


DAY 1	Lotty (@lottybrand) 	Diego
1.00pm	Introduce Open Science part 1	
1.30pm	Q&A / Discussion - Plan S	Q&A / Discussion – Plan S
1.45pm	Introduce Open Science part 2	
2.15pm	Q&A / Discussion – Preregistration TEA & COFFEE	Q&A / Discussion – Preregistration TEA & COFFEE
2.30pm	Further points on preregistration	
3.00pm		Introduce the dataset and the question for Day 2
3.15pm	Go over preregistration template	
3.15pm – 4.00pm	Preregistration exercise	Preregistration exercise
4.00pm	Q&A about preregistration, discuss any difficulties	Q&A about preregistration, discuss any difficulties
4.15pm	Introduce Github/ Version control	Introduce Github/ Version control
4.30pm	Download Git on machines	Download Git on machines

DAY 2	Lotty	Diego
1.00pm		Project structure, version control p. I
2.00pm	Q&A / Discussion	Q&A / Discussion
2.15pm		Version control p. II, GitHub
3.15pm	Q&A / Discussion	Q&A / Discussion
3.30pm		Using remake
4.00pm		Writing a reproducible report
4.30pm	Q&A / Discussion	Q&A / Discussion
4.45pm	Wrap-up	Wrap-up

What is Open Science?

1. Publishing in Open Access Journals
2. Sharing your data with your publication
3. Sharing your analysis script and your data with your publication
4. Practicing **transparent and reproducible** research from the **beginning** of the research project **to the end** (preregistration, version control, well documented data collection procedures, data processing and analysis scripts, preprints, open peer-review, and making all of this openly available alongside your manuscript and data)

Scientific Publishing

- Most of us can only access journal articles through your university subscription
- Ethical arguments against this: tax payers pay for research, but can't access the research themselves
- Also: researchers outside of wealthy academic institutions can't afford subscriptions, and other professionals need the info (e.g. doctors!)
- Academic publishers are hugely profiteering, wider profit margins than Google and Shell

Tax-funded academics do the research, write the papers, make the figures, do the editing roles, do the peer review – all for free, sign over the copyright to publishers who then sell it back to them, typeset.

Huh?

How we got here

In last 25 years, there's been a growing divergence between the roles of academic publishing:

- Disseminating validated knowledge.
- Symbolic capital for academic career progression.
- Profitable business enterprise – 35-40% profits.

Left ventricular non-compaction cardiomyopathy

Information needed - can you help?

I am a patient recently diagnosed with LVNC. I am looking for all papers related to my condition.

Requested by an anonymous user on 12/07/2018

Knowledge, attitude, and practices related to hepatitis B virus infection among Nigerian obstetricians and midwives

Information needed - can you help?

Greetings, I am a medical student in Lagos, Nigeria carrying out a study on Knowledge, attitude and risk factors of hepatitis B among waste scavengers in Lagos State. I would appreciate access to your study in order to use it in my literature review. Thank you in anticipation of a favourable response.

Requested by an anonymous user on 15/07/2018

Cannabinoids and bone regeneration

In progress - join and share the request

I will use this information to support my patients with bone pain and bone loss

Requested by Nalini, a health professional at AIIORE, 2 weeks ago



Aaron Swartz was bankrupted by legal fees, faced \$1 million in fines and 35 years in prison, for downloading academic journals.

1986-2013.

Alexandra Elbakyan is in hiding due to the risk of extradition.

Elsevier was granted a \$15 million injunction against her.

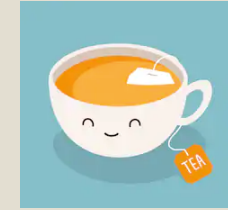
~600,000 papers downloaded/day.



Open Access Journals

- Some subset of regular journals, RSOS, Nature Communications, etc – charge **APCs**
- Some are 'free' - Ecology & Evolution, PeerJ, PLOS Biology – see https://en.m.wikipedia.org/wiki/List_of_open-access_journals
- Some are entirely free, online only, voluntarily run – see Meta-Psychology Journal (OJS)

Plan S- discuss

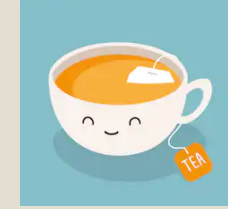


PLAN S

Requires researchers who benefit from state-funded research organisations to publish their work open access by 2020.

12 Countries: Austria, Finland, France, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Slovenia, Sweden, UK.

Plan S - discuss



The [AAAS](#), publisher of the journal [Science](#), argued that Plan S "will not support high-quality peer-review, research publication and dissemination...

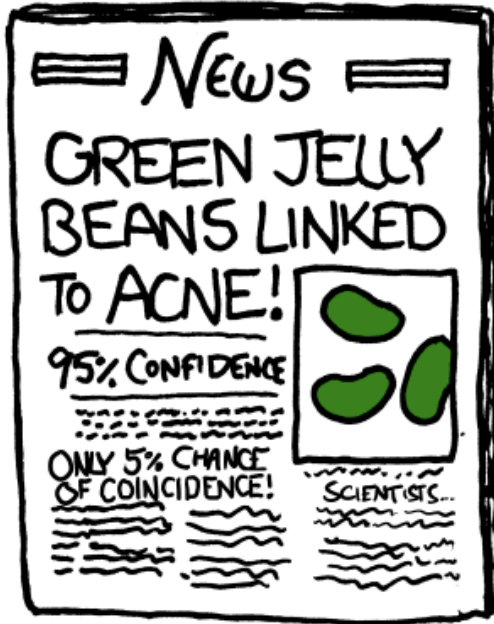
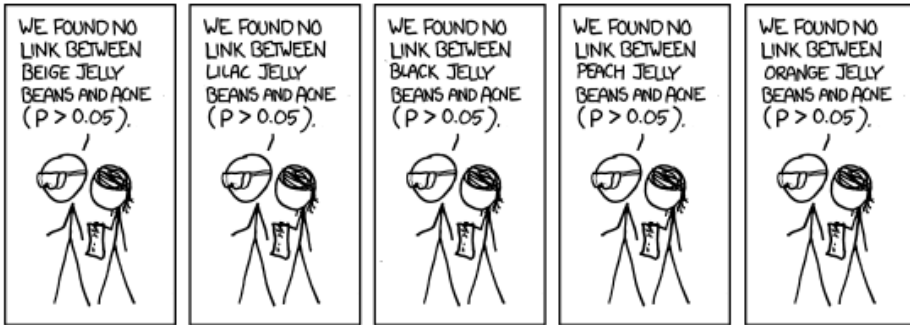
...would disrupt scholarly communications, be a disservice to researchers, and impinge academic freedom"

