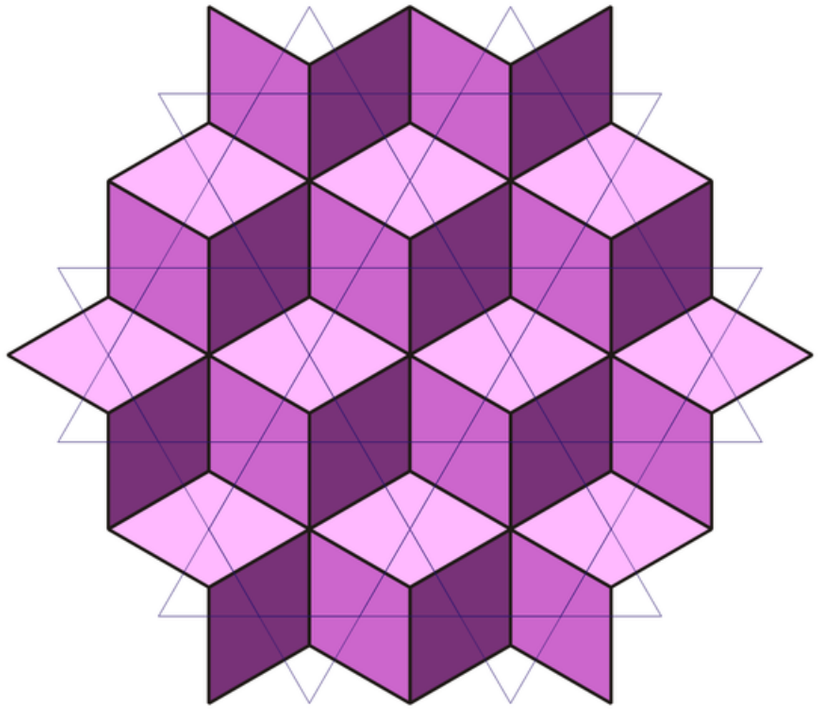
* Crédit image sur https://ouionatousledroitdebienmanger.fr/Blog-Bleu-Blanc-Coeur/458-Combien-y-a-t-il-de-facons-de-cuire-un-oeuf, 2019-02-25

inventeurs du monde numérique

C@fé-In

Une rencontre informelle
autour d'un sujet scientifique.



Notre science peut-elle être reproductible ?

Damien.Saucez@inria.fr

* Crédit image sur https://commons.wikimedia.org/wiki/File:P3_dual.png, 2019-02-25

Gauche ou droite?

- *“Under our model, it turns out to be optimal for the Democrats to move slightly to the right but staying clearly to the left of the Republicans’ current position on economic issues.”* [1]

- “[…]because of a data coding error on one of the variables, all our analysis of social issues is incorrect. […]” [2]

[1] Gelman A, Cai CJ. Should the Democrats move to the left on economic policy?. The Annals of Applied Statistics. 2008;2(2):536-49.
[2] Gelman A. Correction: Should the Democrats move to the left on economic policy?. The Annals of Applied Statistics. 2013;7(2):1248-.

Etrange mais fabuleux

- Geoffrey Chang découvre la structure cristalline d'une certain protéine membranaire.

- Belles publications

  3 Science, 1 Nature, 1 PNAS et 1 JMB.

- Toutes rétractées en 2006 à cause d'une erreur de signe dans un logiciel…

  certains de ces papiers sont encore cités en 2019.

Open access, freely available online

Essay

Why Most Published Research Findings Are False

John P. A. Ioannidis

Summary

There is increasing concern that most current published research findings are false. The probability that a research claim is true may depend on study power and bias, the number of other studies on the same question, and, importantly, the ratio of true to no relationships among the relationships probed in each scientific field. In this framework, a research finding is less likely to be true when the studies conducted in a field are smaller; when effect sizes are smaller; when there is a greater number and lesser preselection of tested relationships; where there is greater flexibility in designs, definitions, outcomes, and analytical modes; when there is greater financial and other interest and prejudice; and when more teams are involved in a scientific field in chase of statistical significance. Simulations show that for most study designs and settings, it is more likely for a research claim to be false than true. Moreover, for many current scientific fields, claimed research findings may often be simply accurate measures of the prevailing bias. In this essay, I discuss the implications of these problems for the conduct and interpretation of research.

Published research findings are

factors that influence this problem and some corollaries thereof.

Modeling the Framework for False Positive Findings

Several methodologists have pointed out [9–11] that the high rate of nonreplication (lack of confirmation) of research discoveries is a consequence of the convenient, yet ill-founded strategy of claiming conclusive research findings solely on the basis of a single study assessed by formal statistical significance, typically for a *p*-value less than 0.05. Research is not most appropriately represented and summarized by *p*-values, but, unfortunately, there is a widespread notion that medical research articles

It can be proven that most claimed research findings are false.

should be interpreted based only on *p*-values. Research findings are defined here as any relationship reaching formal statistical significance, e.g., effective interventions, informative predictors, risk factors, or associations. "Negative" is actually a misnomer, and the misinterpretation is widespread.

is characteristic of the field and can vary a lot depending on whether the field targets highly likely relationships or searches for only one or a few true relationships among thousands and millions of hypotheses that may be postulated. Let us also consider, for computational simplicity, circumscribed fields where either there is only one true relationship (among many that can be hypothesized) or the power is similar to find any of the several existing true relationships. The pre-study probability of a relationship being true is $R/(R + 1)$. The probability of a study finding a true relationship reflects the power $1 - \beta$ (one minus the Type II error rate). The probability of claiming a relationship when none truly exists reflects the Type I error rate, α. Assuming that c relationships are being probed in the field, the expected values of the 2×2 table are given in Table 1. After a research finding has been claimed based on achieving formal statistical significance, the post-study probability that it is true is the positive predictive value, PPV. The PPV is also the complementary probability of what Wacholder et al. have called the false positive report

