

First steps into metaresearch

David Causeur
Institut Agro Rennes Angers
IRMAR CNRS UMR 6625

Joint work with Baptiste Scancar (Institut Agro, Rennes), Jennifer Byrne (University of Sydney, Aus.), Adrian Barnett (Queensland University of Technology, Aus.)

Metaresearch (*Meta-science, research on research*) is the scientific study of how research is **conducted, reported, evaluated, and disseminated**, with the goal of improving the **quality, reliability, efficiency, and reproducibility** of scientific work.

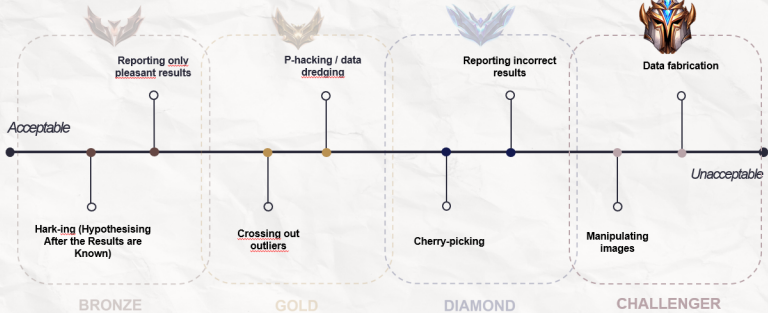
Emerging interdisciplinary research field spanning :

- statistics [bibliometrics / scientometrics]
- science policy
- sociology of science
- research integrity

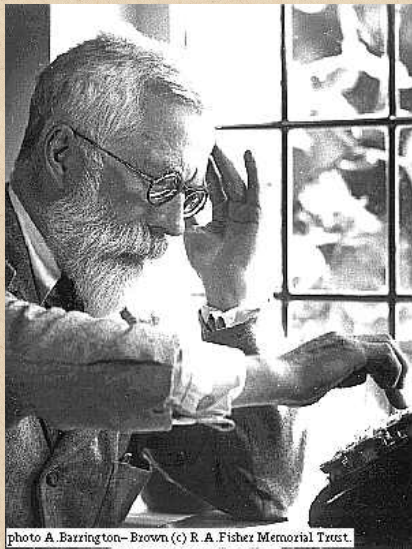
Research Fraud

'Fraud is not an absolute, it is a spectrum' – Dr. Stephen Lock

Lock (1996)



Courtesy of Baptiste Scancar



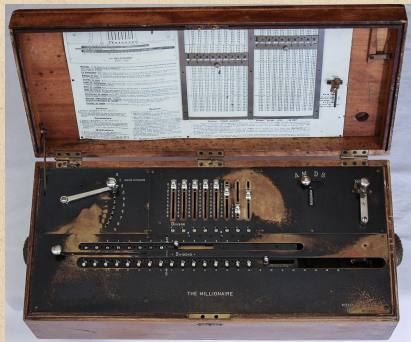
Sir Ronald Aylmer Fisher
(1890-1962)

- Head of the **Eugenics** department at University College London (1933)
- *"The null hypothesis is never proved or established, but is possibly disproved, in the course of experimentation."*
- *The Correlation Between Relatives on the Supposition of Mendelian Inheritance.* (Biometrika, 1918).

photo A. Barrington-Brown (c) R. A. Fisher Memorial Trust.

Reflections on Time and Discovery

Visiting Fisher's Office at Rothamsted, 2017



- 📊 Low-tech research : *The Millionaire mechanical calculator*
- ✉ Handwritten communication
- 📖 Few scientific journals
- ⌚ Lengthy experimental data collection
- 👥 Competition driven by scientific convictions

Fisher's Statistical Analysis of Mendel's Data (1936)

Mendel's two-trait experiment (seed shape $\times$ color, $n = 556$) :

Round & yellow 315 (exp. 312.75)	Round & green 108 (exp. 104.25)	Wrinkled & yellow 101 (exp. 104.25)	Wrinkled & green 32 (exp. 34.75)
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Fisher's remark :

- Observed ratios surprisingly close to expected Mendelian proportions.
- No evidence of research misconduct
- Could reflect selection or unconscious bias

An era of careful and paced scientific production

... to an era of industrial research fraud

Striking similarities between publications from China describing single gene knockdown experiments in human cancer cell lines

Jennifer A. Byrne^{1,2} · Cyril Labbé³

He, Y., Chen, F., Cai, Y., & Chen, S. (2015). **Knockdown of tumor protein D52-like 2** induces cell growth inhibition and apoptosis in oral squamous cell carcinoma. *Cell Biology International*, 39(3), 264-271.

