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Open Science: what, why and how?

Professor Ina Bornkessel-Schlesewsky

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UNSW skin cancer researcher [REDACTED] hit with string of retractions

By [Elise Worthington](#) and [Kyle Taylor](#), ABC Investigations

In the news ...

October 17th 2019



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<https://www.abc.net.au/news/2019-10-17/unsw-skin-cancer-levon-khachigian-allegations-and-retractions/11585768>

- “six research papers [...] withdrawn or retracted from publication due to unresolved concerns over missing or manipulated data”
- “the same images had apparently been duplicated and then labelled as if they were representing two different things”
- “So the claim that the drug is having effect on cell size is clearly due to a magnification of the image and not an actual effect of the drug.”
- “ ... the authors withdrew the research, admitting they couldn't locate the raw data needed to prove their work.”

In the news ...

October 17th 2019

The nine circles of scientific hell

Neuroskeptic (2012, Perspectives on Psychological Science)

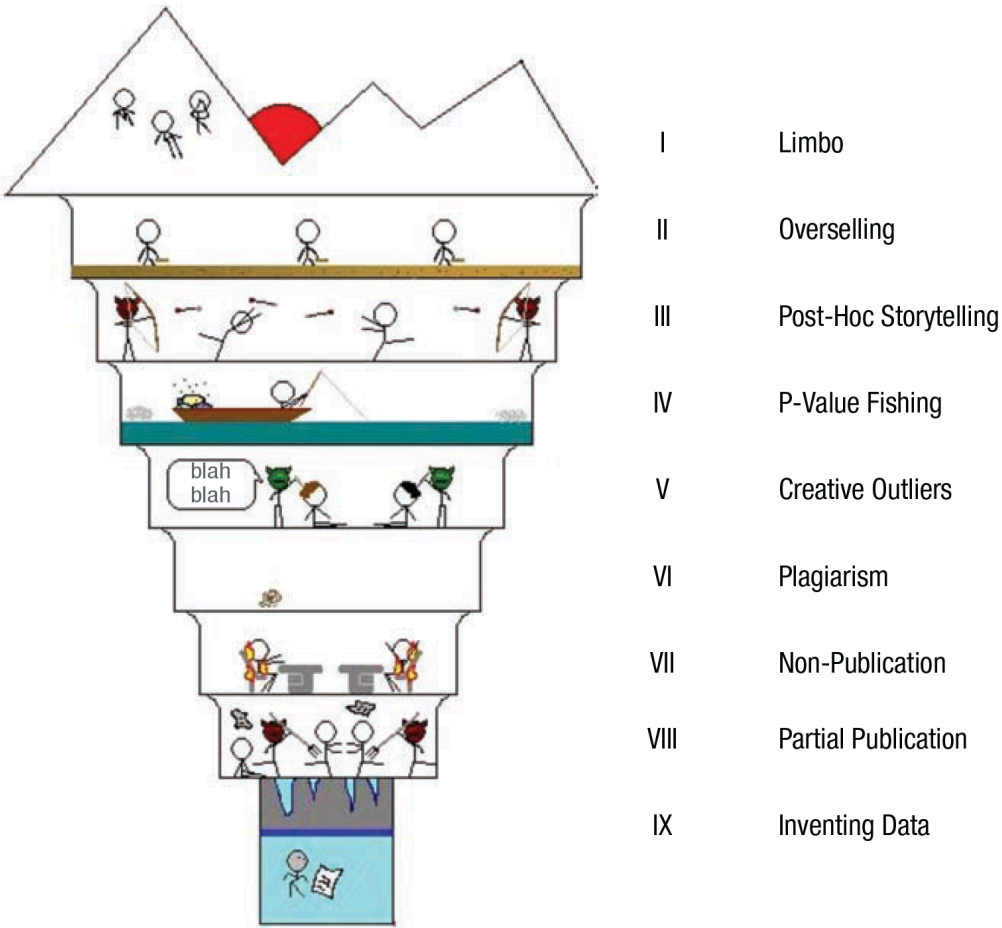


Fig. I. The nine circles of scientific hell (with apologies to Dante and xkcd)



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Center for Open Science – <https://cos.io>



What is open science?