$\times$ 2 table, one gets PPV = $(1 - \beta)R/(R - \beta R + \alpha)$. A research finding is thus

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Essay

Why Most Published Research Findings Are False

John P. A. Ioannidis

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John P. A. Ioannidis

FOLLOW

Professor of Medicine, Stanford University (previously at U Ioannina, Greece)
Verified email at stanford.edu - Homepage

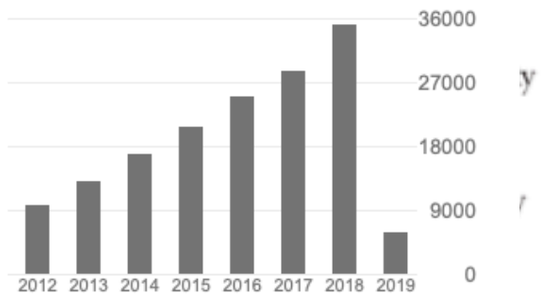
Evidence-based medicine research methods meta-analysis clinical epidemiology genetic epidemiology

GET MY OWN PROFILE

TITLE	CITED BY	YEAR
Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement D Moher, A Liberati, J Tetzlaff, DG Altman, Prisma Group PLoS medicine 6 (7), e1000097	41036	2009
Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement D Moher, A Liberati, J Tezlaff, DG Altman, G Antes, D Atkins, V Barbour, ... Annals of internal medicine 151 (4), 264-269	~~40414~~	2009
Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement D Moher, A Liberati, J Tetzlaff, DG Altman, Prisma Group PLoS medicine 6 (7), e1000097	~~40361~~	2009

