Integrity in research

Sophie NICOLE

CRHC, Inserm

Human neurogenetics & neuromuscular physiology

Sensitive data (familial, health, genome sequence)

Creation and use of GMOs

Animal experimentation

What does scientific integrity mean?

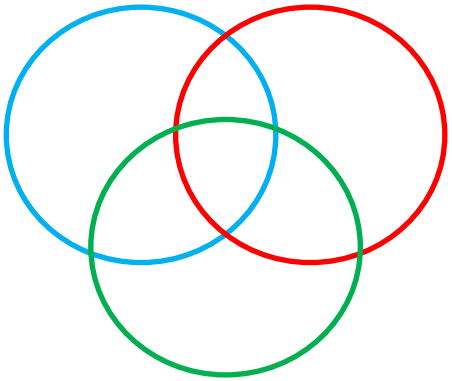
What does scientific integrity mean?

all of the rules and values that must govern research
in order to ensure its honesty and scientific rigor

Research Integrity
Behaviors of researchers

Research Ethics
Consideration on the use of animals or humans in research

Responsible Research
Consequences of research for society and environment



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Possible consequences of any research

Arthur GALSTON (1920-2008), Plant biologist, Bioethics, Yale University

His PhD work served the US army to develop a chemical weapon (Agent orange) used by the UK and US army (1952-1971) : causes cancers, birth defects, environmental defects

"I used to think that one could avoid involvement in the antisocial consequences of science simply by not working on any project that might be turned to evil or destructive ends. I have learned that things are not all that simple, and that **almost any scientific finding can be perverted or twisted under appropriate societal pressures**. In my view, the only recourse for a scientist concerned about the social consequences of his work is to remain involved with it to the end. **His responsibility to society does not cease with publication of a definitive scientific paper**... Science is now too potent in transforming our world to permit random fallout of the social consequences of scientific discoveries. Some scrutiny and regulation are required, and I believe that scientists must play an important role in any bodies devised to carry out such tasks."

Science and social responsibility: A case history (Ann NY Acad Sci. 1972;196(4):223-35)

Research integrity and you?

Your definition of research integrity?

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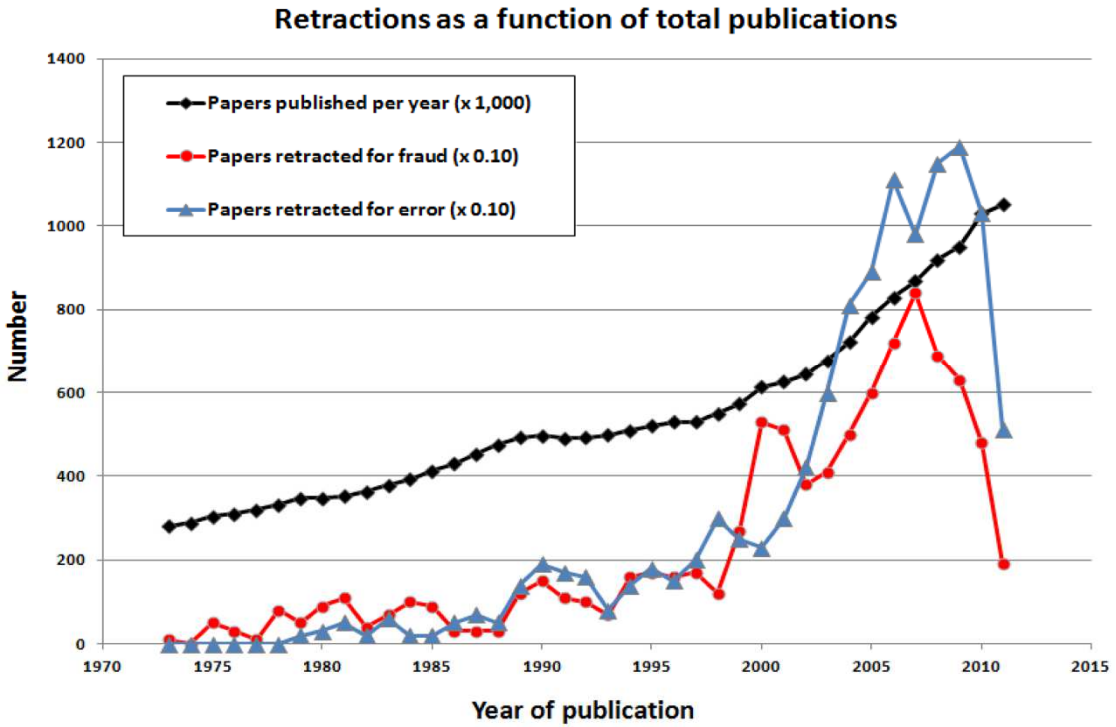
https://integgame.eu/

