

Breaking Bad

Wrong statistics and perverse incentives have ruined Science

Tomas Fürst



Something's wrong

- **Amgen** tried to replicate 53 landmark studies in cancer treatment. In 6 cases they obtained confirming results.

[Begley: Drug development: Raise standards for preclinical cancer research, Nature 2012](#)

- **Bayer Health Care** tried to replicate 67 landmark studies. About 80 % failed.

[Prinz: Believe it or not: how much can we rely on published data on potential drug targets?, Nature Drug Discovery, 2011](#)

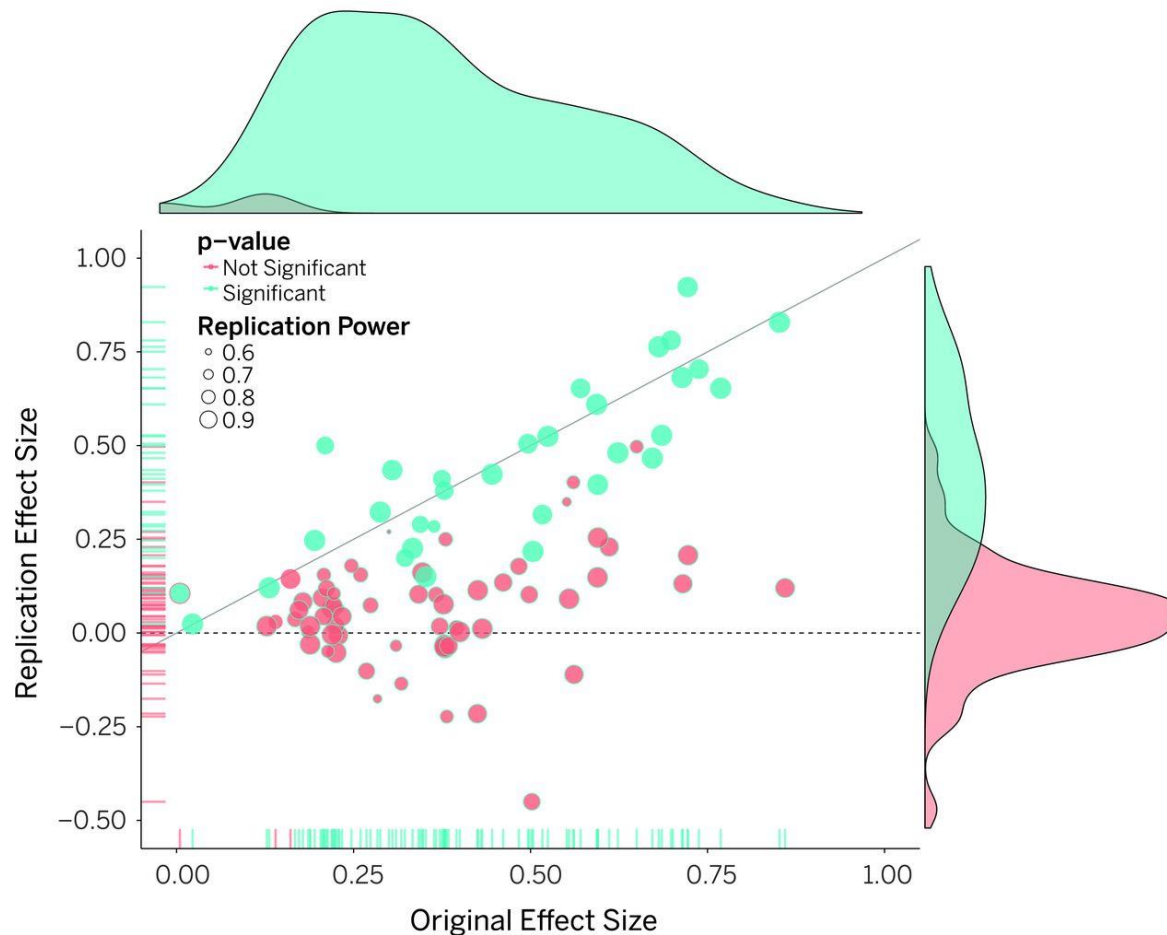
- **More than 100 potential drugs for ALS** tested in an established mouse model. Many of these drugs had been reported to slow down disease in that same mouse model. None was found to be beneficial in our experiments.

[Perrin: Preclinical research: Make mouse studies work, Nature, 2014](#)