Cited by VIEW ALL

	All	Since 2014
Citations	195387	132973
h-index	176	127
i10-index	823	684



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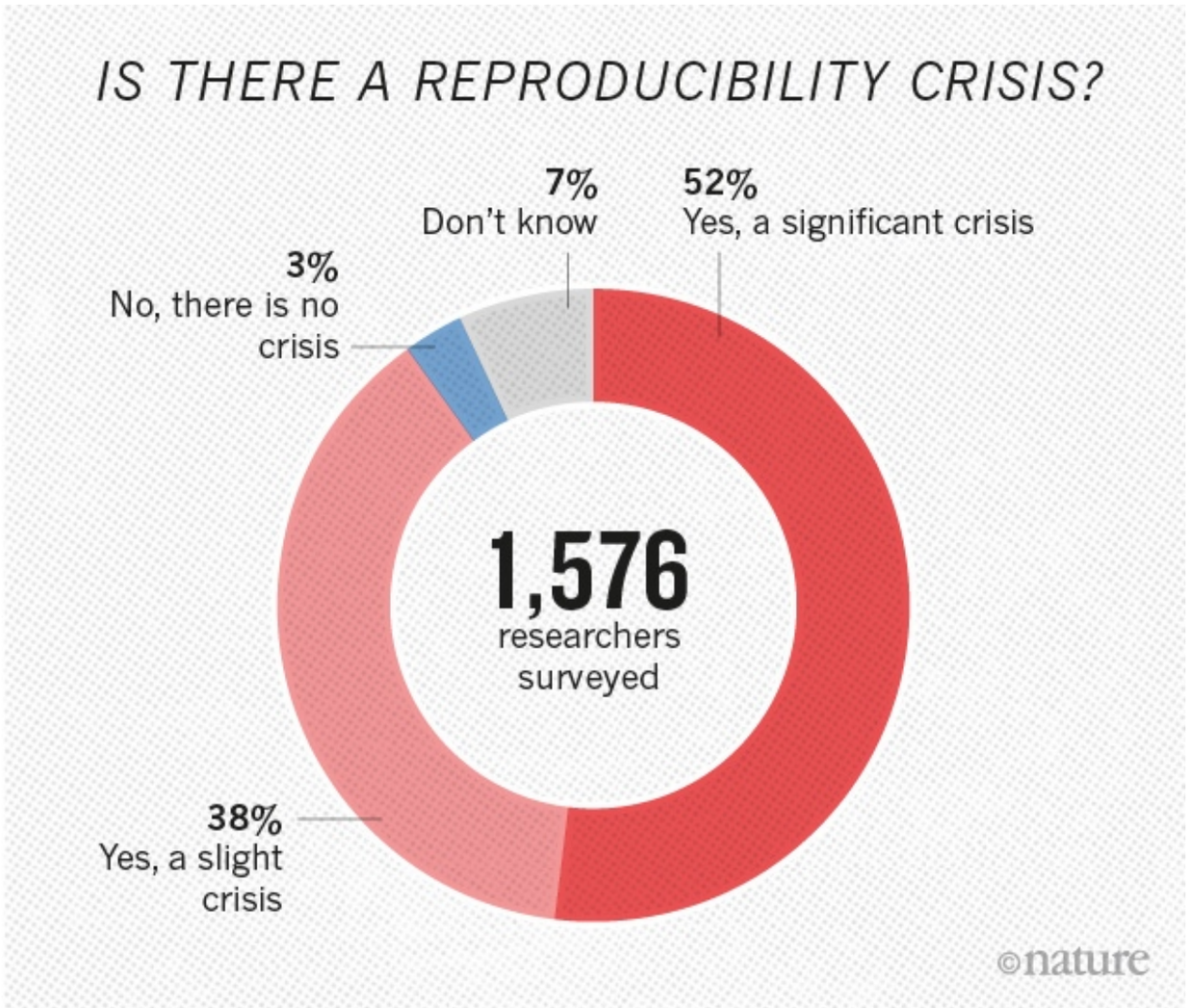
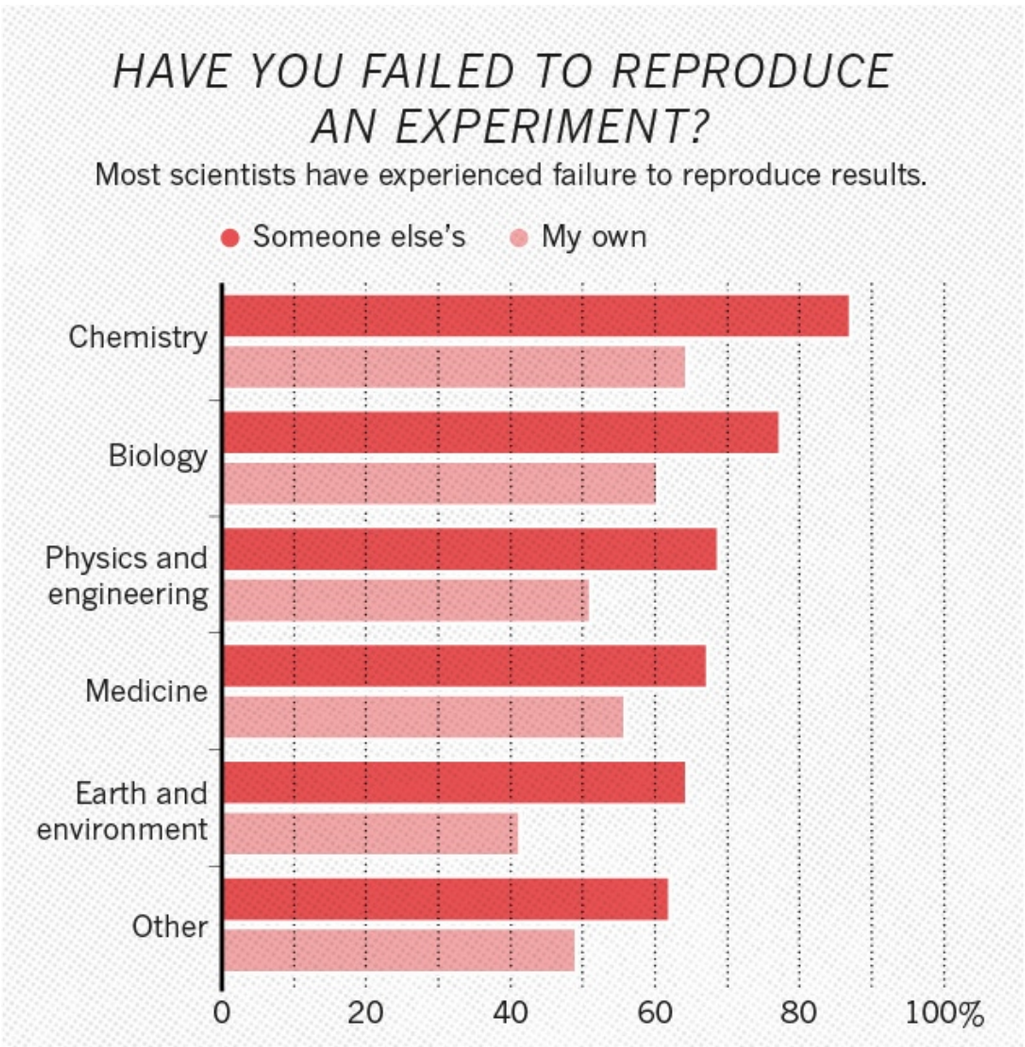
[3] Ioannidis JP. Why most published research findings are false. PLoS medicine. 2005 Aug 30;2(8):e124.

Crise de la reproductibilité[4]

- Prise de conscience à partir début des années 2000.





[4] Baker M. 1,500 scientists lift the lid on reproducibility. Nature News. 2016 May 26;533(7604):452.

“non-reproducible single occurrences are of no significance to science”