'If you think that information should be free of charge, go to Wikipedia' – Spokesperson for [Elsevier](#) (Tom Reller)

“potentially undermines the whole research publishing system” – [Springer Nature](#)

head of the Scientific Information Provision at the [Max Planck Digital Library](#), told [The Scientist](#) that "This will put increased pressure on publishers and on the consciousness of individual researchers that **an ecosystem change is possible ..**"

Share your analysis script



P-hacking

HARKing

Publication bias

→ distorted literature

→ Wasted research time & money

→ Replication crisis

Replication crisis

RESEARCH

RESEARCH ARTICLE

PSYCHOLOGY

Estimating the reproducibility of psychological science

Open Science Collaboration*†

Reproducibility is a defining feature of science, but the extent to which it characterizes current research is unknown. We conducted replications of 100 experimental and correlational

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It 'began' in Psychology but the problems are science-wide...

Science Isn't Broken

It's just a hell of a lot harder than we give it credit for.

By [Christie Aschwanden](#)
Graphics by [Stechie King](#)
Filed under [Scientific Method](#)
Published Aug. 19, 2015

[f](#) [t](#) [=](#)

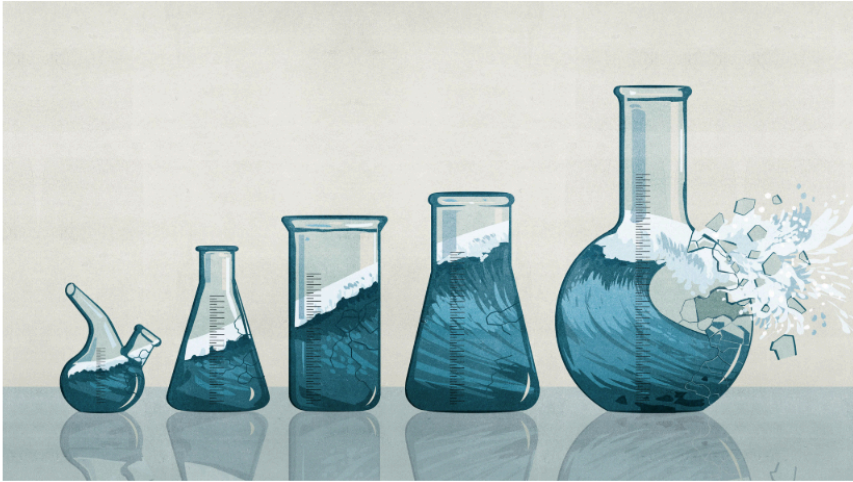


ILLUSTRATION BY SHOUT

Meta-science

ROYAL SOCIETY
OPEN SCIENCE

rsos.royalsocietypublishing.org

Research



Cite this article: Smaldino PE, McElreath R.

2016 The natural selection of bad science.

R. Soc. open sci. **3**: 160384.


<http://dx.doi.org/10.1098/rsos.160384>

The natural selection of bad science

Paul E. Smaldino¹ and Richard McElreath²

¹Cognitive and Information Sciences, University of California, Merced, CA 95343, USA

²Department of Human Behavior, Ecology, and Culture, Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany

 PES, 0000-0002-7133-5620; RME, 0000-0002-0387-5377

Poor research design and data analysis encourage false-positive findings. Such poor methods persist despite perennial calls for improvement, suggesting that they result from something more

Main message:
NOT about *bad scientists*, but *bad incentives* and a *flawed system*

Through the variation, selection, and reproduction of scientific practices...

A lot of bad practice is maintained by accident, unconsciously following norms...

Reproducibility

- Is my supervisor checking this?
- Is the rest of the field checking this?

Now they can (and will)!

- Preregistration and/or Registered Reports
- Using R over SPSS/other point-click software
- Version control and repositories
- Pre-print archives
- Open journals/data/scripts
- (also, Twitter)

PREREGISTRATION – Discuss



Time-stamped, open record of your predictions, hypotheses and analysis plan

Preregistration

- Stating predictions before data collection (we do this anyway, right?!)
- Designed to prevent HARKing, p-hacking, other *unconscious* QRPs

