

# Open Science and reproducible research

Monday 20th May 2019

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Brendan Palmer,  
Clinical Research Facility - Cork &  
School of Public Health  
 @B\_A\_Palmer

# Can we believe what we see in the literature?

The screenshot shows the PLOS Medicine homepage with a purple header bar. In the top right corner, there are links for 'plos.org', 'create account', and a purple 'sign in' button. Below the header, the PLOS logo and 'MEDICINE' are on the left, followed by navigation links for 'BROWSE', 'PUBLISH', and 'ABOUT'. To the right is a search bar with a magnifying glass icon and a link to 'advanced search'. The main content area features a purple banner for the article 'Why Most Published Research Findings Are False' by John P. A. Ioannidis, published on August 30, 2005. The banner includes the DOI: <https://doi.org/10.1371/journal.pmed.0020124>. To the right of the banner are four purple boxes containing article metrics: 68,836 Save, 2,931 Citation, 2,768,586 View, and 10,482 Share.

OPEN ACCESS

ESSAY

## Why Most Published Research Findings Are False

John P. A. Ioannidis

Published: August 30, 2005 • <https://doi.org/10.1371/journal.pmed.0020124>

68,836 Save	2,931 Citation
2,768,586 View	10,482 Share

# Some cautionary tales

The Atlantic

Popular

Latest

Sections ▾

SCIENCE

## A Waste of 1,000 Research Papers

Decades of early research on the genetics of depression were built on nonexistent foundations. How did that happen?

ED YONG MAY 17, 2019

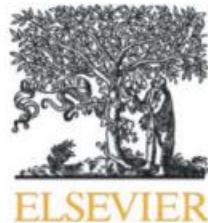


[Am J Psychiatry. 2019 May 1;176\(5\):376-387. doi: 10.1176/appi.ajp.2018.18070881. Epub 2019 Mar 8.](#)

**No Support for Historical Candidate Gene or Candidate Gene-by-Interaction Hypotheses for Major Depression Across Multiple Large Samples.**

[Border R<sup>1</sup>, Johnson EC<sup>1</sup>, Evans LM<sup>1</sup>, Smolen A<sup>1</sup>, Berley N<sup>1</sup>, Sullivan PF<sup>1</sup>, Keller MC<sup>1</sup>.](#)

# 241 shades of grey



Contents lists available at SciVerse ScienceDirect

NeuroImage

journal homepage: [www.elsevier.com/locate/ynim](http://www.elsevier.com/locate/ynim)



## Full Length Articles

### The secret lives of experiments: Methods reporting in the fMRI literature

Joshua Carp

*University of Michigan, Department of Psychology, 530 Church Street, Ann Arbor, MI, 48109, USA*

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#### ARTICLE INFO

*Article history:*  
Accepted 3 July 2012  
Available online 10 July 2012

*Keywords:*  
fMRI  
Methods reporting  
Reproducibility  
Experimental design  
Analysis methods  
Statistical power

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#### ABSTRACT

Replication of research findings is critical to the progress of scientific understanding. Accordingly, most scientific journals require authors to report experimental procedures in sufficient detail for independent researchers to replicate their work. To what extent do research reports in the functional neuroimaging literature live up to this standard? The present study evaluated methods reporting and methodological choices across 241 recent fMRI articles. Many studies did not report critical methodological details with regard to experimental design, data acquisition, and analysis. Further, many studies were underpowered to detect any but the largest statistical effects. Finally, data collection and analysis methods were highly flexible across studies, with nearly as many unique analysis pipelines as there were studies in the sample. Because the rate of false positive results is thought to increase with the flexibility of experimental designs, the field of functional neuroimaging may be particularly vulnerable to false positives. In sum, the present study documented significant gaps in methods reporting among fMRI studies. Improved methodological descriptions in research reports would yield significant benefits for the field.

# Ig Nobel research - 2012 Neuroscience winner



Journal of Serendipitous and Unexpected Results

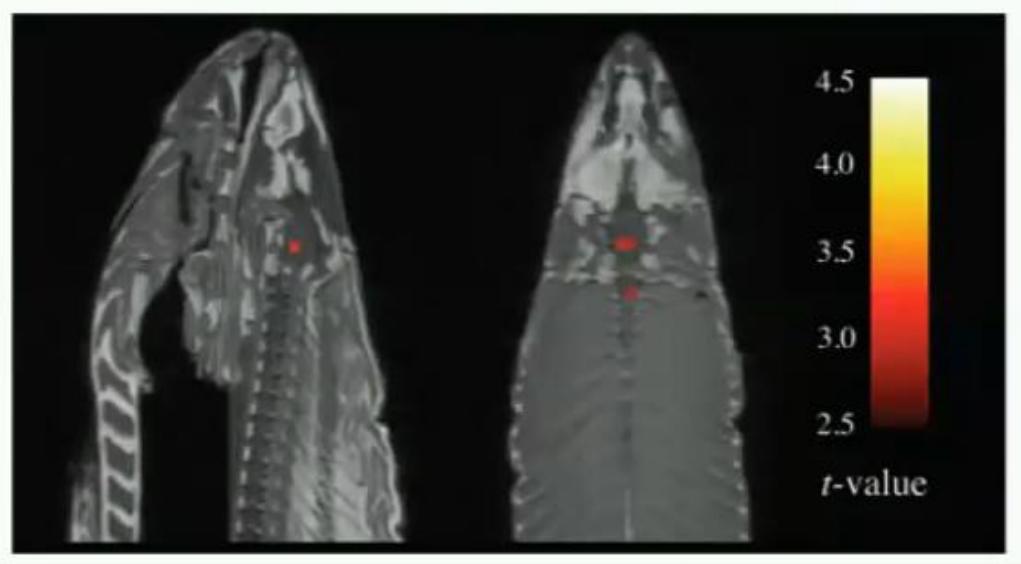
## Neural Correlates of Interspecies Perspective Taking in the Post-Mortem Atlantic Salmon: An Argument For Proper Multiple Comparisons Correction

Craig M. Bennett<sup>1\*</sup>, Abigail A. Baird<sup>2</sup>, Michael B. Miller<sup>1</sup> and George L. Wolford<sup>3</sup>

<sup>1</sup>Department of Psychology, University of California at Santa Barbara, Santa Barbara, CA 93106

<sup>2</sup>Department of Psychology, Blodgett Hall, Vassar College, Poughkeepsie, NY 12604

<sup>3</sup>Department of Psychological and Brain Sciences, Moore Hall, Dartmouth College, Hanover, NH 03755



One mature Atlantic Salmon (*Salmo salar*) participated in the fMRI study. The salmon measured approximately 18 inches long, weighed 3.8 lbs, and was not alive at the time of scanning. It is not known if the salmon was male or female, but given the post-mortem state of the subject this was not thought to be a critical variable.

The task administered to the salmon involved completing an open-ended mentalizing task. The salmon was shown a series of photographs depicting human individuals in social situations with a specified emotional valence, either socially inclusive or socially exclusive. The salmon was asked to determine which emotion the individual in the photo must have been experiencing.

Several active voxels were observed in a cluster located within the salmon's brain cavity (see Fig. 1). The size of this cluster was  $81 \text{ mm}^3$  with a cluster-level significance of  $p = 0.001$ .

Either we have stumbled onto a rather amazing discovery in terms of post-mortem ichthyological cognition, or there is something a bit off with regard to our uncorrected statistical approach.

# Publication bias is a thing



Rink Hoekstra  
@RinkHoekstra

Follow ▾

Elsevier editor Spada acknowledging that null results are not even considered for Addictive Behaviors, seemingly not realizing how problematic that is. Offering a lower prestige alternative journal doesn't make that right.



Professor M. M. Spada said:

*"Articles that may not traditionally be considered by Addictive Behaviors, including negative/null data papers, studies using smaller samples and cross-sectional designs, replication studies, cross-cultural research, and case reports will be welcome by its sister journal Addictive Behaviors Reports."*

Editor-in-Chief  
Professor M. M. Spada  
London South Bank University

Journal Metrics

> CiteScore: 3.10 ⓘ

Impact Factor: 2.686 ⓘ

...and this is where we put the non-significant results.