– Karl Popper

Terminologie

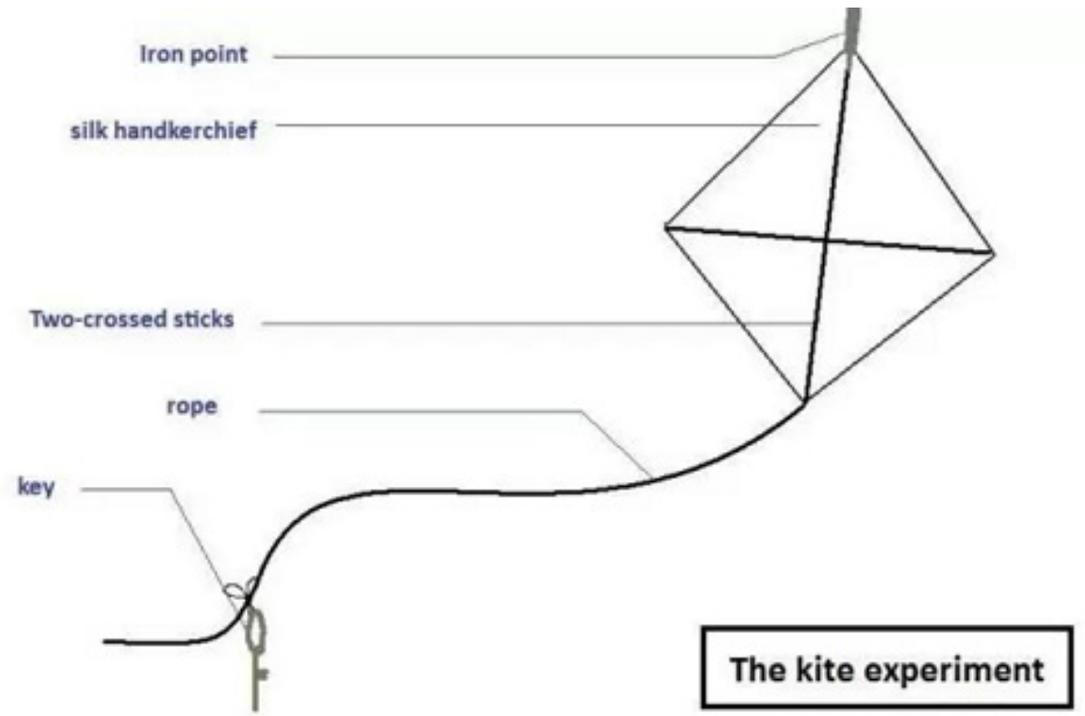
Recherche expérimentale

1. Emettre des hypothèses
2. Reproduire un phénomène
3. (In)validation des hypothèses.

* Crédit image sur https://art.famsf.org/alexander-anderson/benjamin-franklin-flying-kite-19633024209, 2019-02-25

Production d’artéfacts*

- Artéfact: objet digital
  - créé par les auteurs pour être utilisé dans l’expérimentation
  - ou généré par l’expérimentation.



* https://www.acm.org/publications/policies/artifact-review-badging#appendix, 2019-02-25
† Crédit image sur http://www.benjamin-franklin-history.org/kite-experiment/, 2019-02-25

Reproduire un phénomène?*

- Répétition

  même équipe, même environment expérimental

- Réplication

  équipes différentes, même environnent expérimental

- Reproduction

  équipes différentes, environnement expérimentaux différents

* https://www.acm.org/publications/policies/artifact-review-badging#appendix, 2019-02-25

Pourquoi est-ce compliqué?

Un problème sociologique

Prime à la nouveauté

We expect submissions to be daring and emphasize novelty and creativity. We recognize that more novel concepts can be harder to fully develop and evaluate, and the review process will take this into account. We encourage authors to discuss the limitations of their ideas in addition to the benefits.

Unlike some previous years, SIGCOMM 2019 will not have a separate experience track. However, we do encourage the submission of experience papers, particularly from industry, that provide detailed technical insight into real-world deployments of novel networking technologies and systems.

https://conferences.sigcomm.org/sigcomm/2019/cfp.html, 2019-02-25

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Processus de review

Submission Instructions

Submissions must be original, unpublished work, and not under consideration at another conference or journal. Each submission must be a single PDF file in two columns, 10 point format following the sigconf format of the **2017 ACM Master Article LaTeX Template**. Use the sample latex file sample-sigconf.tex. Submitted short papers should be no longer than six (6) pages, and long papers no longer than twelve (12) pages, including all material except references. SOSR '19 is double-blind, meaning that authors should make a good faith effort to anonymize papers. Papers should be submitted electronically via the submission site.

Accepted papers will be published in the ACM Digital Library. We stress that the publication of short papers at SOSR does not preclude the later publication of a full-length version of the paper at a conference or in a journal. Authors of accepted papers are expected to present their papers at the symposium and will have the opportunity to present a poster/demo at an interactive session, co-located with ONS.

Please direct any submission-related questions to sosr19chairs@colgate.edu.

Submission site:

Please visit https://sosr19.hotcrp.com/ to submit.

Important Dates

Abstracts due:	November 8, 2018 (5pm PT)
Paper submission:	November 15, 2018 (5pm PT)
Notification:	January 15, 2019
Camera-ready due:	February 28, 2019
Conference:	April 3-4, 2019 in San Jose, CA

https://conferences.sigcomm.org/sosr/2019/calls.html, 2019-02-25

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Forme des publications

“Always remember that it is impossible to speak in such a way that you cannot be misunderstood […]”

– Karl Popper

Biais de publication

- La communauté favorise des résultats “positifs”

  e.g., difficile de publier des résultats qui confirment l’hypothèse nulle.

Peu de valorisation

- Pour les auteurs

  impression de perte de temps,

  rarement considéré pour les postes ou promotions.

- Pour les reviewers

  prend beaucoup de temps,

  demande des compétences techniques,

  demande des resources.

Un problème technique

Complexité

- Logiciels

  dépendances, licences, interactions.

- Données

  représentation, stockage, description.

- Matériel

  resources de calcul, architectures, disponibilité.