Preregistration

vs

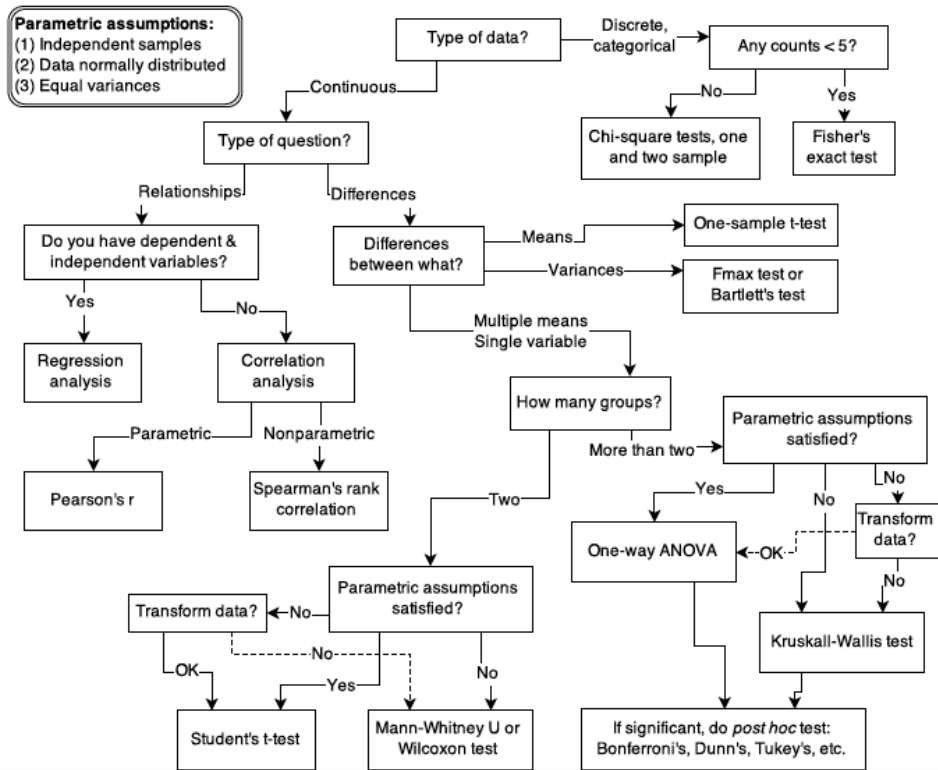
Registered Reports

- Time-stamped, open record of your predictions, hypotheses and analysis plan
 - Usually (but not exclusively) before you collect your data
 - Is not linked to any particular journal
- Peer-review is conducted on your intro, methods and analysis, *before you collect the data*
 - This is done with a specific journal who promises to publish your work as long as you follow that peer-reviewed plan

Why bother?

- It speeds up your research
- Freedom from too many degrees of freedom (and anxiety)
- Confidence to explore
- Gain reviewers' trust
- Be scoop-proof!
- Improve the validity of science *..forever....*

Speeds up your research!



To consult the statistician after an experiment is finished is often merely to ask him to conduct a post mortem examination. He can perhaps say what the experiment died of.

— Ronald Fisher —

Freedom from degrees of freedom (and anxiety!)

PREREGISTRATION: A PLAN, NOT A PRISON

PREREGISTERED

Tweets **353** Following **170** Followers **705** Likes **510** **Following**

OSF Prereg
@OSFPrereg
Preregister your research on @OSFramework. Need help with OSF? Check out @OSFSupport!
Charlottesville, VA
cos.io/prereg/
Joined January 2018

Tweets Tweets & replies Media

Pinned Tweet

OSF Prereg @OSFPrereg · 1 May 2018
"The Preregistration Revolution" now available in PNAS:

**The preregistration revolution**
Progress in science relies in part on generating hypotheses with existing observations and testing hypotheses with new observations. This distinction b...
pnas.org

Who to follow · Refresh · View all

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-  **SIPS** @improvingpsych
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Confidence to Explore!

Exploratory analysis

If you plan to explore your data set to look for unexpected differences or relationships, you may describe those tests here. An exploratory test is any test where a prediction is not made up front, or there are multiple possible tests that you are going to use. A statistically significant finding in an exploratory test is a great way to form a new confirmatory hypothesis, which could be registered at a later time.

It may be the case that participants' ratings reflect their previously held perceptions of their group members, rather than being a result of interactions during the group task. We will therefore include a model in which being initially named as someone influential in the group, or someone who others would like to learn from, are predictors of group nominations. We will also include these predictors in the full model, to see how much, if any, explanatory power they hold. We do not have any specific predictions regarding these effects, as it could conceivably be the case that influential/knowledgeable members of the group are also influential/knowledgeable on the group quiz, equally it may be the case that although they are influential/knowledgeable in one domain (e.g. knitting), they are not in another (e.g. the quiz). This is an empirical question and we do not have a strong prediction in either direction for this particular aspect of the study, nor is it our main area of focus for this study:

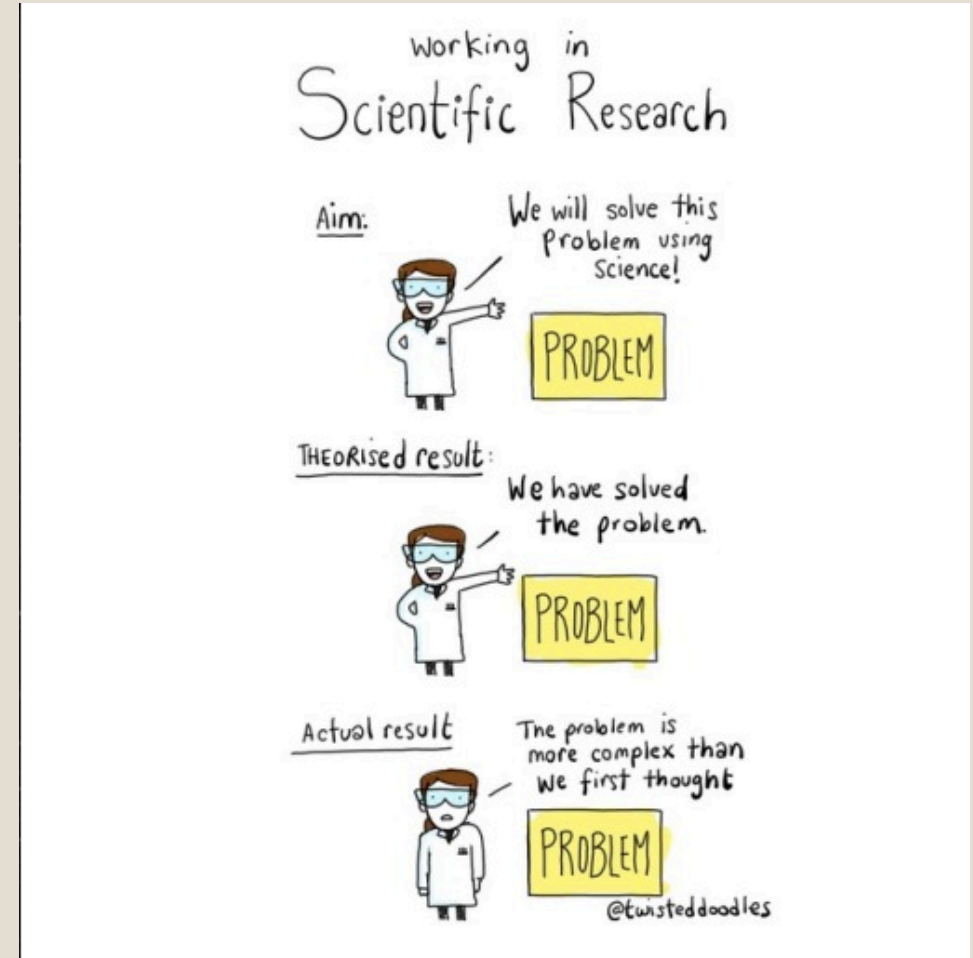
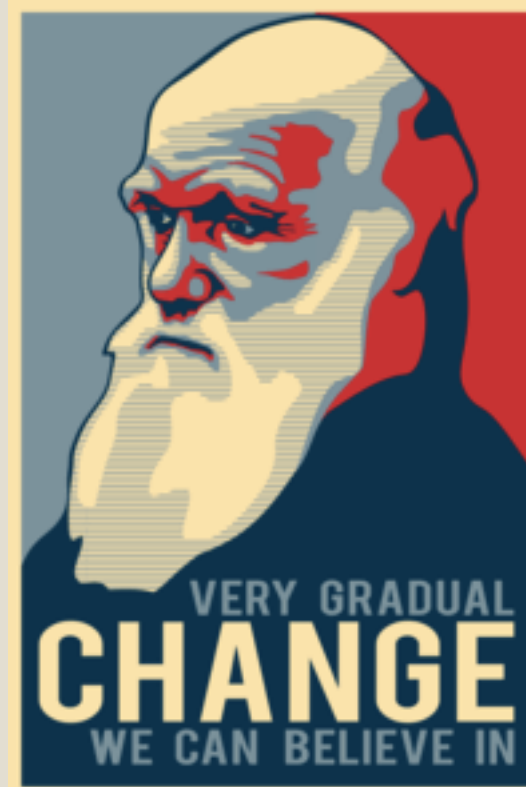
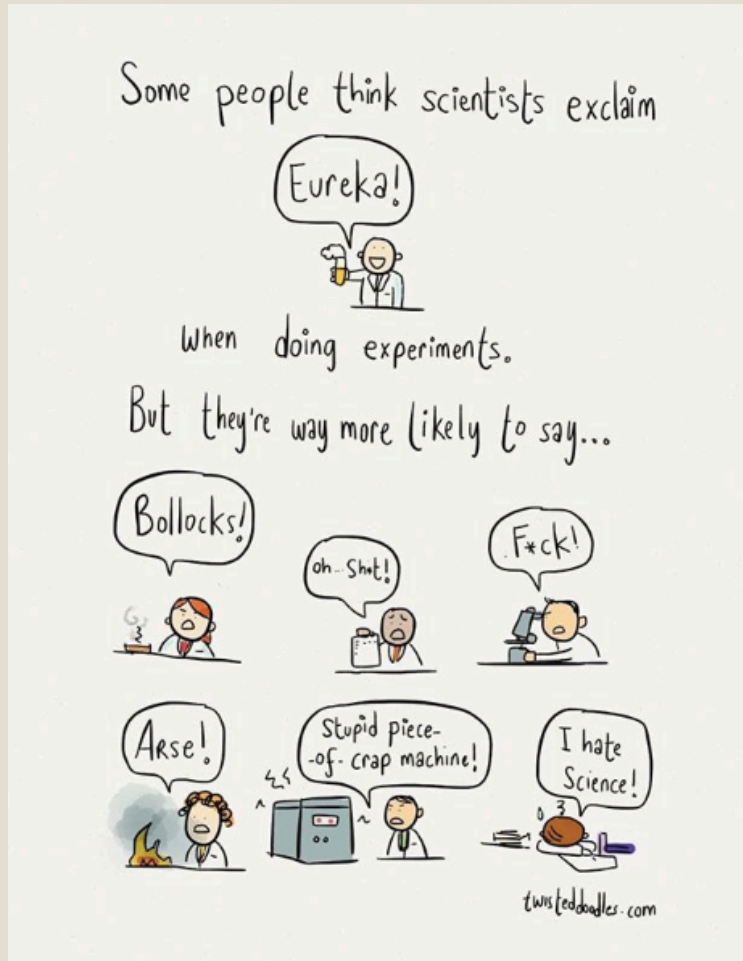
- 1) Individuals who are rated as highly influential in the group before the task are not necessarily chosen to represent the group after the task
- 2) Those whom individuals want to learn from within their group (e.g. how to knit) are not necessarily also nominated to represent the group at the quiz

Similarly we will check for sex differences in dominance and prestige ratings, but do not have any specific predictions regarding this. The previous studies using these dominance and prestige scales did not find a sex difference, however other research suggests males are more dominant than females in terms of Big Five personality traits, competitiveness, aggression, physical strength etc. Thus we remain open to the possibility of a sex difference in dominance ratings in our study. Similarly, a few theoretical and empirical papers suggest that age and prestige may correlate, thus we will have age as a predictor in our full models of prestige (and dominance) to check for this possibility, however we do not have a specific prediction for this and this is not the main focus of our study. We primarily predict that performance on the quiz and influence in the group task will predict prestige ratings above and beyond age in our particular study.