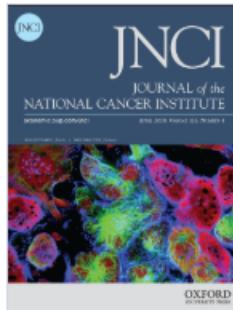


someecards  
user card

Journal Metrics

> CiteScore: 2.11 ⓘ

# #addedvalue



Volume 111, Issue 4

April 2019

## Height and Body Mass Index as Modifiers of Breast Cancer Risk in *BRCA1/2* Mutation Carriers: A Mendelian Randomization Study

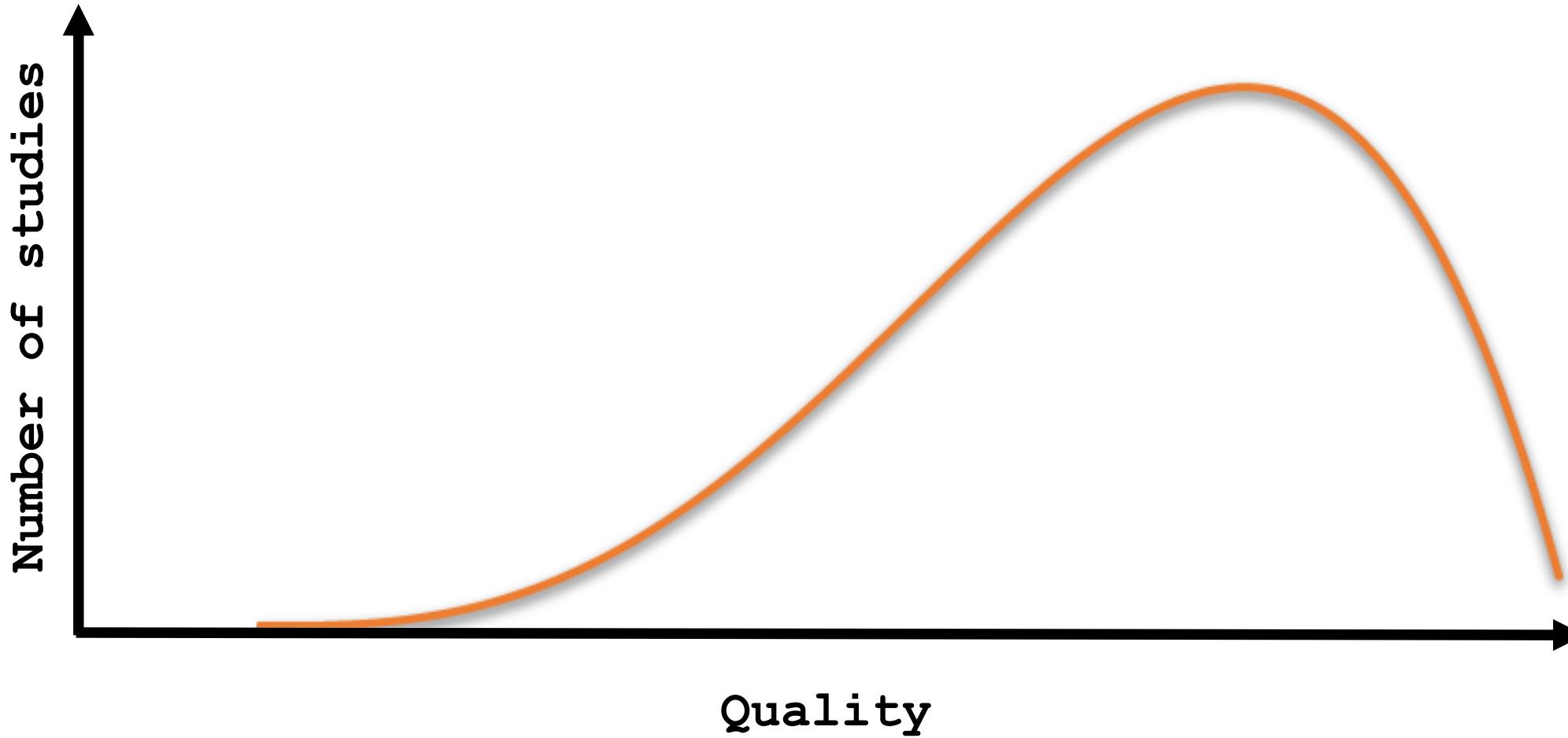
Frank Qian, Shengfeng Wang, Jonathan Mitchell, Lesley McGuffog, Daniel Barrowdale, Goska Leslie, Jan C Oosterwijk, Wendy K Chung, D Gareth Evans, Christoph Engel ... Show more

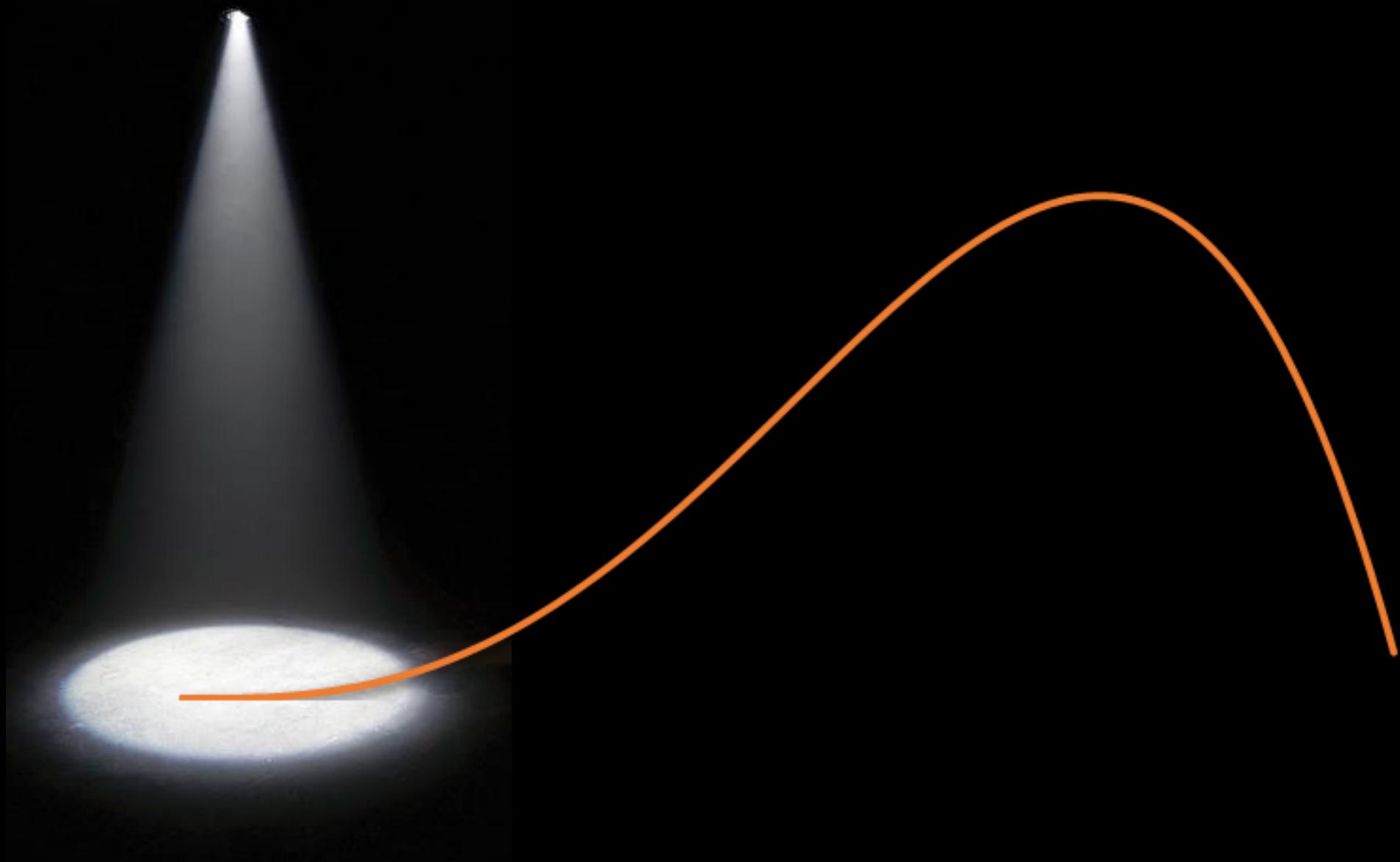
*JNCI: Journal of the National Cancer Institute*, Volume 111, Issue 4, April 2019, Pages 350–364, <https://doi.org/10.1093/jnci/djy132>