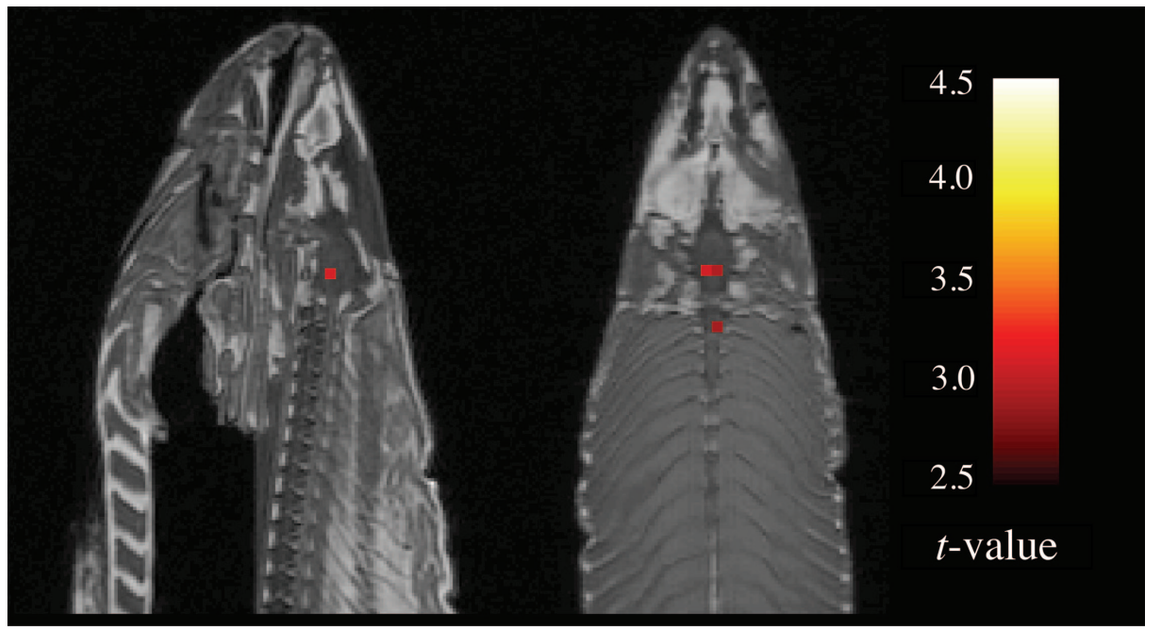


Fig. 1. Sagittal and axial images of significant brain voxels in the $\mathrm{task} > \mathrm{rest}$ contrast. The parameters for this comparison were $t(131) > 3.15$, $p(\mathrm{uncorrected}) < 0.001$, 3 voxel extent threshold. Two clusters were observed in the salmon central nervous system. One cluster was observed in the medial brain cavity and another was observed in the upper spinal column.[5]

[5] Bennett CM, Miller MB, Wolford GL. Neural correlates of interspecies perspective taking in the post-mortem Atlantic Salmon: an argument for multiple comparisons correction. Neuroimage. 2009 Jul 1;47(Suppl 1):S125.

Accès aux artefacts

- Comment donner accès aux artéfacts?

  Avant publication (double-blind)

  Après publication

- Epreuve du temps

  e.g., changement d’institution, passage à un autre projet.

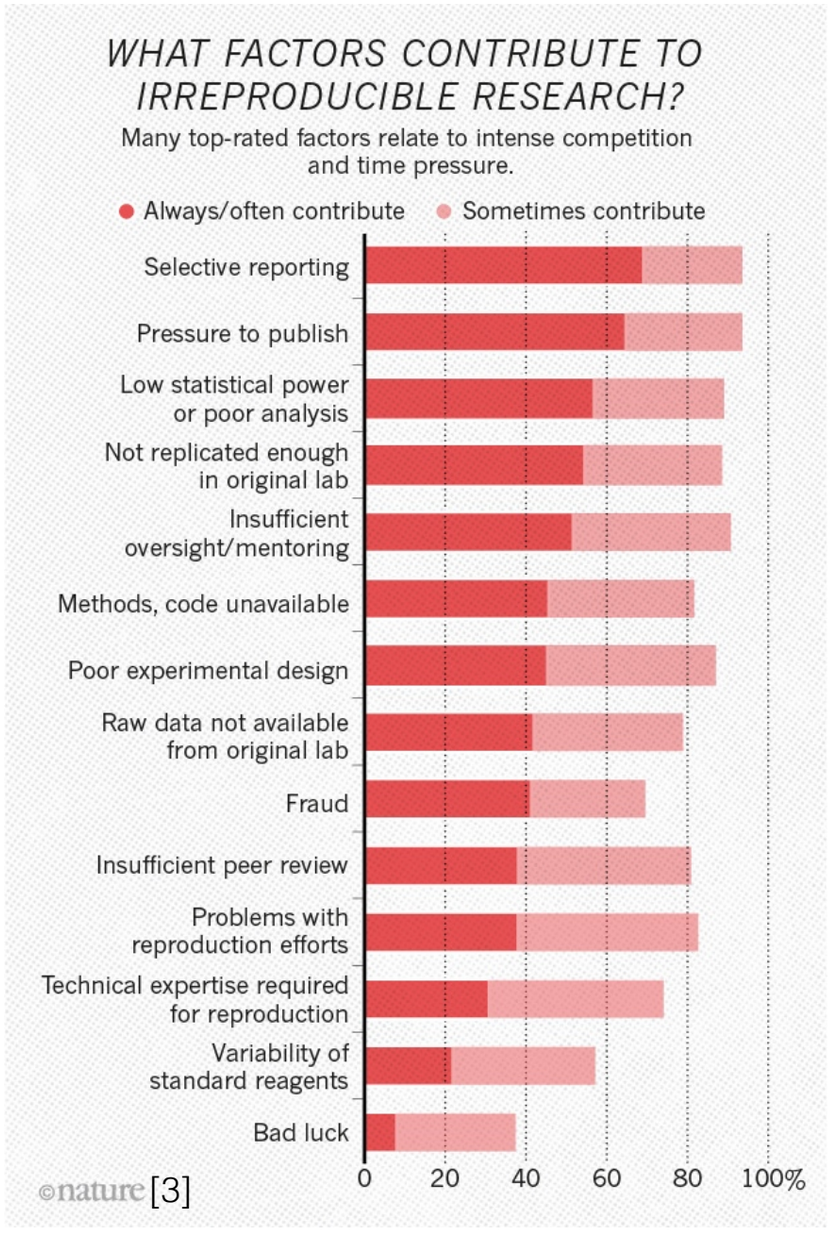
Comment changer la donne?

