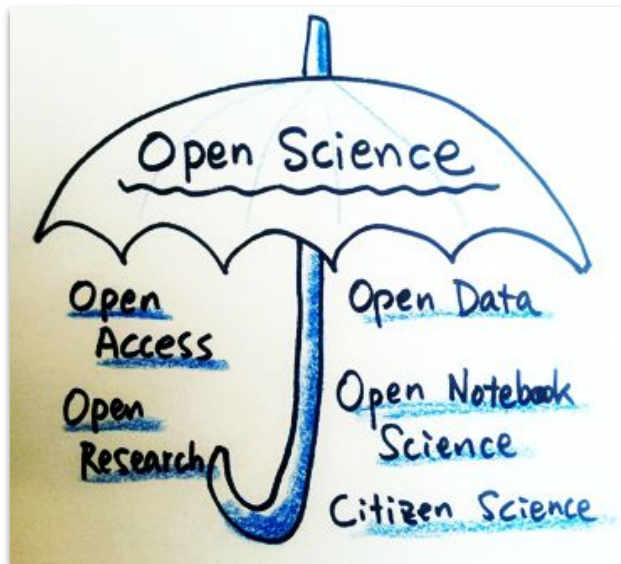


Image credit: Flickr user 지우 황 CC BY 2.0

Ultimate goal:

Improving Openness,
Integrity and Reproducibility
of Scientific Research

What are the problems?

- Studies lacking rigor
- Outcomes that are never shared
- Results that are not *reproducible*



Data dredging

Also known as p-hacking, this involves repeatedly searching a dataset or trying alternative analyses until a 'significant' result is found.



Omitting null results

When scientists or journals decide not to publish studies unless results are statistically significant.



Underpowered study

Statistical power is the ability of an analysis to detect an effect, if the effect exists – an underpowered study is too small to reliably indicate whether or not an effect exists.



Errors

Technical errors may exist within a study, such as misidentified reagents or computational errors.



Underspecified methods

A study may be very robust, but its methods not shared with other scientists in enough detail, so others cannot precisely replicate it.



Weak experimental design

A study may have one or more methodological flaws that mean it is unlikely to produce reliable or valid results.

Issues

What are the problems?

BIOLOGICAL
REVIEWS

Cambridge
Philosophical Society

Biol. Rev. (2013), 88, pp. 511–536.
doi: 10.1111/brv.12013

511

What do we really know about the signalling role of plumage colour in blue tits? A case study of impediments to progress in evolutionary biology

Timothy H. Parker*

Department of Biology, Whitman College, Walla Walla, WA 99362, USA



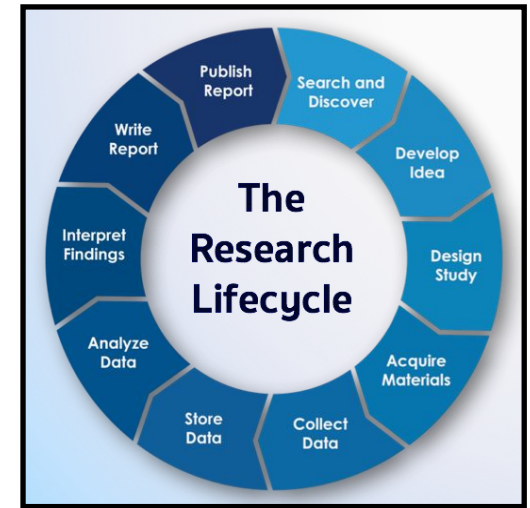
Table 2. Tallies of sufficiently and insufficiently reported statistical effects from papers ($N = 48$) testing sexual selection hypotheses related to plumage colour in blue tits

Category	Total effects reported (including interactions)	Total main effects reported (excluding interactions)	Number of main effects reported sufficiently (including effect size, sign, and sample size)	Proportion of effects reported insufficiently
All categories	1192	997	588	0.41
Age	111	76	40	0.47
Aggression	77	71	69	0.03
Mate choice	254	222	130	0.41
Quality	382	324	172	0.47
Sex	172	155	105	0.32
Offspring sex ratio	86	55	20	0.64

i.e. impossible to incl. in meta-analysis

Different reasons for those problems:

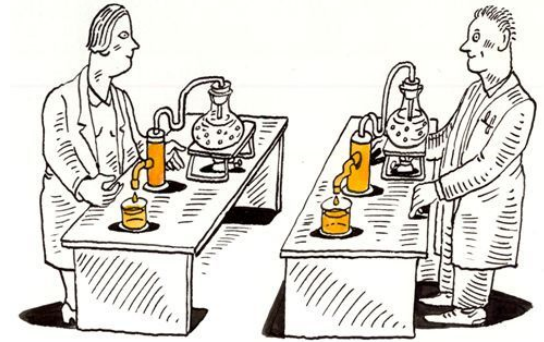
- Methodological, statistical, and reporting practices that are not always crystal clear
- Structural and organisational practices that result in unavailable, lost, or difficult to use data, code, and materials
- Rarely, intentional cases of scientific misconduct



Reproducibility?

Research findings become credible and useful if they are reproducible

- The results are reliable, and others can independently obtain the same evidence
- Knowledge accumulation facilitated when others can reuse or extend credible ideas and findings



Computational, Methods and Results Reproducibility

Open research in eco/evo?

Psychology's replication crisis inspires ecologists to push for more reliable research

By Cathleen O'Grady | Dec. 9, 2020, 2:05 PM

Perspective | Published: 17 February 2020

Open Science principles for accelerating trait-based science across the Tree of Life

Rachael V. Gallagher ✉, Daniel S. Falster, [...] Brian J. Enquist

Nature Ecology & Evolution 4, 294–303(2020) | Cite this article

Review | Open Access | Published: 01 July 2015

Building a multi-scaled geospatial temporal ecology database from disparate data sources: fostering open science and data reuse

Patricia A. Soranno ✉, Edward G. Bissell, Kendra S. Cheruvilil, Samuel T. Christel, Sarah M. Collins, C. Emi Fergus, Christopher T. Filstrup, Jean-Francois Lapierre, Noah R. Lottig, Samantha K. Oliver, Caren E. Scott, Nicole J. Smith, Scott Stopyak, Shuai Yuan, Mary Tate Bremigan, John A. Downing, Corinna Gries, Emily N. Henry, Nick K. Skaff, Emily H. Stanley, Craig A. Stow, Pang-Ning Tan, Tyler Wagner & Katherine E. Webster

GigaScience 4, Article number: 28 (2015) | Cite this article

7346 Accesses | 38 Citations | 26 Altmetric | Metrics

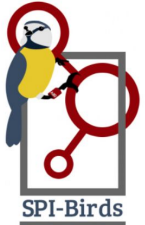
EDITOR'S CHOICE

Data-Intensive Ecological Research Is Catalyzed by Open Science and Team Science ^{FREE}

Kendra Spence Cheruvilil, Patricia A Soranno

BioScience, Volume 68, Issue 10, October 2018, Pages 813–822, <https://doi.org/10.1093/biosci/biy097> ^{C'R}

Published: 12 September 2018



Article | Open Access |

Open science, reproducibility, and transparency in ecology

Stephen M. Powers ✉, Stephanie E. Hampton

First published: 25 October 2018 | <https://doi.org/10.1002/eap.1822> ^{C'R} | Citations: 22



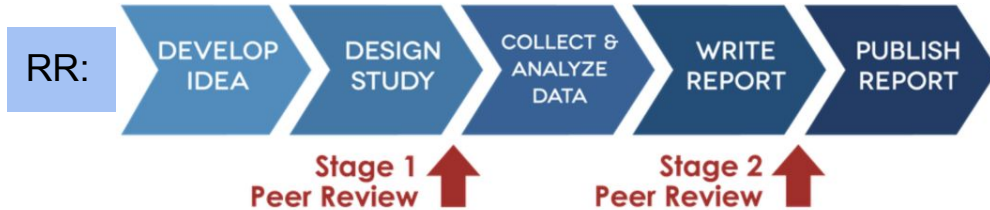
How can you start doing open research?