### Results

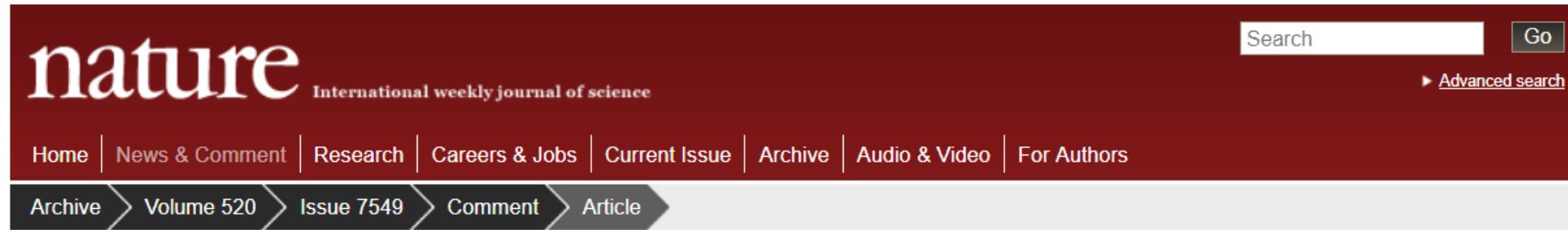
Observed height was positively associated with breast cancer risk (HR = 1.09 per 10 cm increase, 95% confidence interval [CI] = 1.0 to 1.17;  $P = .17$ ). Height genetic score was positively associated with breast cancer, although this was not statistically significant (per 10 cm increase in genetically predicted height, HR = 1.04, 95% CI = 0.93 to 1.17;  $P = .47$ ). Observed BMI was inversely associated with breast cancer risk (per 5 kg/m<sup>2</sup> increase, HR = 0.94, 95% CI = 0.90 to 0.98;  $P = .007$ ). BMI genetic score was also inversely associated with breast cancer risk (per 5 kg/m<sup>2</sup> increase in genetically predicted BMI, HR = 0.87, 95% CI = 0.76 to 0.98;  $P = .02$ ). BMI was primarily associated with premenopausal breast cancer.