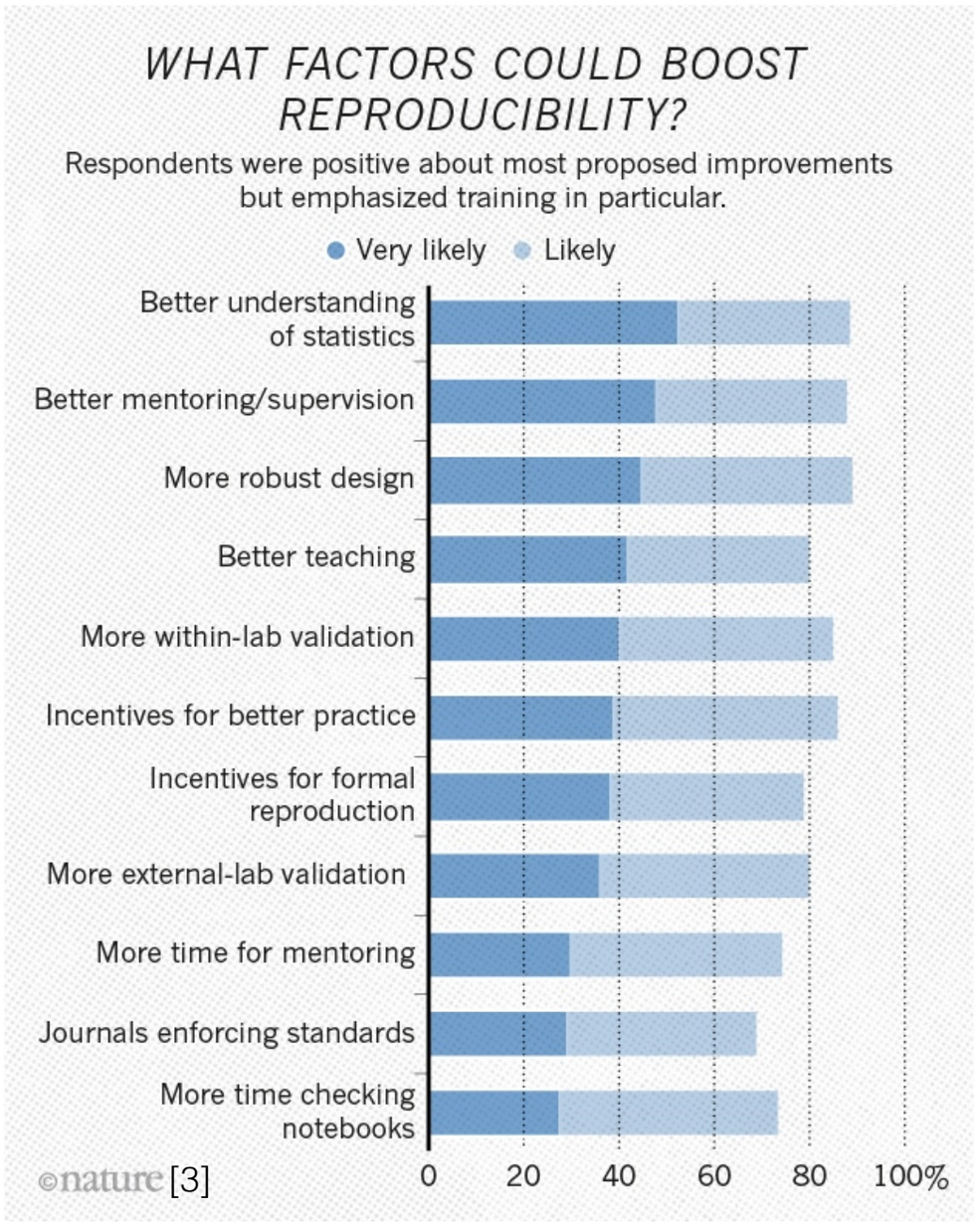
“L’enfer c'est les autres” [6]

[3]

[3]

“L’enfer c'est les autres” [6]





[6] Sartre JP. " Huis-clos". 1946.
[3] Baker M. 1,500 scientists lift the lid on reproducibility. Nature News. 2016 May 26;533(7604):452.

Individuellement

Documentation et automatisation

- Méticuleusement documenter et instrumenter les expérimentations

  e.g., notebooks.

- Automatiser toutes les tâches ET les valider

  e.g., éviter les click, favoriser le code et les scripts.

- Assurer un suivi de version

  être clair dans les messages de commit.