A movement aiming to make science more reliable, transparent and accessible

Evaluating the replicability of social science experiments in *Nature* and *Science* between 2010 and 2015

Colin F. Camerer, Anna Dreber, Felix Holzmeister, Teck-Hua Ho, Jürgen Huber, Magnus Johannesson, Michael Kirchler, Gideon Nave, Brian A. Nosek , Thomas Pfeiffer, Adam Altmejd, Nick Buttrick, Taizan Chan, Yiling Chen, Eskil Forsell, Anup Gampa, Emma Heikensten, Lily Hummer, Taisuke Imai, Siri Isaksson, Dylan Manfredi, Julia Rose, Eric-Jan Wagenmakers & Hang Wu

Nature Human Behaviour 2, 637–644 (2018) | [Download Citation](#) 

from the abstract:

We replicate 21 systematically selected experimental studies in the social sciences published in *Nature* and *Science* between 2010 and 2015. The replications follow analysis plans reviewed by the original authors and pre-registered prior to the replications. The replications are high powered, with sample sizes on average about five times higher than in the original studies. We find a significant effect in the same direction as the original study for 13 (62%) studies, and the effect size of the replications is on average about 50% of the original effect size. **Replicability varies between 12 (57%) and 14 (67%) studies for complementary replicability indicators.**

Why open science?
The replicability crisis

A movement aiming to make science
more reliable, transparent and accessible

More social science studies just failed to replicate. Here's why this is good.

What scientists learn from failed replications: how to do better science.

By Brian Resnick | @B_resnick | brian@vox.com | Aug 27, 2018, 11:00am EDT

<https://www.vox.com/science-and-health/2018/8/27/17761466/psychology-replication-crisis-nature-social-science>

Why open science?
The replicability crisis

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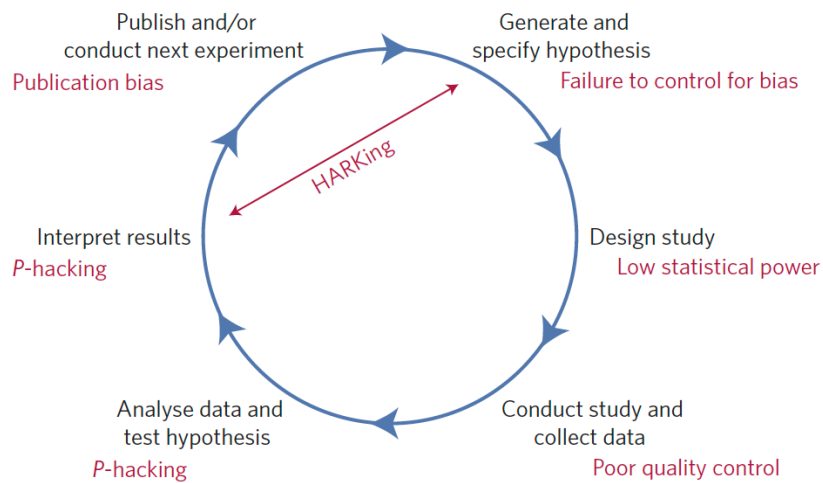


Figure 1 | Threats to reproducible science. An idealized version of the hypothetico-deductive model of the scientific method is shown. Various potential threats to this model exist (indicated in red), including lack of replication⁵, hypothesizing after the results are known (HARKing)⁷, poor study design, low statistical power², analytical flexibility⁵¹, *P*-hacking⁴, publication bias³ and lack of data sharing⁶. Together these will serve to undermine the robustness of published research, and may also impact on the ability of science to self-correct.