Pre/Register* your study (when adequate)

→ separates hypothesis-generating (exploratory) from **hypothesis-testing** (confirmatory) research (both are important, but the same data cannot be used to generate and test a hypothesis)

→ a means of addressing publication bias in academic journals

→ an opportunity to get feedback at an earlier stage



Journal of Applied Ecology



COMMENTARY | Open Access |

Exploratory and confirmatory research in the open science era

Erlend B. Nilsen , Diana E. Bowler, John D. C. Linnell

First published: 09 February 2020 | <https://doi.org/10.1111/1365-2664.13571> | Citations: 2

**publishing format used by over 250 journals*



How can you start doing open research?

Share Data, Materials or Code (when allowed)

→ allows others to benefit from and build on your work, and facilitates replication



Open Science Framework



GitHub



GitLab



[Cf. Olivier Gimenez](#)



How can you start doing open research?

Share a Paper or a Preprint

→ accelerates scholarly communication, feedback that can improve the work, and discoverability of finished research

+ may help stand against the 'positive results only' bias

arXiv.org

E_{vo}Rxiv bioRxiv

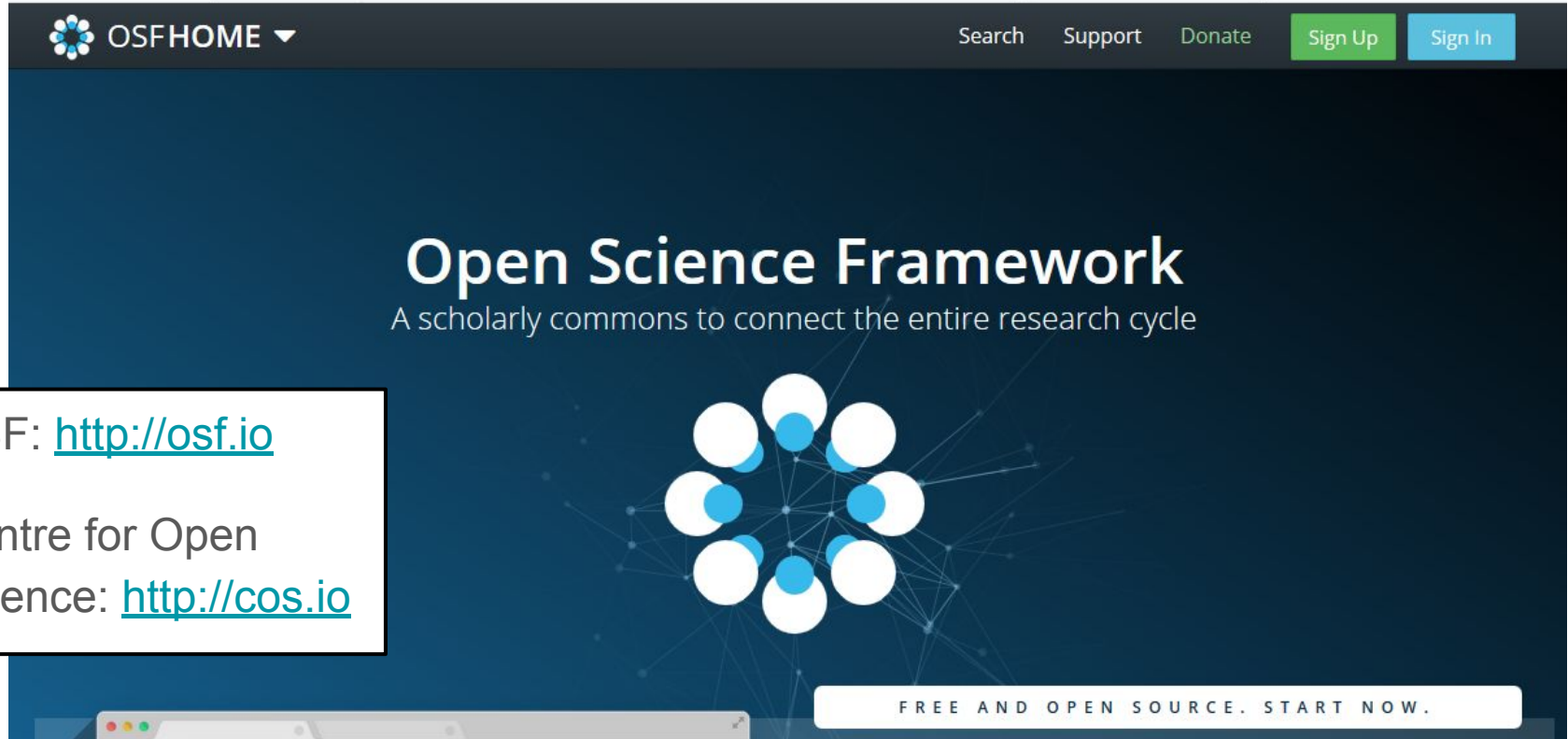


PUBPEER
The online Journal club



PREreview

And in practice?



The image shows a screenshot of the OSFHOME website. The header is dark blue with the OSFHOME logo and name on the left, and navigation links for Search, Support, Donate, Sign Up, and Sign In on the right. The main content area has a dark blue background with the text 'Open Science Framework' in large white letters, followed by the tagline 'A scholarly commons to connect the entire research cycle'. A central graphic features a cluster of white and blue circles connected by thin lines, resembling a network or molecular structure. At the bottom, a white banner contains the text 'FREE AND OPEN SOURCE. START NOW.'.