Pan, Z. Y., Yang, Y., Pan, H., Zhang, J., Liu, H., Yang, Y., *et al.* (2015). Lentivirus-mediated **TPD52L2 depletion** inhibits the proliferation of liver cancer cells in vitro. *International Journal of Clinical and Experimental Medicine*, 8(2), 2334-2341

Wang, Z., Sun, J., Zhao, Y., Guo, W., Lv, K., & Zhang, Q. (2014). Lentivirus-mediated **knockdown of tumor protein D52-like 2** inhibits glioma cell proliferation. *Cellular and Molecular Biology*, 60(1), 39-44.

Xu, J., Wang, W., Zhu, Z., Wei, Z., Yang, D., & Cai, Q. (2015). **Tumor protein D52-like 2** accelerates gastric cancer cell proliferation in vitro. *Cancer Biotherapy and Radiopharmaceuticals*, 30(3), 111-116.

Yang, M., Wang, X., Jia, J., Gao, H., Chen, P., Sha, X., *et al.* (2015). **Tumor protein D52-like 2** contributes to proliferation of breast cancer cells. *Cancer Biotherapy and Radiopharmaceuticals*, 30(1), 1-7.

What is a paper mill ?

Research paper mills are "contract-cheating organisations which provide undeclared services to support research manuscripts and publications" (Byrne et al., 2022)

What favors the growth of paper mills :

- Research evaluation policies
- Worldwide competition for research funds
- Research massification : more and more researchers, publications, scientific journals
- Easy access to sophisticated AI tools

Research

Machine learning based screening of potential paper mill publications in cancer research: methodological and cross sectional study

BMJ 2026 ; 392 doi: <https://doi.org/10.1136/bmj-2025-087581> (Published 30 January 2026)

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Article

Related content

Metrics

Responses

Peer review

Baptiste Scancar , data scientist¹, Jennifer A Byrne , cancer researcher^{2 3}, David Causeur , statistician¹,
Adrian G Barnett , statistician⁴

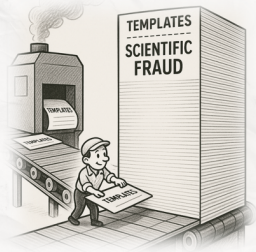
Scancar, B. and Causeur, D. (2026). Les fausses publications scientifiques menacent de submerger la recherche contre le cancer. *The Conversation*.

Templates and textual signals

MicroRNA-32 inhibits osteosarcoma cell proliferation and invasion by targeting Sox9.

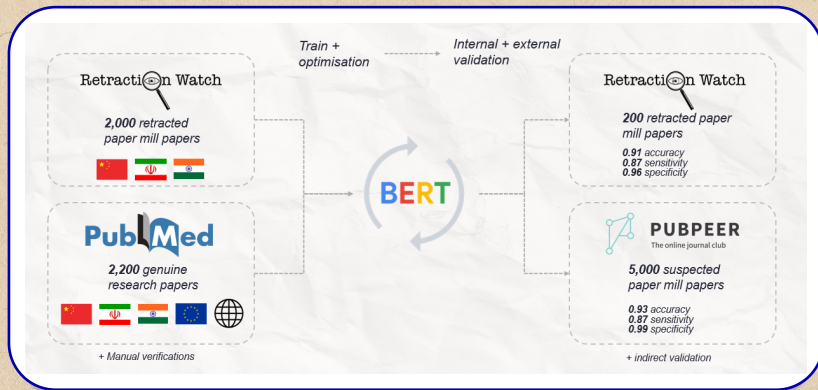
MicroRNA-153 inhibits osteosarcoma cells proliferation and invasion by targeting TGF-B2.