Munafò et al. (2017, Nature Human Behaviour)

Table 1. Open science practices. Some methods introduced or suggested by the open science community to improve scientific practices.

Resources	Sharing of code, data, research materials, and methods [2,19].
Publishing formats	Registered reports [28], preregistrations [17], exploratory reports [32], preprints [27], open access publishing [33], as well as new evaluation and peer review processes [24].
Research questions	Pursuing replications and reanalyses [2,5,6,9,19].
Methodology	Changes in statistical approaches for power [21,22], how evidence is assessed [23] and communicated [34], as well as documenting data analysis in a way that facilitates reproducing results [35].

<https://doi.org/10.1371/journal.pbio.3000246.t001>

Allen & Mehler (2019, Plos Biology)

Open science: how?

Some very real benefits

- Collaborate to correct errors

“Willoughby, the first author of the 2014 study who wrote the script, called the new study ‘a beautiful example of science working to advance the work we reported in 2014.’”

MOTHERBOARD
TECH BY VICE

A Code Glitch May Have Caused Errors In More Than 100 Published Studies

The discovery is a reminder that science is collaborative and ideally self-correcting, but that nothing can be taken for granted.

By Maddie Bender

Oct 10 2019, 11:30pm  Share  Tweet

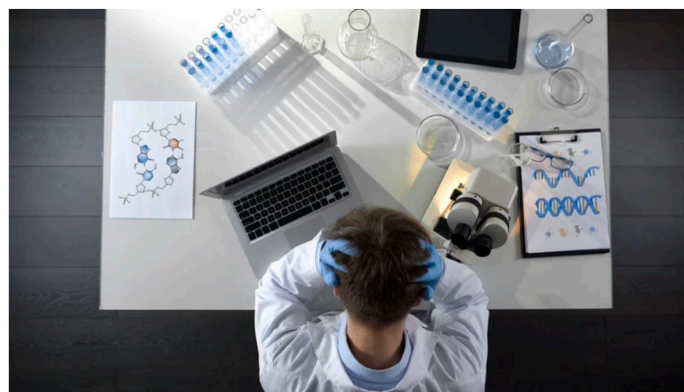


IMAGE: GETTY

Scientists in Hawai'i have uncovered a glitch in a piece of code that could have yielded incorrect results in over 100 published studies that cited the original paper.

The glitch caused results of a common chemistry computation to vary depending on the operating system used, causing discrepancies among Mac, Windows, and Linux systems. The researchers published the revelation and a debugged version of the script, which amounts to roughly 1,000 lines of code, on Tuesday in the journal *Organic Letters*.

Some very real benefits

- Your future self will thank you!



Hang on ... what about qualitative research?

Challenges include:

- emergent methodology depending on data
- contextual embedding of data
- sensitivity of data

ACCOUNTABILITY IN RESEARCH
2019, VOL. 26, NO. 3, 229–244
<http://dx.doi.org/10.1080/08989621.2019.1580147>



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Preregistering qualitative research

Tamarinde L. Haven ^a and Dr. Leonie Van Grootel ^b

^aDepartment of Philosophy, Vrije Universiteit Amsterdam, Amsterdam, The Netherlands; ^bDepartment of Methodology & Statistics, Tilburg University, Tilburg, The Netherlands



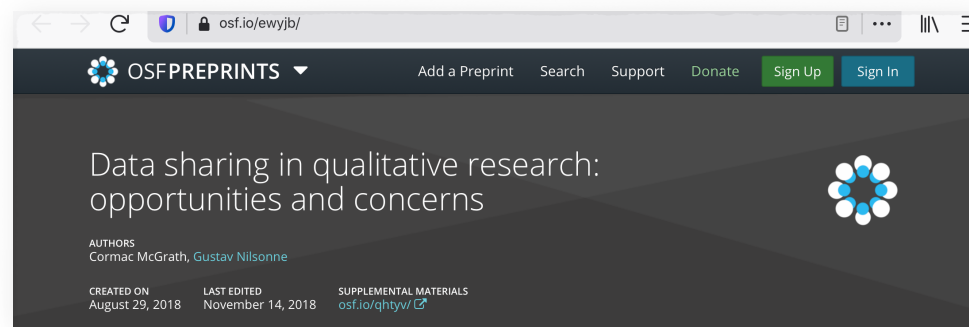
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Article