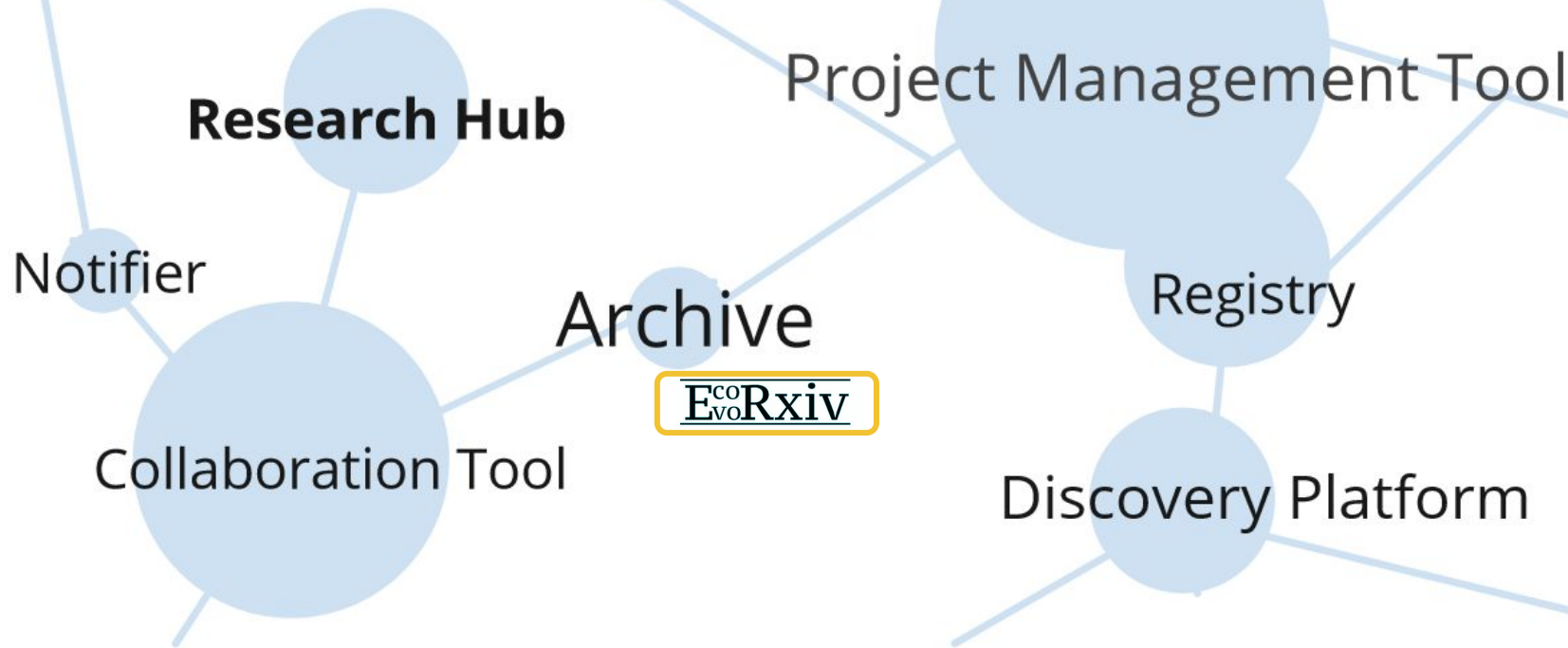
OSF: <http://osf.io>

Centre for Open
Science: <http://cos.io>