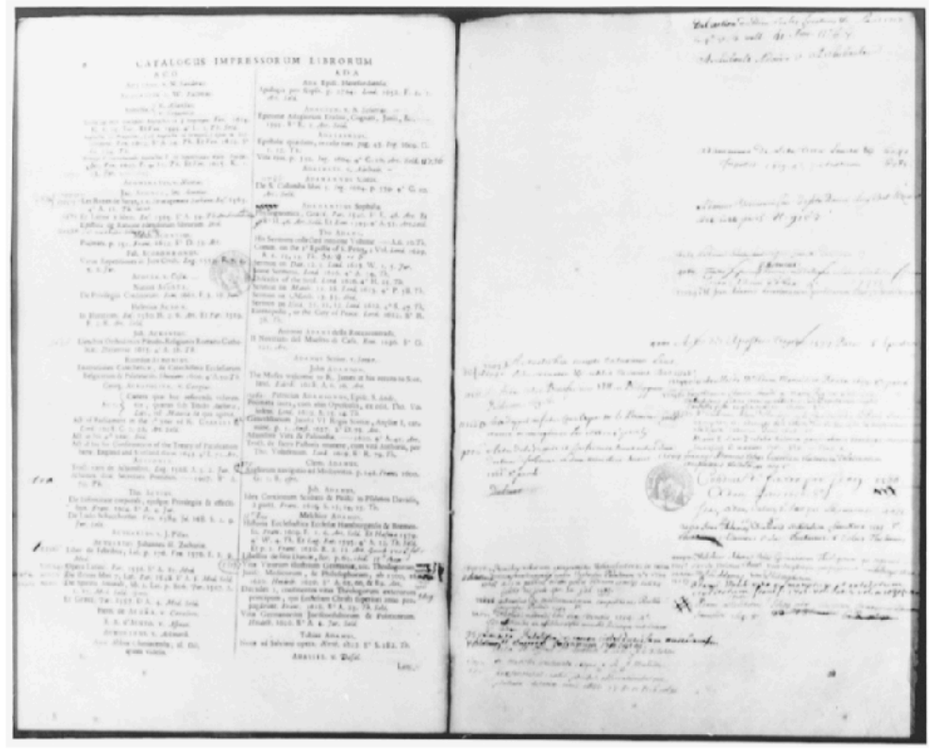


FIGURE 2. Annotations in an interleaved copy of the printed catalog of the Bodleian Library of 1674 are designed to serve as the record of the holdings of the Mazarine Library in Paris in the late seventeenth century. This example of the reuse of another library's cataloging work is comparable to the reuse of electronic library records today. Bibliothèque Mazarine MS 4138–4145, Thomas Hyde, *Catalogus impressorum librorum bibliothecae Bodleianae* (Oxford, 1674), interleaved in 8 volumes. Reproduction by the Bibliothèque Mazarine, Paris. [7]

[7] Blair A. Note taking as an art of transmission. Critical Inquiry. 2004 Sep;31(1):85-107.

Partager les artéfacts

- Rendre public les artéfacts et les documenter clairement.
- Si un artefact n’est pas publiable, le seconder par un artefact public.

Validation

- Mettre en place des techniques de validation des artefacts

  e.g., tests de régression, p-value.

- Toujours considerer tous les résultats valides

  positifs ou non.

Adapter les reviews

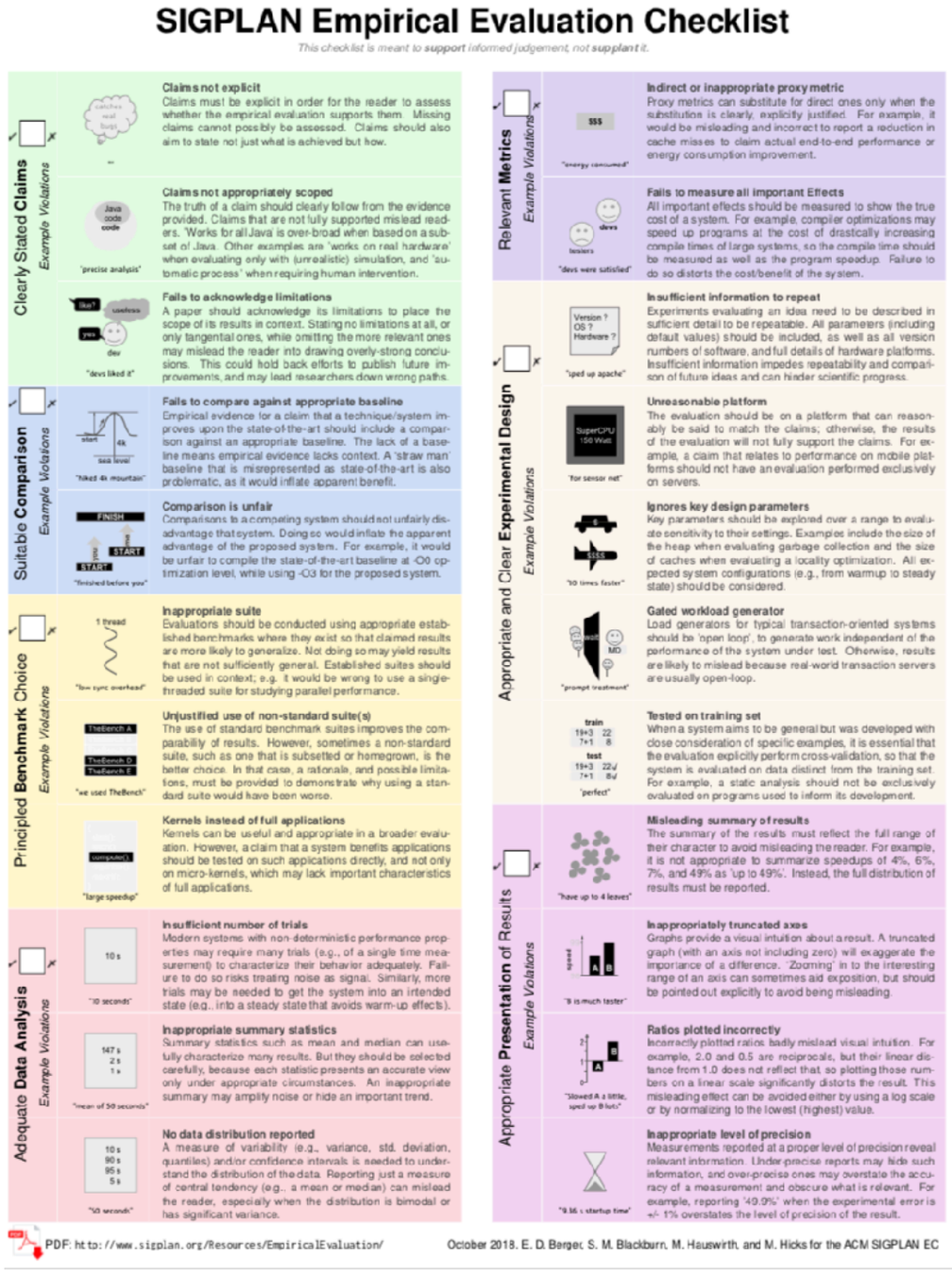
- Discuter la reproductibilité (potentielle) des artefacts dans les reviews

  regarder les artefacts.