# Academic clickbait





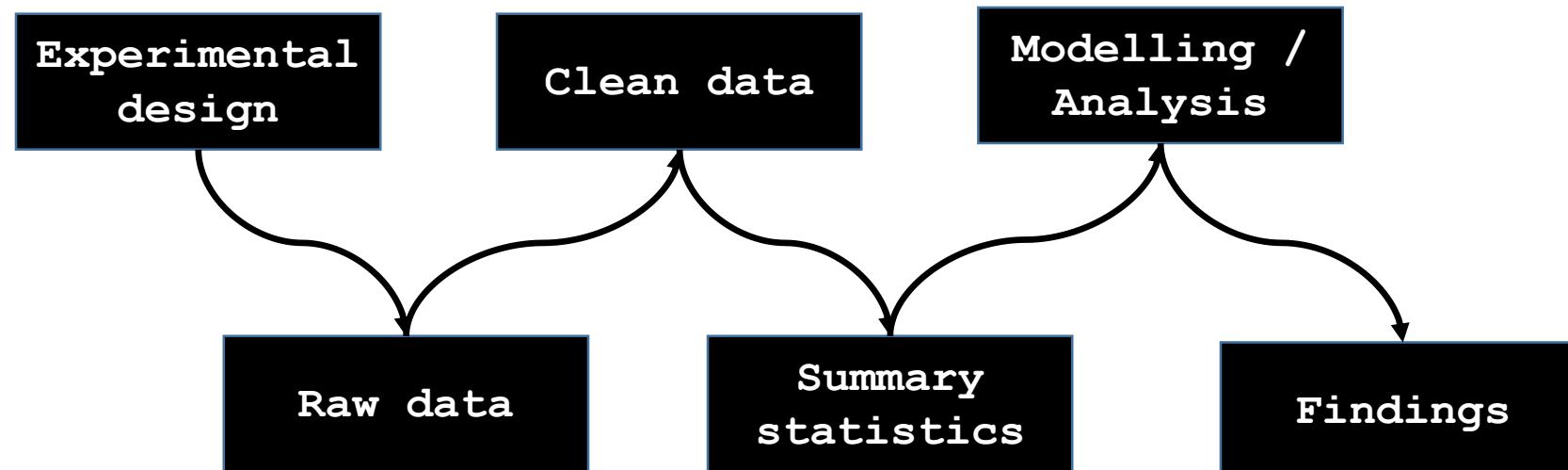
# p-values should not define a study

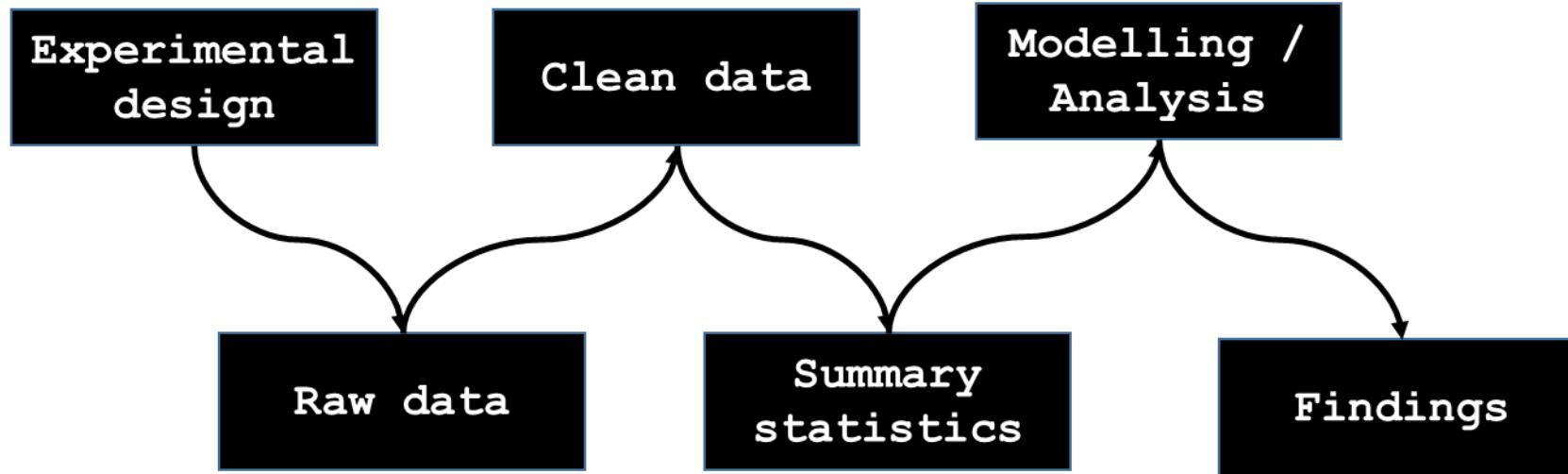


## Statistics: *P* values are just the tip of the iceberg

Jeffrey T. Leek & Roger D. Peng

28 April 2015





Little debate

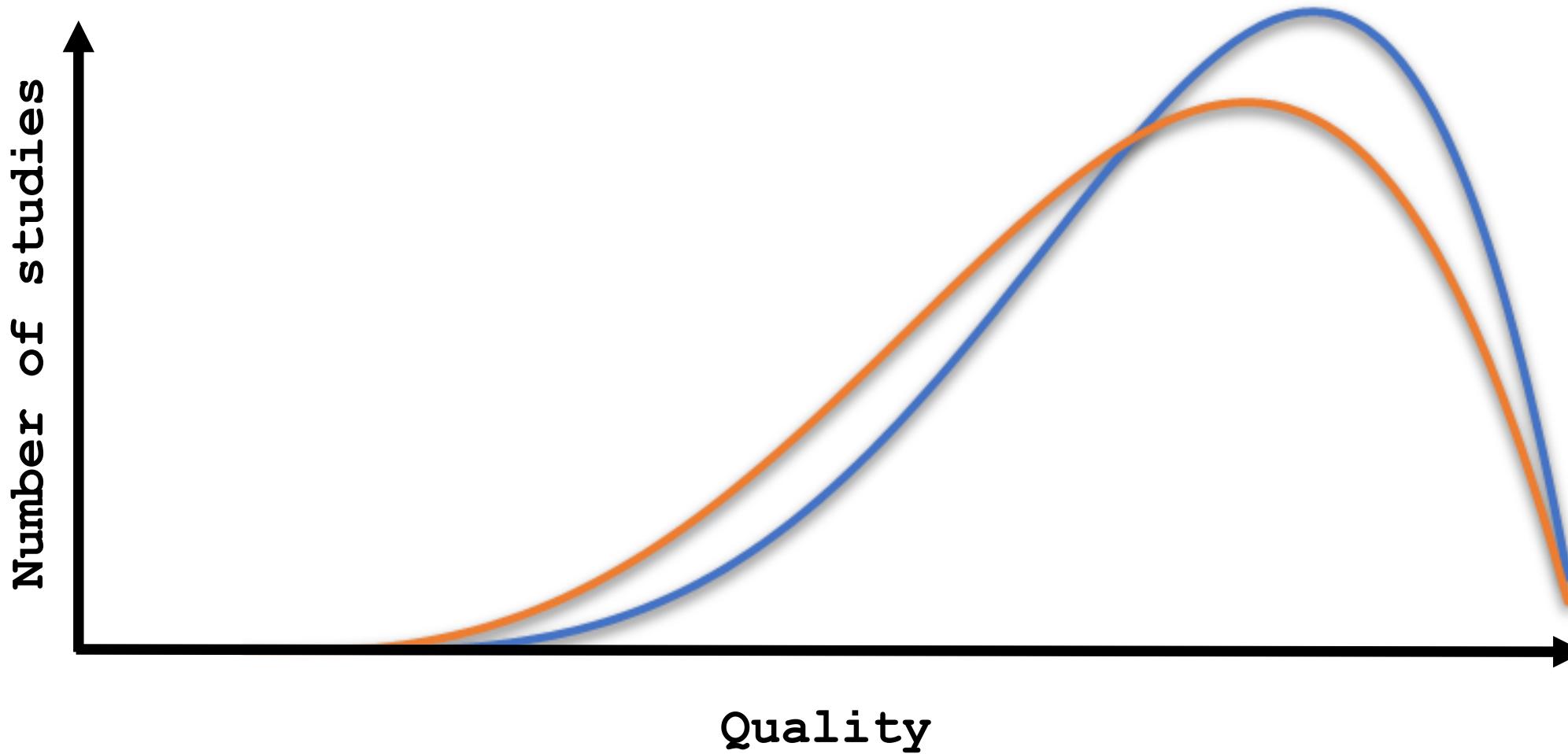
p-value

Extreme  
scrutiny



p-value

# Can we shift the distribution?



# The butterfly has started flapping its wings



Why Plan S [10 Principles](#) Funders & support Implementation About Contact

"After 1 January 2020 scientific publications on the results from research funded by public grants provided by national and European research councils and funding bodies, must be published in compliant Open Access Journals or on compliant Open Access Platforms."



EUROPEAN COMMISSION  
Directorate-General for Research & Innovation

## H2020 Programme

Guidelines on  
FAIR Data Management in Horizon 2020

Home > Funding > Policies and principles > **Open Research**

**Open Research**

The HRB is committed to ensuring that its funded research is open, accessible and usable, so it can have the greatest possible impact.

There is a fundamental shift across Europe towards making research more transparent, collaborative, accessible and efficient. The Open Science movement is a strategic priority for the European Commission in research and innovation policy and an EU high-level Expert Group, the [Open Science Policy Platform](#) (OSPP 2016–2018) has been established to consider key implementation areas.

Funding schemes  
EU funding support  
Manage a grant  
Funding awarded  
Evaluation  
GDPR guidance for researchers  
Policies and principles  
EU legislation  
Gender  
Good research practice  
Open Research



Funding Engagement Events Research News SFI Research Centres

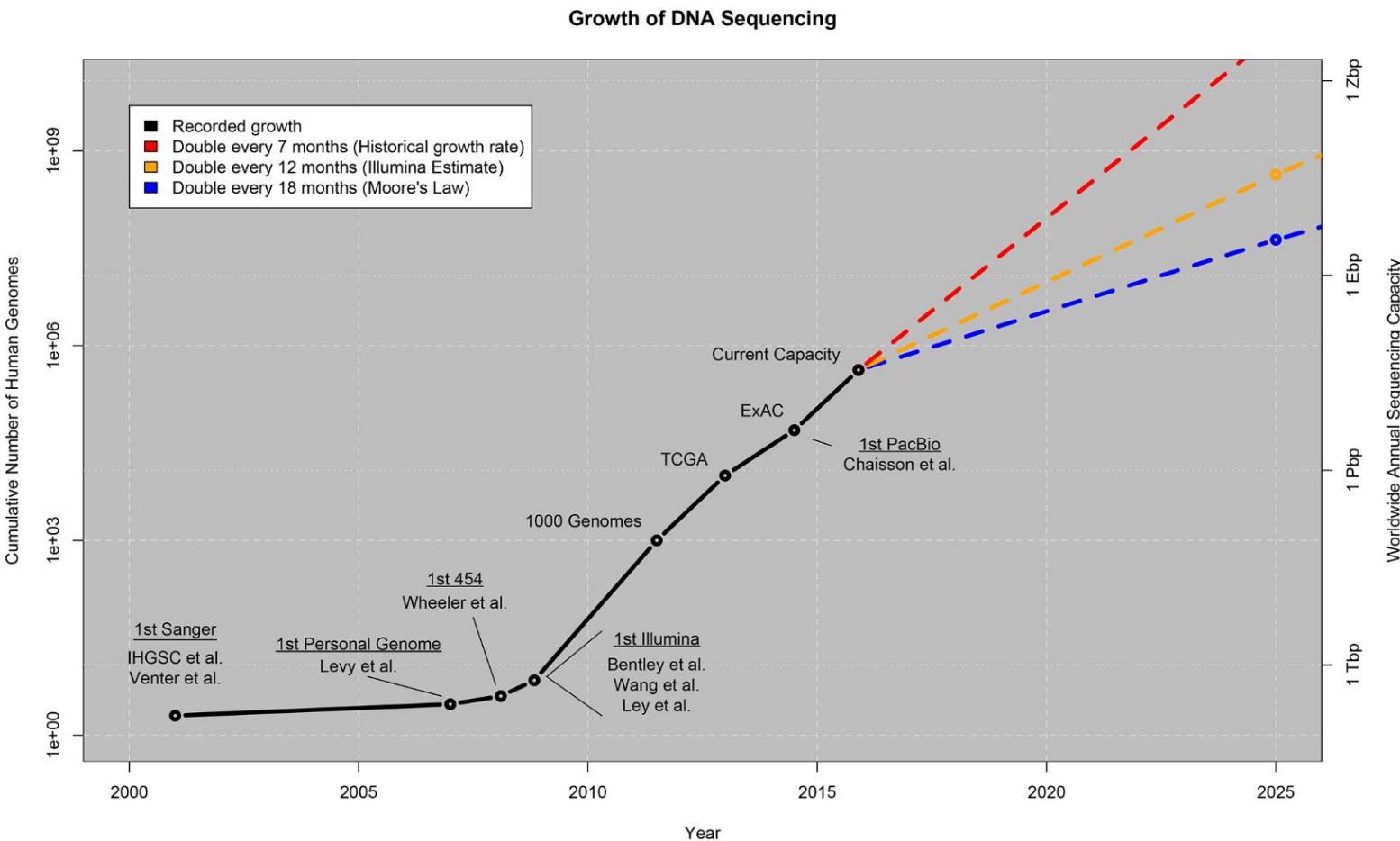
→ Science Foundation Ireland joins DORA

14th February 2019, Dublin – Science Foundation Ireland has become a signatory to the San Francisco Declaration of Research Assessment (DORA), making a formal commitment to assessing the quality and impact of research through means other than journal impact factors.