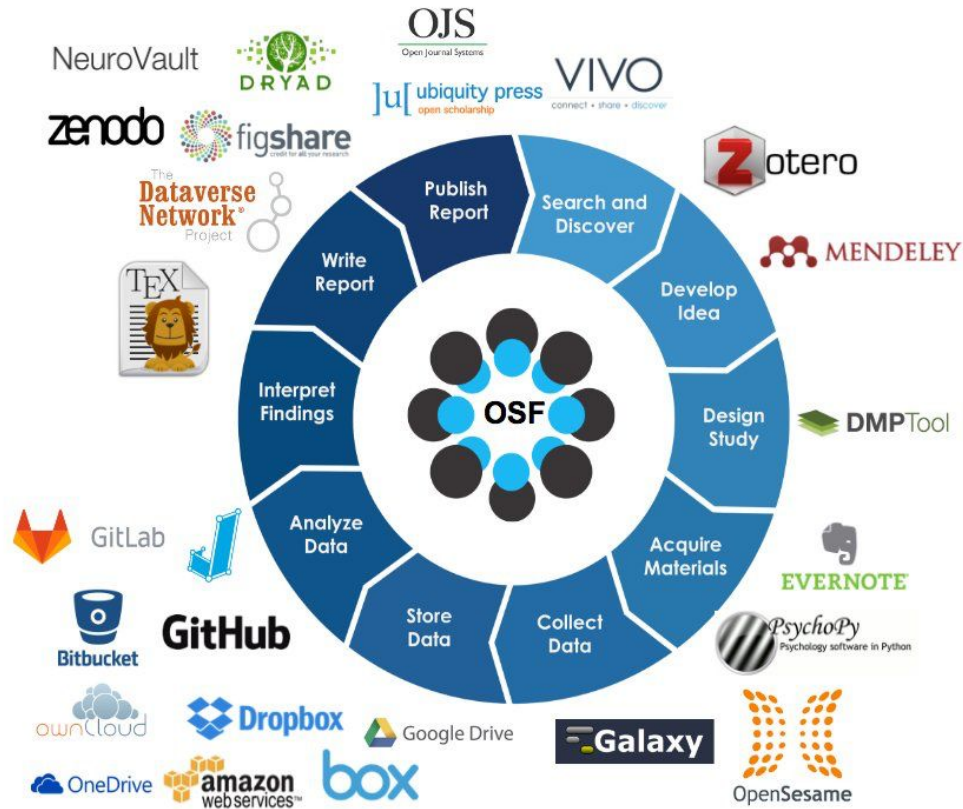
FREE AND OPEN SOURCE. START NOW.



What is OSF?