Gain reviewers' trust!

I read this manuscript with interest, and I appreciated the efforts taken to obtain a diverse community sample of groups with varying sets of interests. I also appreciated how the authors reported both supported and unsupported hypotheses in an unbiased way. I had some questions and comments that I think would help to clarify some aspects of the paper.

Improve validity and trust in science... forever!



Let's talk about impact...

UK Research Councils Sign Declaration Against The Use of Journal Impact Factors in Evaluating Research Excellence

All seven UK Research Councils have joined others from across the globe signing the San Francisco Declaration on Research Assessment (DORA), to protest against the use of Journal Impact Factors in assessing research quality, Times Higher Education reported on 7 February 2018. This is significant for the UK research funding allocation as a new category of "impact" had been added from 2014 onwards

The Declaration protests against the use of Journal Impact Factors in research assessment, hiring and grant applications. DORA signatories argue that Journal Impact Factors were not designed to measure research quality, but rather as a tool to assist librarians in deciding which journals to purchase. They are based on how frequently the journal is cited across a period of two years, a practice which DORA signatories argue has very little to do with research quality, and does not reflect differences across disciplines, nor differences in the quality of papers within the same publication. It has become common practice, however, for individual and institutional quality to be evaluated according to the number of publications in high impact journals.

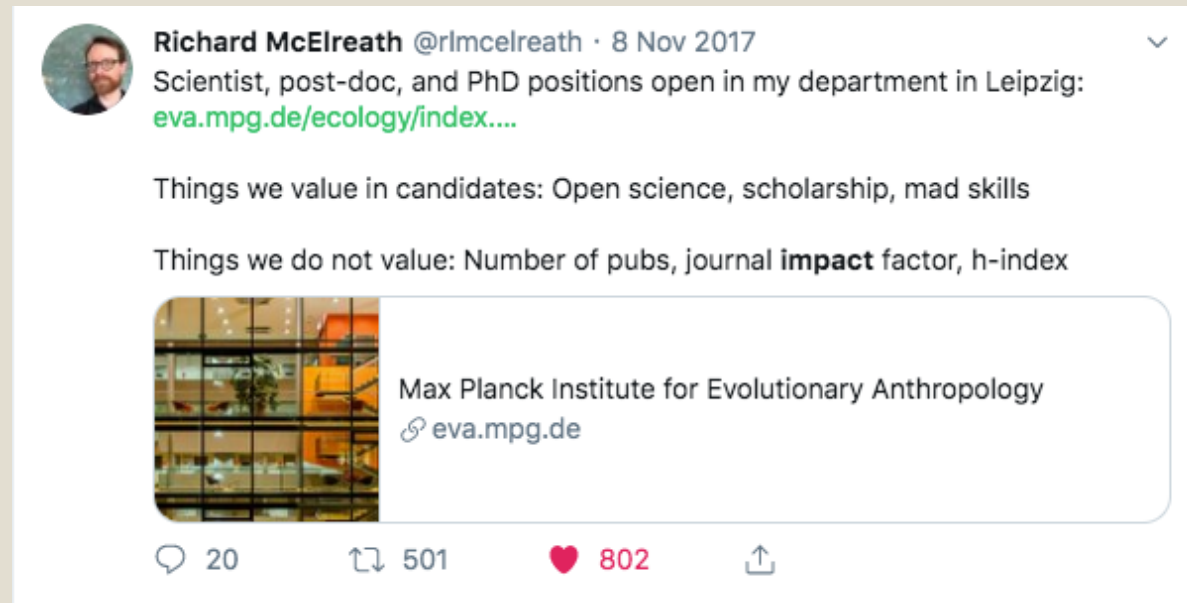
Wisdom, not impact

“Some people think that what I should be doing is producing *Nature* and *Science* papers. More than one colleague has specifically asked me which “*Science/Nature* projects” I have planned. That is not what Max Planck Departments are for. High-profile publications may arise, but they should be side effects. We demand wisdom, not professional impact.”

Richard McElreath, a director of the Max Planck Institute for Evolutionary Anthropology

http://elevanth.org/blog/2018/09/02/golden_eggs/

Hiring decisions:




 **Richard McElreath** @rlmcelreath · 8 Nov 2017

Scientist, post-doc, and PhD positions open in my department in Leipzig:
eva.mpg.de/ecology/index...