MicroRNA-204 inhibits proliferation, migration, invasion and epithelial-mesenchymal transition in osteosarcoma cells via targeting Sirtuin 1.



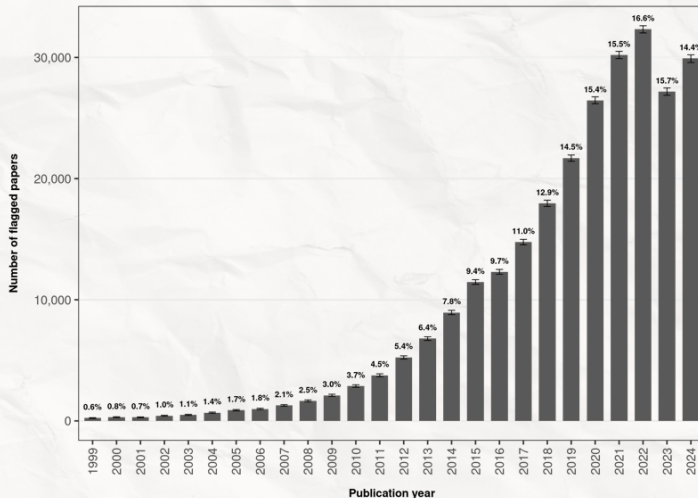
Courtesy of Baptiste Scancar

Machine learning based detection of paper mill papers

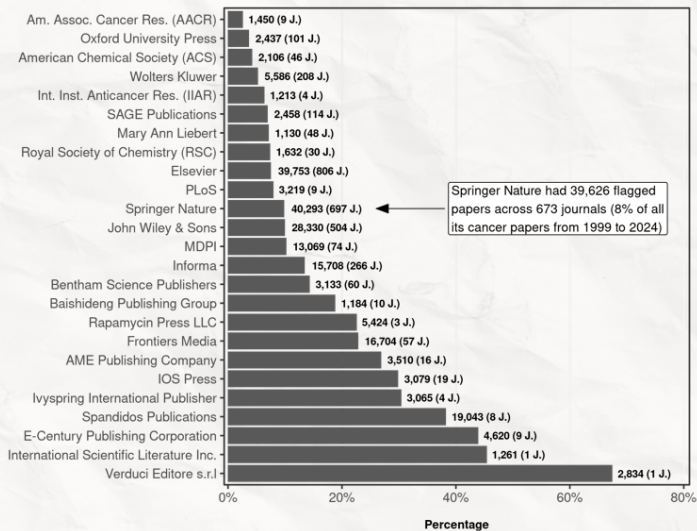


Courtesy of Baptiste Scancar

10 % of 1999-2024 cancer research publications flagged



High-impact journals are no exception



Ongoing work : suspicion of citation manipulation by paper mills

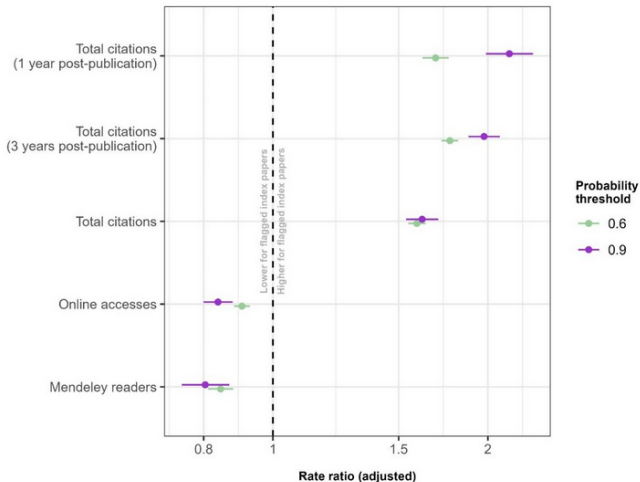


Figure 1: Adjusted rate ratios (RR) for citation and attention outcomes associated with flagged index papers. Points represent adjusted rate ratios estimated from negative binomial regression models, comparing flagged and non-flagged index papers based on the predicted probability threshold (0.6 and 0.9). Horizontal bars are 95% confidence intervals. Models were adjusted for journal and year of publication. Outcomes are displayed from higher to lower adjusted rate ratios. Rate ratios are shown