OSF: Tools



Demo project

Demo Project Files Wiki Analytics Registrations Forks Contributors Settings

Click on a storage provider or drag and drop to upload

Filter i

Name ^ v	Size	Version	Down...	Modified ^ v
Demo Project				
- OSF Storage				
- Data				
- OSF Storage				
clean_data.csv	7.5 kB	1	0	2017-05-01 04:23 PM
Data Dictionary.docx	81.5 kB	1	0	2017-05-01 04:23 PM
- Materials				
- OSF Storage				
analyses.R	529 B	1	0	2017-05-01 04:23 PM
cleaning.R	201 B	1	0	2017-05-01 04:23 PM
Questionnaire.docx	78.5 kB	1	0	2017-05-01 04:23 PM
- Manuscripts				
- OSF Storage				

Role of Replication Studies in Ecology Files Wiki Analytics Registrations Settings

Role of Replication Studies in Ecology

Contributors: Hannah Fraser, Fiona Fidler, Timothy H. Parker, Ashley Barnett
Date created: 2018-08-06 06:14 AM | Last Updated: 2020-02-14 06:06 AM
Identifier: DOI 10.17605/OSF.IO/BQC74
Category: Project

Has supplemental materials for [The role of replication studies in ecology](#) on EcoEvoRxiv

Wiki [No wiki content](#)

Citation [osf.io/d5ntj](#)

Components [Add Component](#) [Link Projects](#)

No components have been added to this project.

Tags

Recent Activity

Courtney Soderberg added Center For Open Science affiliation to Demo Project
2017-01-31 10:31 AM

Files [Click on a storage provider or drag and drop to upload](#)

Filter i

Name ^ v	Modified ^ v
Demo Project	
- OSF Storage	



Tim Parker



SORTEE

Society for Open, Reliable, and Transparent
Ecology and Evolutionary Biology



SOCIETY FOR THE
IMPROVEMENT OF
PSYCHOLOGICAL SCIENCE

Very active twitter account [@sortecoevo](https://twitter.com/sortecoevo)

- Journal club, Open Science Tools
Ressources and Blog section
Network and Discussion


Join for free!

IN DEPTH | RESEARCH INTEGRITY

Ecologists push for more reliable research

Cathleen O'Grady

+ See all authors and affiliations

Science 11 Dec 2020:
Vol. 370, Issue 6522, pp. 1260-1261
DOI: 10.1126/science.370.6522.1260 

<https://www.sortee.org/join/>

Any thoughts?

*Open science as
THE solution?*

Isn't it a risky bet?



*Will that really make
any change?*

*Could we imagine
another alternative?*

Other useful resources



thinkchecksubmit.org



Publisher copyright policies & self-archiving

sherpa.ac.uk/romeo

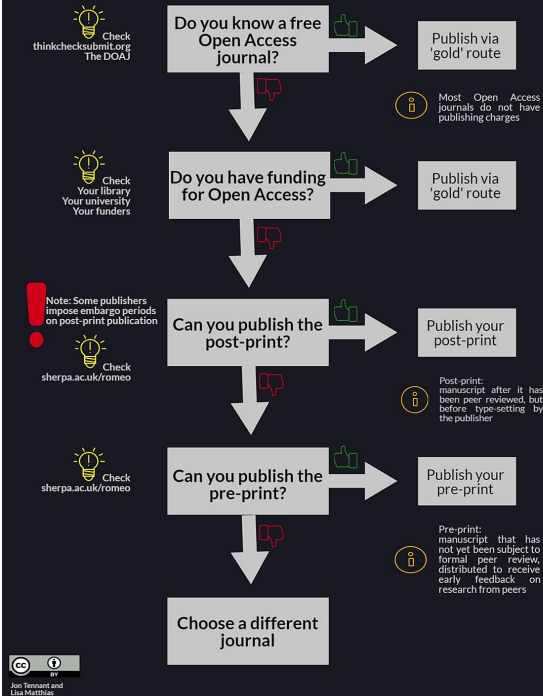
Retraction Watch

Tracking retractions as a window into the scientific process

<https://retractionwatch.com/>

HOW TO MAKE YOUR RESEARCH OPEN ACCESS

FOR FREE AND LEGALLY





Registered Reports