Things we value in candidates: Open science, scholarship, mad skills

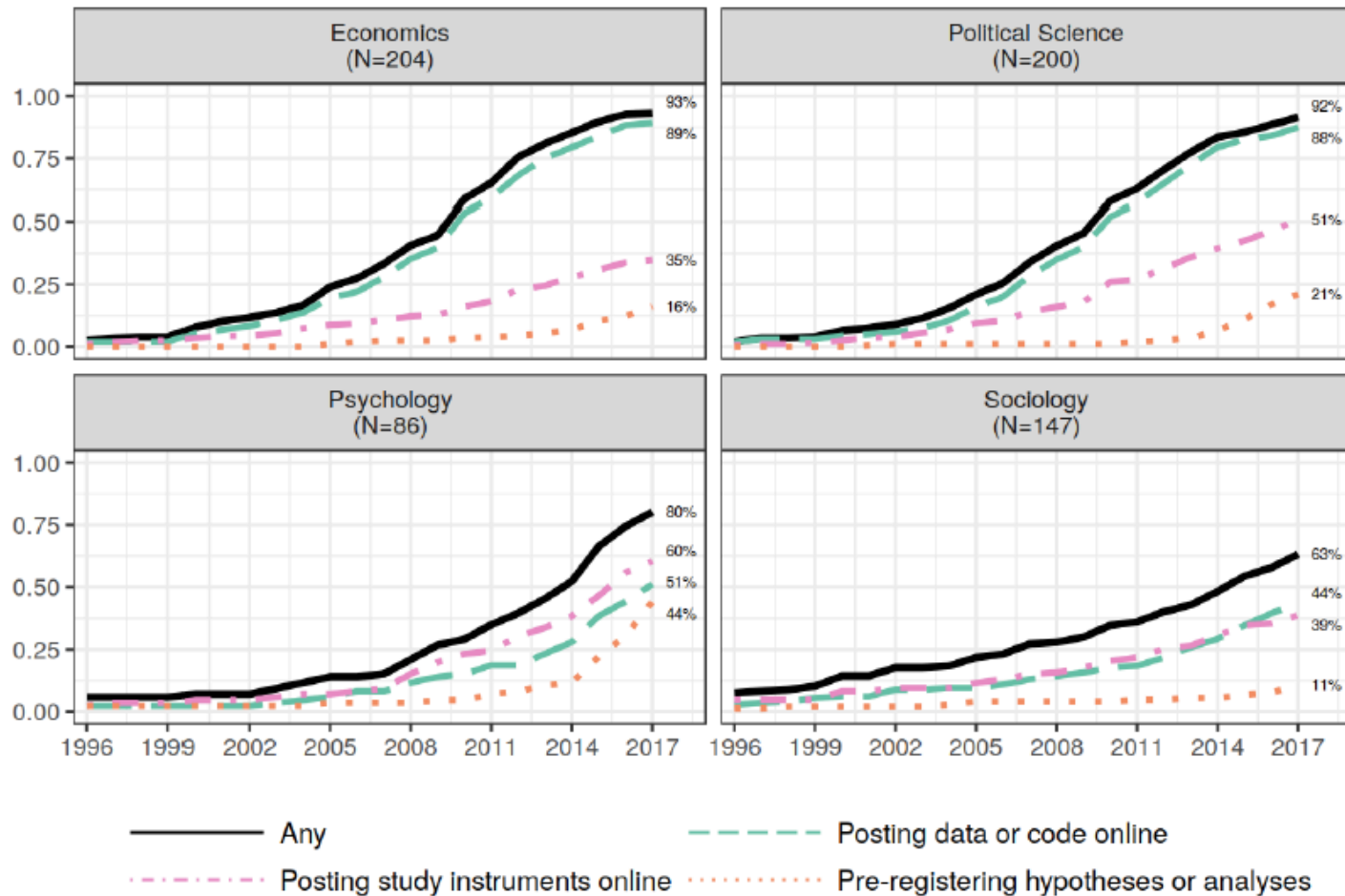
Things we do not value: Number of pubs, journal **impact** factor, h-index

 Max Planck Institute for Evolutionary Anthropology
eva.mpg.de

20 501 802

Is anyone actually doing it?

Share of Published Authors (PhD < 2010) Adopting Practice



Pre-registered...
obviously!

- ▶ **Published Authors:** Scraped journal websites for all individuals with at least one publication between 2014-2016 in top 10 journals from each discipline
- ▶ **PhD Students:** Scraped top-20 North American doctoral program websites for PhD students in Fall 2017

<https://www.bitss.org/events/2018am/>

Is anyone actually doing it?

REGISTERED REPORTS CUT PUBLICATION BIAS

Pre-registering research protocols in a 'registered reports' format could lead to less publication bias skewed towards positive results. Studies that pre-register their protocols publish more negative findings that don't support their hypothesis, than those that don't.

HYPOTHESES NOT SUPPORTED BY RESEARCH PAPERS (%)



Estimates from general literature **5-20%**



Registered reports for novel studies **55%***



Registered reports for replication studies **66%***

© nature

*Sample size: 296 hypotheses across 113 studies in biomedicine and psychology

2

138

265



<https://www.nature.com/articles/d41586-018-07118-1>

Is anyone doing it?

 **Daniel Ansari** @NumCog Follow ▼

I now get more enjoyment & excitement out of writing preregistrations than manuscripts, since the latter depends on the former and the former lays the recipe for the latter (with the exception of non-registered exploratory analyses).

12:37 am - 22 Mar 2019

2 Retweets 43 Likes 

 2  2  43 



 **Daniel Ansari** @NumCog · Mar 22 ▼


I am also enjoying how the [@NumCogLab](#)'s preregistrations have evolved. We are learning from our early mistakes, becoming more detailed. I am sure this will evolve further as we gain more experience with this process.

 1  1  9 





 **Daniel Ansari** @NumCog · Mar 22 ▼

It's the process of making predictions precise, thinking of (hopefully) most of the details ahead of time that is so satisfying, with the added benefits of error control etc.

 1   12 

 **Daniel Ansari** @NumCog · Mar 22 ▼

Also - a very practical benefit of preregistration, as a forgetful PI, is that I can open OSF & see all of our projects & preregistrations. Which means that I can spare my trainees with inane and surely annoying questions such as : " Exactly what does your study involve again??"

   14 

How do I do it?