# Where to begin...



# The challenge



Follow

Congratulations to Dr Katie Bouman!  
This is the woman who created the algorithm  
to crunch the 5 petabytes of data from 500  
kg of hard drives from 8 radio telescopes to  
make the first image of the #EHTBlackHole  
#BlackHole



2:55 PM - 10 Apr 2019

# Fundamental problem



I'm not in the office at the moment. Send any work to be translated

# Beware of default settings

Ziemann et al. *Genome Biology* (2016) 17:177  
DOI 10.1186/s13059-016-1044-7

Genome Biology

COMMENT

Open Access



## Gene name errors are widespread in the scientific literature

Mark Ziemann<sup>1</sup>, Yotam Eren<sup>1,2</sup> and Assam El-Osta<sup>1,3\*</sup>

### Abstract

The spreadsheet software Microsoft Excel, when used with default settings, is known to convert gene names to dates and floating-point numbers. A programmatic scan of leading genomics journals reveals that approximately one-fifth of papers with supplementary Excel gene lists contain erroneous gene name conversions.

frequently reused. Our aim here is to raise awareness of the problem.

We downloaded and screened supplementary files from 18 journals published between 2005 and 2015 using a suite of shell scripts. Excel files (.xls and.xlsx suffixes) were converted to tabular separated files (tsv) with ssconvert (v1.12.9). Each sheet within the Excel file was converted to a separate tsv file. Each column of data in the tsv file was screened for the presence of gene sym-

Live Home Page Apple Apple Support Apple Store iTools Mac OS X Microsoft MacTopics

NCBI LocusLink

PubMed Entrez BLAST OMIM Taxonomy Structure

Search LocusLink Display Brief Organism: All

Query: Go Clear

View Hs NEDD5 One of 1 Loci Save All Loci

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Click to Display mRNA-Genomic Alignments (spanning 38716 bps)

PUB OMIM A VIEW UNIGENE MAP VAR HOMOL GDB

e! UCSC

Homo sapiens Official Gene Symbol and Name (HGNC)

NEDD5: neural precursor cell expressed, developmentally down-regulated 5

LocusID: 4735

Overview Submit GeneRIF ?

Locus Type: gene with protein product, function known or inferred

Product: neural precursor cell expressed, developmentally down-regulated 5

Alternate Symbols: DIFF6, SEPT2, hNed5, KIAA0158

Relationships ?

Map

RefSeq

GenBank

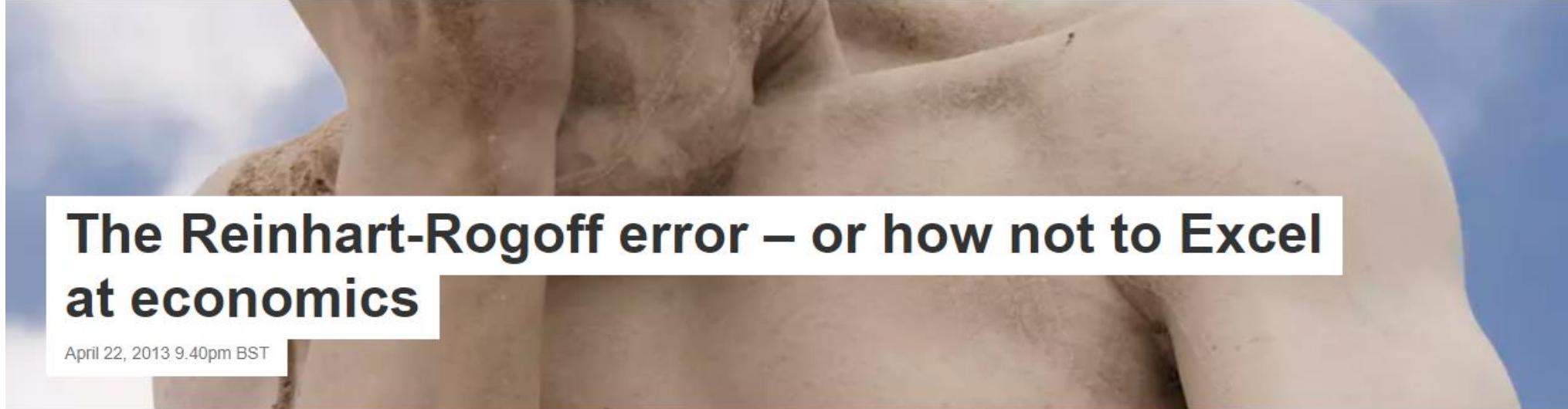
Links

Mouse Homology Maps:

NCBI vs. MGD	1 cM	2-Sep	Hs Mm
UCSC vs. MGD	1 cM	Sept2	Hs Mm
UCSC vs. Hudson et al.	1 1319.34 cR	AW208991	Hs Mm

Map Information ?

# Beware of default settings



## The Reinhart-Rogoff error – or how not to Excel at economics

April 22, 2013 9.40pm BST

Data and computer code should be made publicly available at an early stage – or else ... [esarastudillo](#)

[Email](#)

[Twitter](#)

88

[Facebook](#)

453

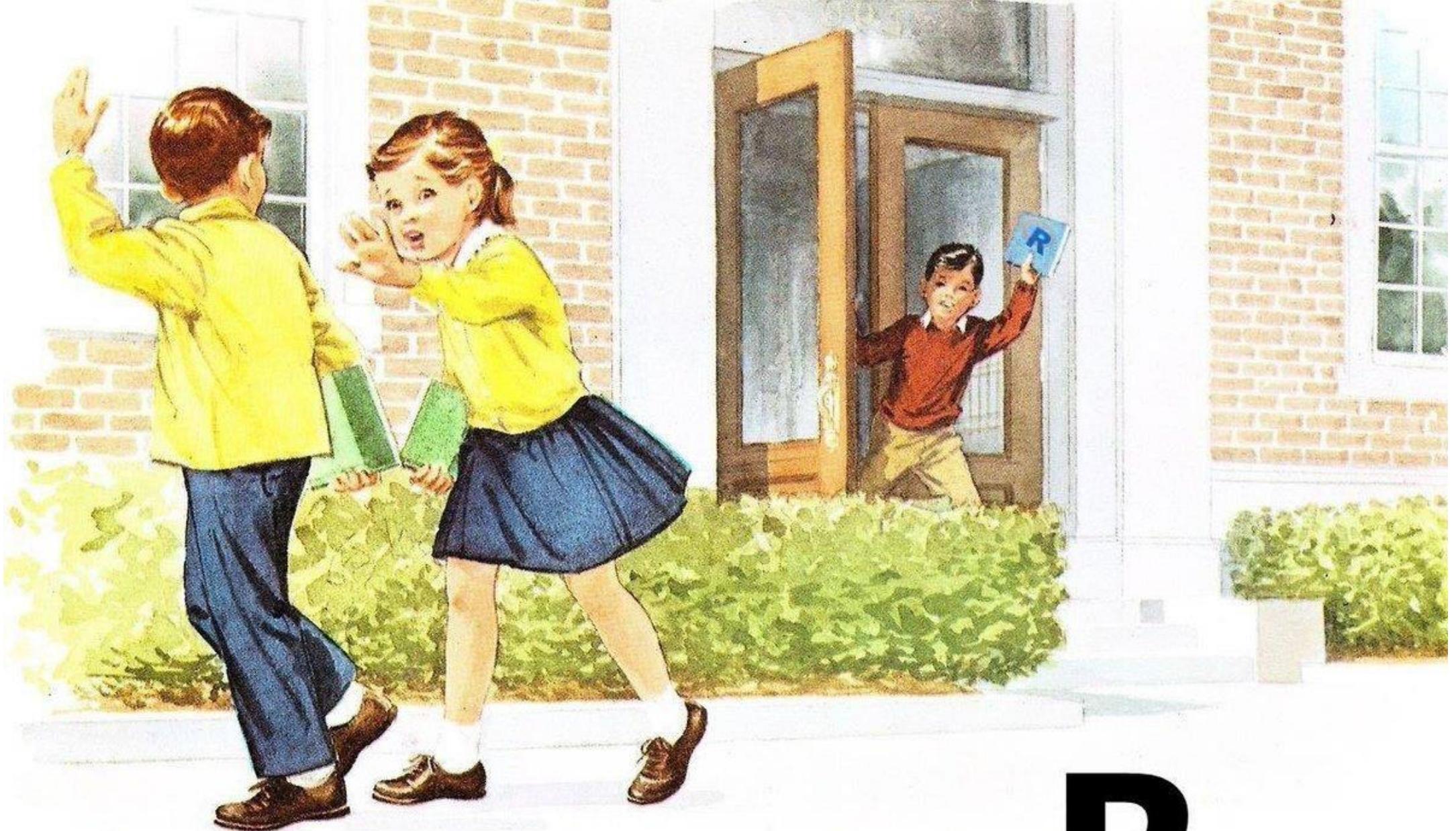
[LinkedIn](#)