Open Data in Qualitative Research

Amelia Chauvette¹, Kara Schick-Makaroff¹,
and Anita E. Molzahn²

International Journal of Qualitative Methods
Volume 18: 1–6
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Data Impact Blog

Show Me the Data: research reproducibility in qualitative research

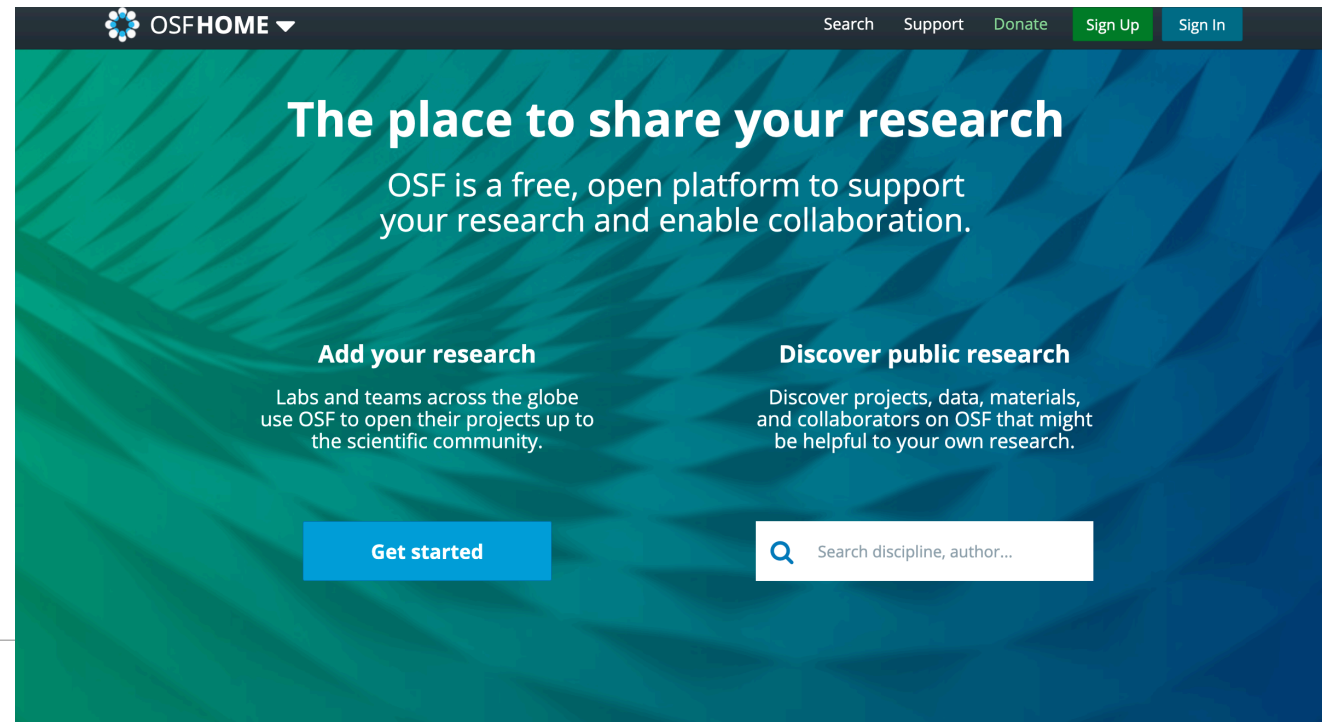
September 18, 2018 Neil Dymond-Green Leave a comment

Louise Corti, Director of Collections Development and Data Publishing for the UK Data Service explores research reproducibility in qualitative research.