- <https://psyarxiv.com/wte5z/> <- step by step slideshow
- <https://osf.io/prereg/>
- www.aspredicted.org
- https://docs.google.com/document/d/1w_3DPN6c-evOfgHBfeVgN-huBwMRe3EJCzGFG9Tzs54/edit?usp=sharing <- full template



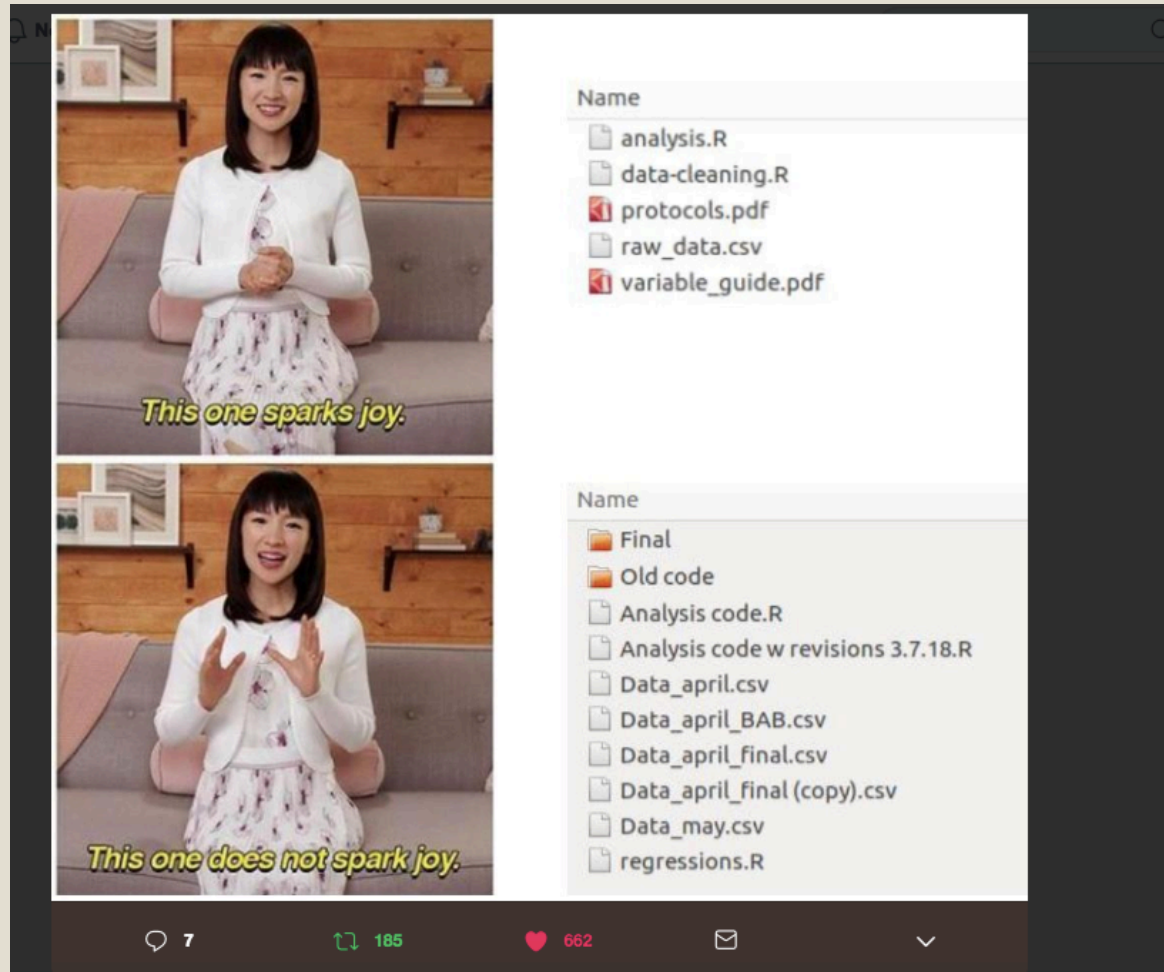
Improve your research with [preregistration](#). By writing out specific details such as data collection methods, analysis plans, and rules for data exclusion, you can make important decisions early on and have a clear record of these choices. This can help reduce biases that occur once the data are in front of you.

Use [OSF Registries](#) to discover previously registered work.

Start a new preregistration

Preregister a project you already have on OSF

Version Control



Benefits your
collaborators

Benefits other
researchers doing similar
work

Benefits FUTURE YOU

How do I do it?

- GitHub
- Can use desktop / Rstudio if command-line too confusing...
- <http://swcarpentry.github.io/git-novice/01-basics/index.html>
- <http://swcarpentry.github.io/git-novice/guide/>
- <http://nicercode.github.io/2014-02-13-UNSW/lessons/70-version-control/why.html>

Preprints

arXiv.org

Open access to 1,595,809 e-prints in the fields of physics, mathematics, computer science, quantitative biology, and economics. Preprints should conform to Cornell University academic standards. arXiv is owned and operated by Cornell University member institutions.

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Open Review

The screenshot shows the top navigation bar of the Royal Society Publishing website. The header includes the logo, 'All Journals', 'Brought to you by University of Exeter', 'Sign in', and a search icon. Below the header is a secondary navigation bar with links for 'Home', 'Content', 'Information for', 'About us', 'Sign up', and 'Submit'. The main content area is divided into three columns. The left column contains a table of contents with items like '1. Introduction', '2. Material and methods', '3. Results', '4. Discussion', and 'Supplemental Material'. The 'Review history' link under 'Supplemental Material' is circled in blue, and a yellow arrow points to it from the bottom left. The middle column contains the 'Abstract' and '1. Introduction' sections. The right column contains navigation icons (Details, References, Related, Figures), a 'This Issue' section with a cover image, and an 'Article Information' section with DOI, PubMed, and ISSN details. A 'PDF' button is visible on the right side of the page.