[Print](#)

Last week we learned a famous [2010 academic paper](#), relied on by political big-hitters to bolster arguments for austerity cuts, contained significant errors; and that those errors came down to misuse of an Excel spreadsheet.

Sadly, these are not the first mistakes of this size and nature when handling data. So what on Earth went wrong, and can we fix it?

Harvard's [Carmen Reinhart](#) and [Kenneth Rogoff](#) are two of the most respected and influential academic economists active today.



Run, or he's going to tell us about  
again!

R

# ...help comes in many forms

## Vignettes

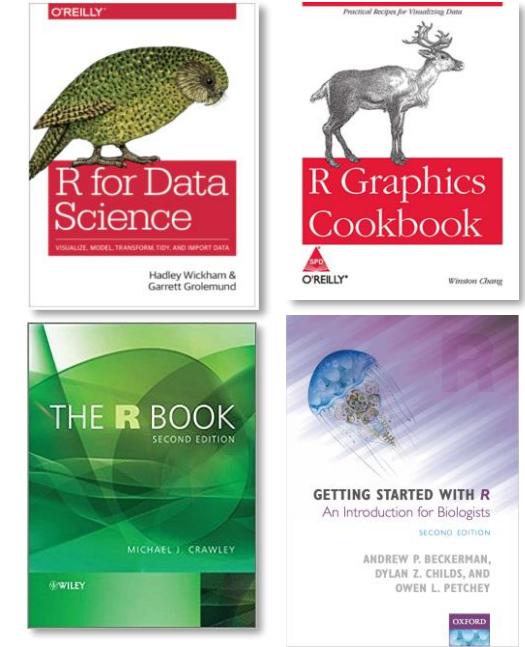


## Webpages

# Google

The collage shows a Google search interface with a microphone icon. Below it are three specific search results: 1) A link to the 'ggplot2 Reference' version 2.2.1.9000 page, which lists various plotting functions like ggplot, geom\_bar, and stat\_smooth. 2) A link to the 'R Language' documentation on Stack Overflow, which provides an introduction to R's syntax and basic operations.

## eBooks



## Twitter

A grid of Twitter profiles for data scientists. Each profile includes a circular photo, the user's name, their Twitter handle (@username), and a brief bio or description. The users include Darren L Dahly, Jenny Bryan, David Robinson, Hadley Wickham, and others. The background of the grid features abstract purple and green patterns.

**GettingStartedWithR**  
An Introduction for Biologists  
SECOND EDITION

**R Tips**  
@R\_Programming

Great #rstats Tips. Offering #datascience course at [goo.gl/is9yV](http://goo.gl/is9yV) and Tuts on #datamining @analytics rstatistics.net. Tweets by @selva86

[r-statistics.co](http://r-statistics.co)

**Hadley Wickham**  
@hadleywickham

R, data, visualisation.  
Houston, TX  
[hadley.nz](http://hadley.nz)

**Jenny Bryan**  
@JennyBryan

@rstudio, humane #rstats, statistics, @ropensci, teach @STAT545, on leave from @UBC, math.ubc.ca/~jbryan/JennyC...

**David Robinson**  
@drob

Data Scientist at @StackOverflow, #rstats fan/evangelist  
New York, NY  
[variancovariance.org](http://variancovariance.org)

**Data Scientists IRL**  
@DataSci\_Ireland Follows you

Promoting the Data Science professions in Ireland.  
Ireland  
[facebook.com/DataScientists...](https://facebook.com/DataScientists...)

**Darren L Dahly**  
@staspepi Follows you

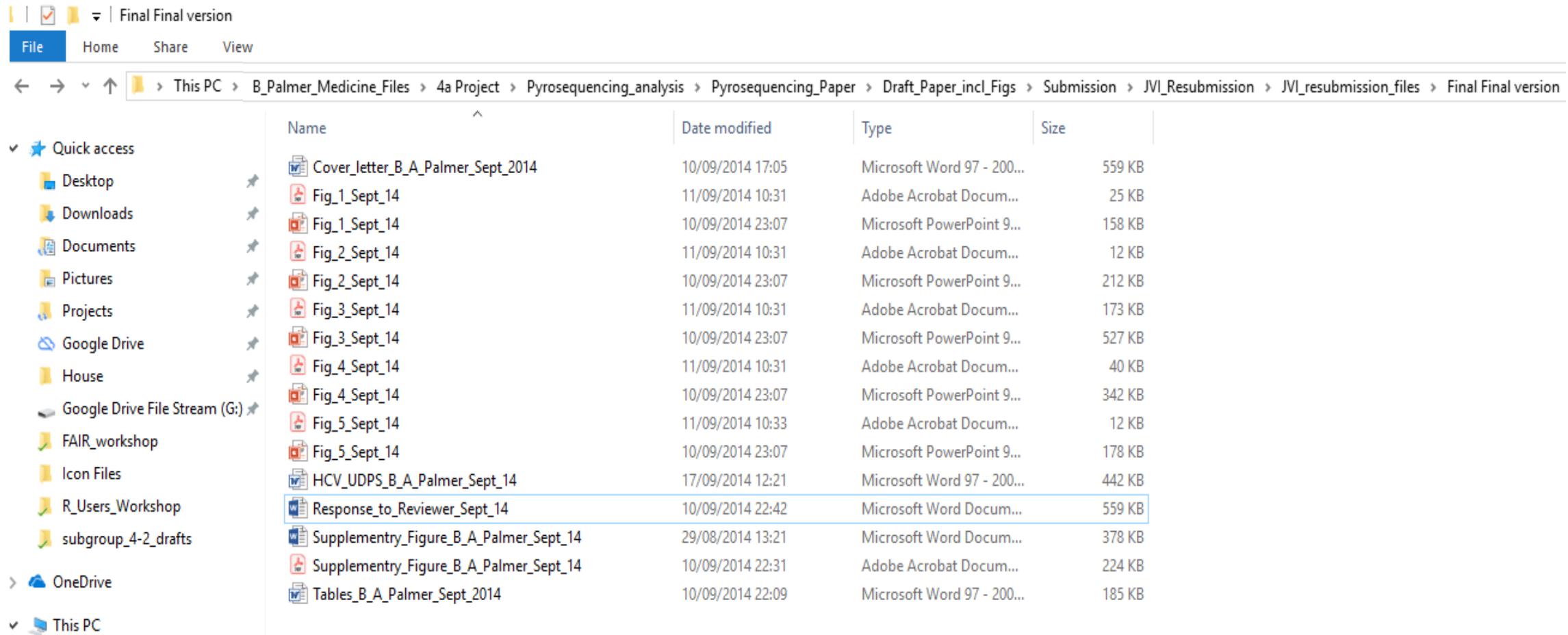
Principal Statistician, Epidemiologist, Sr Lecturer | @HRBIreland Clinical Research Facility @CRF\_CORK | Cork #Rstats Users Group meetup.com/Cork-Ireland-R...  
Cork, Ireland  
[darrendahly.github.io](http://darrendahly.github.io)