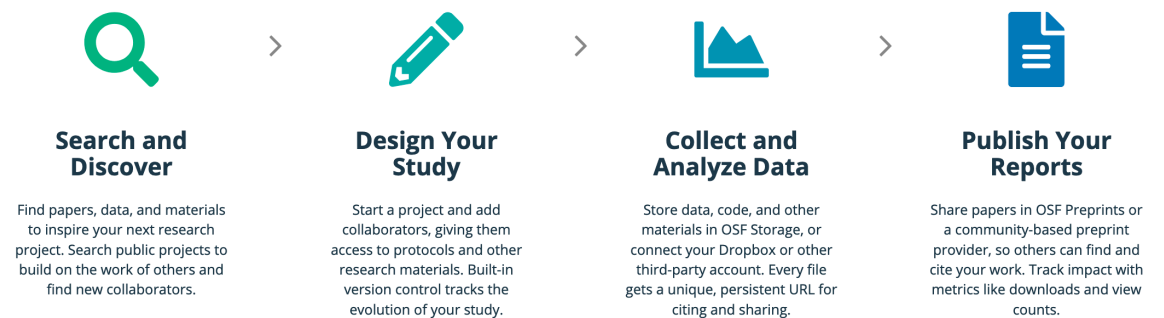
<http://blog.ukdataservice.ac.uk/show-me-the-data/>

Open science: resources

Open Science Framework
osf.io



How OSF supports your research



Language processing as a precursor to language change: evidence from Icelandic

Public 0 ...

Contributors: [Ina Bornkessel-Schlesewsky](#), Dietmar Roehm, [Robert Mailhammer](#), Matthias Schlesewsky

Date created: 2019-07-16 01:17 PM | Last Updated: 2019-12-27 03:39 PM

Category: Data

Description: Data and analysis code to accompany the paper "Language processing as a precursor to language change: evidence from Icelandic". *Frontiers in Psychology*. doi: 10.3389/fpsyg.2019.03013

License: GNU General Public License (GPL) 3.0

Wiki

Experiment Icelandic 2 (ICE2) was run by Dietmar Roehm in Iceland in 2005 as part of research conducted by the Max Planck Research Group Neurotypology (Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig; head: Ina Bornkessel-Schlesewsky).

The data were originally analysed using "traditional" ERP analysis methods, i.e. single-subject averaging per condition, time window and electr...

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Files

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Name ^ v	Modified ^ v
Language processing as a precursor to language change: evidence fr...	
OSF Storage (Australia - Sydney)	
ice2	
bad_chans.txt	2019-07-21 10:45 AM
behav_with_items_corrected.csv	2019-07-21 10:45 AM
besa_81.txt	2019-07-21 10:45 AM
epoch.py	2019-11-30 11:35 AM
epochs	

Citation

Tags

event-related potentials Icelandic language change language comprehension late positivity N400

Recent Activity

Ina Bornkessel-Schlesewsky made [Language processing as a precursor to language change: evidence from Icelandic](#) public 2019-12-27 03:39 PM

Ina Bornkessel-Schlesewsky edited description of [Language processing as a precursor to language change: evidence from Icelandic](#) 2019-12-27 03:39 PM

Ina Bornkessel-Schlesewsky updated the license of [Language processing as a precursor to language change: evidence from Icelandic](#) to GNU General Public License (GPL) 3.0 2019-12-27 03:36 PM

Ina Bornkessel-Schlesewsky updated file [ice2/ice_analysis.Rmd](#) in OSF Storage in [Language processing as a precursor to language change: evidence from Icelandic](#) 2019-11-30 04:08 PM

Ina Bornkessel-Schlesewsky removed file [ice2/tables/2_n400_wald_kable.aux](#) from OSF Storage in [Language processing as a precursor to language change: evidence from Icelandic](#) 2019-11-30 04:05 PM