Collectivement

Processus de review

- Prévoir un champ reproductibilité.
- Mettre en place un AEC.
- Fournir une checklist d’évaluation.

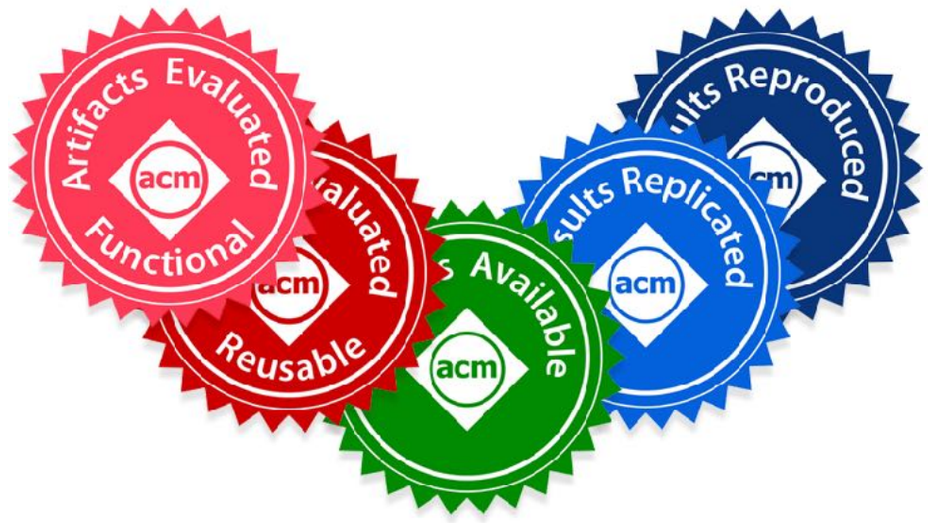


* https://www.sigplan.org/Resources/EmpiricalEvaluation/, 2019-02-25

Mise en avant des qualités

- Evaluer le niveau de reproductibilité des publications

et rendre cette information publique.



* Crédit image sur https://www.acm.org/publications/artifacts, 2019-02-25

“Pre-registered study”

- Publication de pre-rapports définissant

  l’objectif de l’étude,

  la méthodologie d’obtention des résultats,

  la méthodologie d’évaluation des résultats;

- avant même de connaître les résultats.

➡ La publication est garantie indépendamment des résultats.

Inciter la jeune génération

- Favoriser les essais de réplications plutôt que des études originales lors des cours

  e.g., CS 244 Reproducibility Project @ Stanford.

- Faire reproduire des travaux déjà publiés dans le domaine en début de thèse

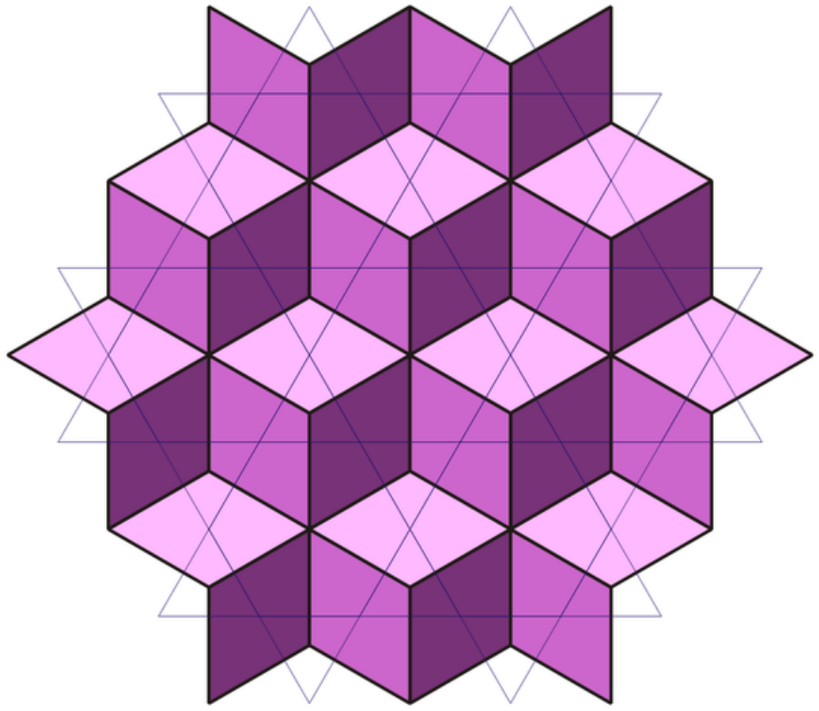
  e.g., essai OpenRF [8].

[8] Mahfoudi MN, Turletti T, Parmentelat T, Dabbous W. Lessons learned while trying to reproduce the openrf experiment. In Proceedings of the Reproducibility Workshop 2017 Aug 11 (pp. 21-23). ACM.

inventeurs du monde numérique

C@fé-In

Une rencontre informelle
autour d'un sujet scientifique.



Notre science peut-elle être reproductible ?

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