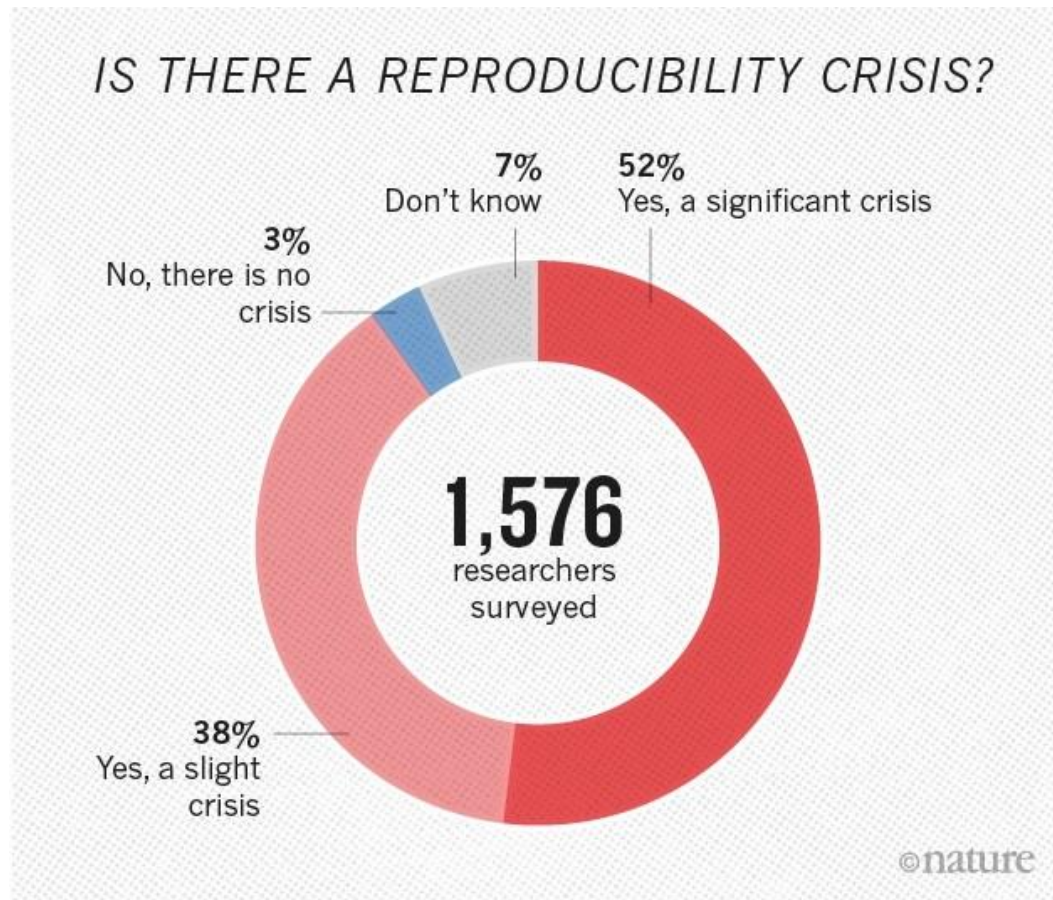
Something's wrong

Open Science Collaboration

Estimating the reproducibility of psychological science. [Science, 2015](#)



Opinion poll among Nature contributors



Monya Baker: 1,500 scientists lift the lid on reproducibility, [Nature, 2016](#)

**The
Economist**

OCTOBER 19TH-25TH 2013

economist.com

Washington's lawyer surplus

How to do a nuclear deal with Iran

Investment tips from Nobel economists

Junk bonds are back

The meaning of Sachin Tendulkar

HOW
SCIENCE
GOES
WRONG

The Coronavirus Science debacle

- **Wrong inference from observational data:**
Brauner: Inferring the effectiveness of government interventions against COVID-19, [Science, 2020](#)
- Fürst: [Lysenkova cena pro CDC](#) (SMIS)
- Fürst: [Tohle není epidemie neočkovaných, tohle je epidemie fake science](#) (SMIS)
- **Downright fraud:** Covid-19: Researcher blows the whistle on data integrity issues in Pfizer's vaccine trial, [BMJ, 2021](#)
- **Retracted:** Hydroxychloroquine or chloroquine with or without a macrolide for treatment of COVID-19, [Lancet, 2020](#)

Perverse Incentives

- Career depending on number of articles published
- Public finance (grants, scholarships, institutional money, ...) available according to the number of articles published
- Peer review failure
- The pressure to publish original results rather than repeat experiments
- Preference for positive findings over negative ones
- Regulatory capture for profit
- Politically correct Science
- Censorship



National Institutes of Health (.gov)

<https://www.ncbi.nlm.nih.gov> > P...



Why Most Published Research Findings Are False - PMC

autor: JPA Ioannidis · 2005 · Počet citací tohoto článku: 12689 — Scientists in a given field may be **prejudiced purely because of their belief in a scientific theory or commitment to their...**

[Summary](#) · [Modeling the Framework for...](#) · [Bias](#) · [Most Research Findings Are...](#)

Wrong Statistics

- The curse of hypotheses testing and p-values:
 $\text{prob}(\text{data} \mid \text{hypothesis})$ versus $\text{prob}(\text{hypothesis} \mid \text{data})$
- Absence of causal inference methods:
association versus causality
- Statistical software!
- Mathematical modelling
- [ASA statement on p-values](#)

Principle 3: Scientific conclusions and business or policy decisions should not be based only on whether a P-value passes a specific threshold.

Principle 6: By itself, a P-value does not provide a good measure of evidence regarding a model or hypothesis.

Bayesovská inference

- Příklad: lékař posuzuje RTG snímek plic pacienta



„Klidně kuřte dál... teď už je to jedno.“

Death of Western Science

$$(HT \times PP)^{PCaC} = \text{Grim Reaper}$$

HT Hypotheses testing

PP Publish or perish culture

PCaC Political correctness & censorship