<https://osf.io/zp6yv/>

Raw data and analysis code to accompany

Bornkessel-Schlesewsky, I., Roehm, D., Mailhammer, R., & Schlesewsky, M. (2020). Language Processing as a Precursor to Language Change: Evidence From Icelandic. *Frontiers in Psychology*, 10, 3013. <https://doi.org/10.3389/fpsyg.2019.03013>

Open science: resources

GitHub (one example of a code repository)

github.com

example: repository providing code to accompany

Corcoran, A. W., Alday, P. M., Schlesewsky, M., & Bornkessel-Schlesewsky, I. (2018). Toward a reliable, automated method of individual alpha frequency (IAF) quantification. *Psychophysiology*, 55(7), e13064. <https://doi.org/10.1111/psyp.13064>

corcorana / restingIAF

Watch 3 Star 14 Fork 2

<> Code

Issues 0

Pull requests 0

Projects 0

Security

Insights

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Source code and associated materials for resting-state individual alpha frequency estimation in EEGLAB

241 commits

1 branch

0 packages

6 releases

3 contributors

GPL-3.0

Branch: master

New pull request

Find file

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corcorana minor typo

Latest commit 73fd99c on Apr 16, 2019

simulations	correct input parsing error for 'norm' input of 'restingIAF'	2 years ago
tutorial	minor typo	10 months ago
.DS_Store	update citation	2 years ago
.gitignore	minor changes	3 years ago
LICENCE.md	Create LICENCE.md	3 years ago
MS_long.pdf	bioRxiv version of MS	2 years ago
MS_short.pdf	update bimod results with extended Wa frame	2 years ago
MS_short_appendix.pdf	tidy up	2 years ago
README.md	update README release version	11 months ago
chanGravs.m	reconfigure dir	2 years ago
chanMeans.m	set cmin for smoothed spectra according to PAF not IAW	2 years ago
findF1.m	add journal issue to readme citation, change derivative search range ...	2 years ago
findF2.m	reconfigure dir	2 years ago
lessThan1.m	reconfigure dir	2 years ago
meanIAF.m	Update meanIAF.m	16 months ago
peakBounds.m	reconfigure dir	2 years ago
plotAvSpec.m	add Q-weight average plotting function, update tute	2 years ago
plotSpec.m	reconfigure dir	2 years ago
restingIAF.m	reinstate nchan	2 years ago
sgfDiff.m	reconfigure dir	2 years ago

README.md

restingIAF

General information

Source code for `restingIAF`, an automated resting-state individual alpha frequency (IAF) estimation routine implemented in MATLAB.

Repo also contains manuscript preprints (long and short(er) versions, archived on *bioRxiv*) outlining the rationale for programme development, its performance across simulated and non-simulated EEG datasets, and guidelines for parameter settings. The [long version](#) includes a detailed examination of some of the problematical features of conventional approaches to IAF estimation. It also contains additional technical details that were omitted from the [short version](#). Most of these details are collated in the latter's accompanying [appendix](#).



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Open science: resources

Many good recent overview articles

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Cite this article: Smaldino PE, McElreath R.
2016 The natural selection of bad science.

The natural selection of bad science

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nature
human behaviour

PERSPECTIVE

PUBLISHED: 10 JANUARY 2017 | VOLUME: 1 | ARTICLE NUMBER: 0021

OPEN

A manifesto for reproducible science

Marcus R. Munafò^{1,2*}, Brian A. Nosek^{3,4}, Dorothy V. M. Bishop⁵, Katherine S. Button⁶, Christopher D. Chambers⁷, Nathalie Percie du Sert⁸, Uri Simonsohn⁹, Eric-Jan Wagenmakers¹⁰, Jennifer J. Ware¹¹ and John P. A. Ioannidis^{12,13,14}

PLOS | BIOLOGY 2019

PERSPECTIVE

Open science challenges, benefits and tips in early career and beyond

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