**Data Science Renee**  
@BecomingDataSci

Creator/Host of Becoming a Data Scientist Podcast // @DataSciGuide @DataSciLearning @NewDataSciJobs // Personal acct: @paix102 // Data Scientist at HelioCampus

# Still haven't found what I'm looking for

- Help your future-self



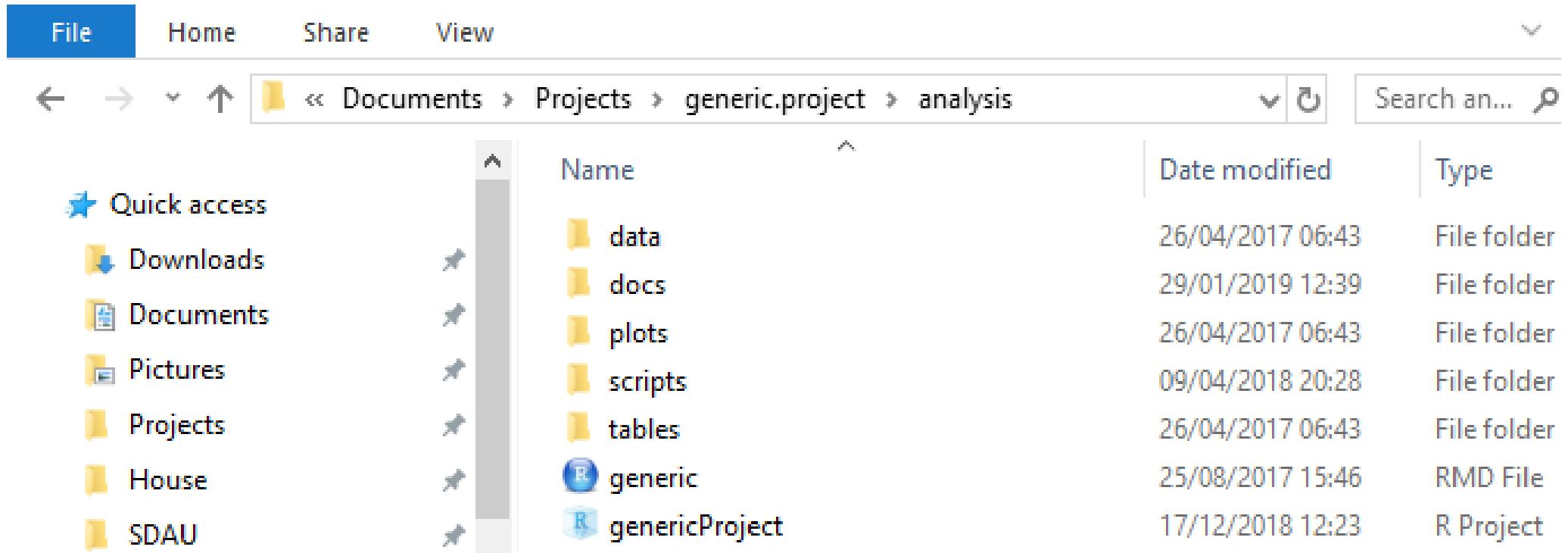
The screenshot shows a Windows File Explorer window with the following details:

- Path:** This PC > B\_Palmer\_Medicine\_Files > 4a Project > Pyrosequencing\_analysis > Pyrosequencing\_Paper > Draft\_Paper\_incl\_Figs > Submission > JVI\_Resubmission > JVI\_resubmission\_files > Final Final version
- File Type:** Microsoft Word 97 - 2003 Document
- File List:** The table below lists the files found in the folder.

Name	Date modified	Type	Size
Cover_letter_B_A_Palmer_Sept_2014	10/09/2014 17:05	Microsoft Word 97 - 200...	559 KB
Fig_1_Sept_14	11/09/2014 10:31	Adobe Acrobat Docum...	25 KB
Fig_1_Sept_14	10/09/2014 23:07	Microsoft PowerPoint 9...	158 KB
Fig_2_Sept_14	11/09/2014 10:31	Adobe Acrobat Docum...	12 KB
Fig_2_Sept_14	10/09/2014 23:07	Microsoft PowerPoint 9...	212 KB
Fig_3_Sept_14	11/09/2014 10:31	Adobe Acrobat Docum...	173 KB
Fig_3_Sept_14	10/09/2014 23:07	Microsoft PowerPoint 9...	527 KB
Fig_4_Sept_14	11/09/2014 10:31	Adobe Acrobat Docum...	40 KB
Fig_4_Sept_14	10/09/2014 23:07	Microsoft PowerPoint 9...	342 KB
Fig_5_Sept_14	11/09/2014 10:33	Adobe Acrobat Docum...	12 KB
Fig_5_Sept_14	10/09/2014 23:07	Microsoft PowerPoint 9...	178 KB
HCV_UDPS_B_A_Palmer_Sept_14	17/09/2014 12:21	Microsoft Word 97 - 200...	442 KB
Response_to_Reviewer_Sept_14	10/09/2014 22:42	Microsoft Word Docum...	559 KB
Supplementary_Figure_B_A_Palmer_Sept_14	29/08/2014 13:21	Microsoft Word Docum...	378 KB
Supplementary_Figure_B_A_Palmer_Sept_14	10/09/2014 22:31	Adobe Acrobat Docum...	224 KB
Tables_B_A_Palmer_Sept_2014	10/09/2014 22:09	Microsoft Word 97 - 200...	185 KB

# Define a generic project structure

- STEP 1: Give your research projects a shared structure



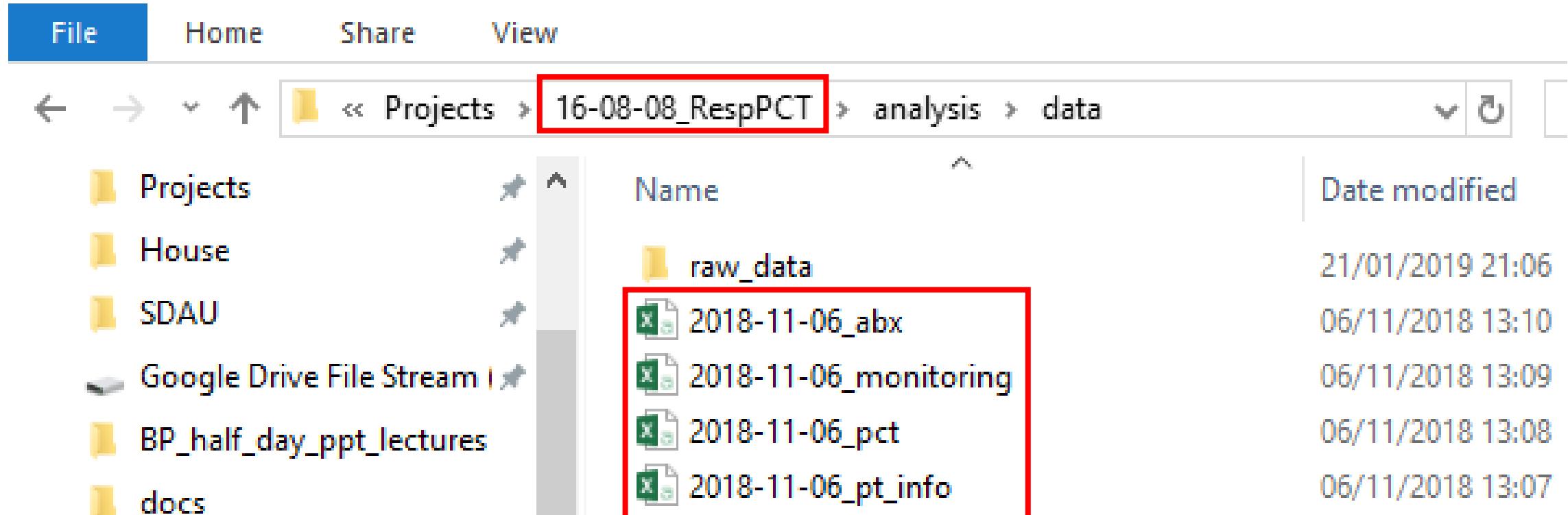
The screenshot shows a Windows File Explorer window with the following details:

- File Bar:** File, Home, Share, View.
- Address Bar:** Shows the path: « Documents > Projects > generic.project > analysis.
- Search Bar:** Search anything... with a magnifying glass icon.
- Left Sidebar:** Quick access, Downloads, Documents, Pictures, Projects, House, SDAU.
- Table View:** Displays the contents of the 'analysis' folder.

Name	Date modified	Type
data	26/04/2017 06:43	File folder
docs	29/01/2019 12:39	File folder
plots	26/04/2017 06:43	File folder
scripts	09/04/2018 20:28	File folder
tables	26/04/2017 06:43	File folder
generic	25/08/2017 15:46	RMD File
genericProject	17/12/2018 12:23	R Project

# Give your files informative names

- STEP 1: Give your research projects a shared structure



# Everything in its right place

- STEP 2: Make your file names machine readable, human readable and work with default ordering

**NO**

Name

- All unique 4a amino acid Sequences (B-N).fas
- All unique 4a amino acid Sequences (B-N).meg
- All\_AA\_haplotypes.meg
- All\_AA\_haplotypes\_with\_clonal\_sequences.meg
- BS100\_AA\_with\_clones
- BS100\_AA\_with\_clones.nwk
- BS1000\_AA\_pyro&clones
- BS1000\_AA\_pyro&clones.nwk
- BS1000\_AA\_pyro\_only
- BS1000\_AA\_pyro\_only.nwk
- BS1000\_Uncle\_Clonal\_AA
- BS1000\_Uncle\_Clonal\_AA.nwk
- BS1000\_Uncle\_Pyro\_AA
- BS1000\_Uncle\_Pyro\_AA.nwk
-  pic

Yes

Projects	
Projects	▲
House	▲
SDAU	▲
Google Drive File Stream	▲
BP_half_day_ppt_lectures	
docs	
My Drive	
Screenshots	
Name	
	01_clean_data
	02_plots
	03_tables
	04_stats_analysis
	05_post_hoc_stats
	functions
	randomization
	tables

# Organise your projects and script your analyses



**Casey Greene**  
@GreeneScientist

Follow



Reproducibility is important because the you  
of 3 months ago is terrible at answering  
email! - [@tracykteal](#) at [#2016dssummit](#)

1:17 PM - 26 Oct 2016 from [Manhattan, NY](#)

# R: A Hitchhikers guide to reproducible research

The screenshot shows the RStudio Cloud interface. The top navigation bar includes links for Home, Help, and Sign In, along with a search bar and user profile for Brendan Palmer. The main workspace is titled "Your Workspace / reproducible-workflows". The left sidebar contains sections for Spaces (with "Your Workspace" selected), New Space, Learn (Guide, What's New, Primers, Cheat Sheets, Feedback and Questions), and Info (Terms and Conditions, System Status). The central workspace area has tabs for Source, Console (active), Terminal, and Jobs. The Console tab shows the path "/cloud/project/reproducible-workflows/example\_project/". The right side of the screen features several panes: Environment (showing "Environment is empty"), History, Connections, Git, Global Environment (showing "Global Environment is empty"), and a Files pane listing project files. The Files pane shows the following contents:

Name	Type	Len...	Size	Value
..	..			
all_together_now.docx	File		24.3 KB	May 1
all_together_now.Rmd	File		1.2 KB	May 1
example_project.Rproj	File		205 B	May 2
data	Folder			
docs	Folder			
figures	Folder			
scripts	Folder			

# Twitter as a force for good

## Can social media be useful for scientists?

Wed, Feb 28, 2018  academic



I have been blogging and using Twitter as a scientist since 2010. By that point it was pretty obvious that the internet was radically changing how scientists could engage with the public and each other, and thus [science blogging had become quite popular](#). Like a lot of people, I wanted to write about how studies from my areas of expertise were reported in the media, and my [first substantial blog post](#) was about a large epidemiological study of homebirths in the UK. Twitter was a natural companion to blogging, since you could use it to share what you were writing. Eight years later I still [blog](#) and [tweet](#). From time to time this comes up in conversation with colleagues, and they often ask if I really think it's worth my time.

# Install the Chrome plugin PubPeer

NCBI Resources ▾ How To ▾ Sign in to NCBI

PubMed ▾ Is the Power Threshold of 0.8 Applicable to Surgical Science? Search

PubMed.gov US National Library of Medicine National Institutes of Health Create RSS Create alert Advanced Help

Format: Abstract ▾ Send to ▾

See 1 citation found by title matching your search:

J Surg Res. 2019 Apr 26;241:235-239. doi: 10.1016/j.jss.2019.03.062. [Epub ahead of print]

23 comments on PubPeer (by: Andrew D. Althouse, Thom Baguley, Guillaume A. Rousselet, Timothy Feeney, Paul M Brown, Frank E. Harrell, David Nunan, Samantha R. Seals, Raj Mehta, Yevgeniy Feyman, Ionomidotis Irregularis, Andrew Gelman, Aleksi Reito, Daniel E. Leisman, Pavlos Msaouel, Ryan Miller, Maarten Van Smeden, Zad Rafi Chow)

**Is the Power Threshold of 0.8 Applicable to Surgical Science?-Empowering the Underpowered Study.**

Bababekov YJ<sup>1</sup>, Hung YC<sup>2</sup>, Hsu YT<sup>2</sup>, Udelsman BV<sup>2</sup>, Mueller JL<sup>2</sup>, Lin HY<sup>2</sup>, Stapleton SM<sup>2</sup>, Chang DC<sup>2</sup>.

Author information

Abstract

**BACKGROUND:** Many articles in the surgical literature were faulted for committing type 2 error, or concluding no difference when the study was "underpowered". However, it is unknown if the current power standard of 0.8 is reasonable in surgical science.

Full text links ELSEVIER FULL-TEXT ARTICLE

Save items

Similar articles

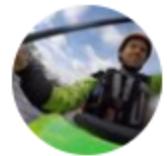
Review Interventions to Prevent Falls in Community-L Agency for Healthcare Research...]

Review Is There Truly "No Significant Difference"? Underl J Bone Joint Surg Am. 2015]

Review Randomized controlled trials and neurosurgery: the ideal fit or : [J Neurosurg. 2016]

Review Low-Dose Aspirin for the Prevention of Morbidity anc Agency for Healthcare Research...]

# Work from the raw data ALWAYS!!



**Tom Webb** @tomjwebb · 16 Jan 2015

If you could tell a new PhD student one thing to help make their data more useful/shareable, what would it be?

27

11

7



**Dr Gavin Simpson**

@ucfagls

Follow

Replying to [@tomjwebb](#)

[@tomjwebb](#) don't, not even with a barge pole, not for one second, touch or otherwise edit the raw data files. Do any manipulations in script

7:15 AM - 16 Jan 2015

And finally...

# QUESTIONS

# Take home message...

Open science is really scary y'all.



Darren L Dahly

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I did something stupid last week. I publicly posted my data and code.

I've been living in a nightmare ever since, terrified by every email and notification, fearful it's someone pointing out how I screwed up.



# Credit where credit's due



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