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Abstract

Mate-searching success is a critical precursor to mating, but there is a dearth of research on traits and tactics that confer a competitive advantage in finding potential mates. Theory and available empirical evidence suggest that males locate mates using mate-attraction signals produced by receptive females (personal information) and avoid inadvertently produced cues from rival males (social information) that indicate a female has probably already mated. Here, we show that western black widow males use both kinds of information to find females efficiently, parasitizing the searching effort of rivals in a way that guarantees competition over mating after reaching a female's web. This tactic may be adaptive because female receptivity is transient, and we show that (i) mate searching is risky (88% mortality) and (ii) a strongly male-biased operational sex ratio (from 1.2 : 1 to more than 10 : 1) makes competition inevitable. Males with access to rivals' silk trails moved at higher speeds than those with only personal information, and located females even when personal information was unreliable or absent. We show that following rivals can increase the potential for sexual selection on females as well as males and argue it may be more widespread in nature than is currently realized.

1. Introduction

Sexual selection arises when the reproductive success of one sex is limited by access to potential mates [1]. In most sexually reproducing species, males compete to fertilize the relatively limited number of eggs produced by females, and the form of competition depends on ecological factors including the distribution of potential mates in space and time [2]. In many taxa, females become sexually receptive at unpredictable spatial or

This Issue

31 July 2019
Volume 286, Issue 1908

Article Information

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Print ISSN: 0962-8452

PDF

Back to top

Sharing your data?

Should data be owned, bought, sold? Some argue no, as long as the data complies with ethics, is anonymized, was consented, should be open to all.

From a scientific perspective- sharing your data allows others to verify your conclusions, make use of it themselves, not have to repeat collect the same data – collaborate!

Scoop Proof!

- You have a jaw-dropping unique idea- Preregister it!
- Someone claims the same idea - point them to your time-stamped preregistration! If they claim they had the idea first, too bad, they should've preregistered it (or, you should've!)
- If they preregistered at exactly the same time too, bond over this coincidence and turn the competition into collaboration
- If they claim they genuinely didn't see your preregistration (or you genuinely didn't see theirs) this is just bad luck and cannot be avoided just like the real life world of people having simultaneous research ideas.... Preregistration doesn't make this any more likely



Other resources:

- Transparency in Ecology and Evolution community: <http://www.ecoevotransparency.org/>
- List of journals accepting Registered Reports: <https://cos.io/rr/>
- Metascience conference: <https://www.metascience2019.org/program/>
- Open Sci Conf: <https://www.amos2019conference.com/program>
- Open Science Workshop: <https://psyarxiv.com/wte5z/>
- <https://doi.org/10.1098/rsos.160384> The Natural Selection of Bad Science (Smaldino & McElreath 2016)
- <https://journals.sagepub.com/doi/full/10.1177/1745691618767878> – Open Science is Liberating and can foster Creativity (Frankenhuis & Nettle 2018)
- <https://www.pnas.org/content/115/11/2600> The Preregistration Revolution (Nosek et al 2018)
- OSF <https://osf.io/>
- Preprints <https://www.biorxiv.org/>
- Publons <https://publons.com/researcher/1248054/charlotte-brand/>
- Access Lab: <https://fo.am/activities/accesslab/>
- Julia Rohrer's open science slides <https://osf.io/e4fja>
- Open science course <https://osf.io/87arq/>
- Munafo manifesto https://www.nature.com/articles/s41562-016-0021_
- Dance of the p values <https://www.youtube.com/watch?v=5OL1RqHrZQ8>
- APC's <http://thetaper.library.virginia.edu/big%20deal/apcs/serials%20crisis/2019/10/07/weekly-big-deal-longread-article-processing-charge-hyperinflation-and-price-insensitivity-an-open-access-sequel-to-the-serials-crisis.html>

Other resources... contact me for more! @lottybrand



- <https://force2019.sched.com/2019-10-16/overview> Force2019
 - <https://twitter.com/curatescience/status/1183454160068530180> Curate Science
 - <https://www.norrag.org/democratising-knowledge-a-report-on-the-scholarly-publisher-elsevier-by-dr-jonathan-tennant/> A report on Elsevier
 - <https://peerj.com/preprints/27638.pdf> research into use of impact factors
 - <https://osf.io/854zr/> Positive results rate in psychology: registered reports compared to conventional literature (Schijen, Scheel & Lakens 2019)
 - <http://www.talyarkoni.org/blog/2018/10/02/no-its-not-the-incentives-its-you/> It's Not the Incentives, it's You
 - Plea for positivity and preregistration <https://lottybrand.wordpress.com/2018/10/05/a-postdocs-plea-for-positivity-preregistration/>
 - refuse Elsevier: <https://www.talyarkoni.org/blog/2016/12/12/why-i-still-wont-review-for-or-publish-with-elsevier-and-think-you-shouldnt-either/>
 - Universities ditch Elsevier: <https://www.editage.com/insights/norway-joins-the-ranks-of-germany-and-sweden-cancels-subscription-with-elsevier>, 2) <https://scholarlykitchen.sspnet.org/2019/05/06/the-university-of-california-and-elsevier-an-interview-with-jeff-mackie-mason/>
 - Profiteering publishers: <https://www.theguardian.com/science/2017/jun/27/profitable-business-scientific-publishing-bad-for-science>
- <https://www.theguardian.com/commentisfree/2019/mar/04/the-guardian-view-on-academic-publishing-disastrous-capitalism>
- Aaron Swartz https://en.wikipedia.org/wiki/Aaron_Swartz



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WHAT ARE THE INDICATORS OF A CREDIBLE RESEARCH CULTURE?



INCREDIBLE

- Transparent methods
- Pre-registration
- Declaration of COIs
- Contributions are credited
- Direct replications/audits
- Null findings reported
- Few unforced errors
- Open review
- Papers as advertisements
- “Take my word” culture
- Appeals to authority/flair
- Few people get all the glory
- All novelty all the time
- Everything is significant
- Many unforced errors
- Blind faith in peer review



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