Increased number of retractation



Why Has the Number of Scientific Retractions Increased?
RG Steen, A Casadevall, FC Fang, Plos One, 2013.

Time-to-retraction (from publication of article to publication of retraction)

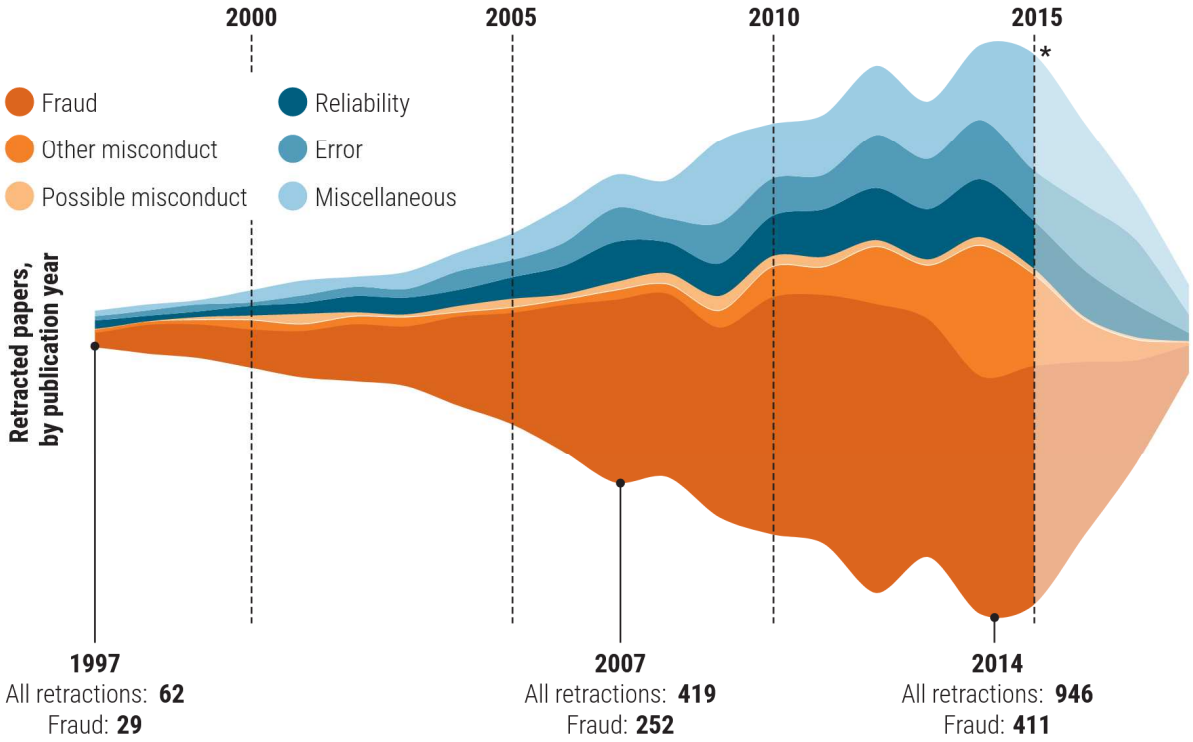
in or before 2002: 49.82 months (n=714)

after 2002 : 23.82 months (n=1,333)

Retractation Watch webdatabase

The burden of misconduct

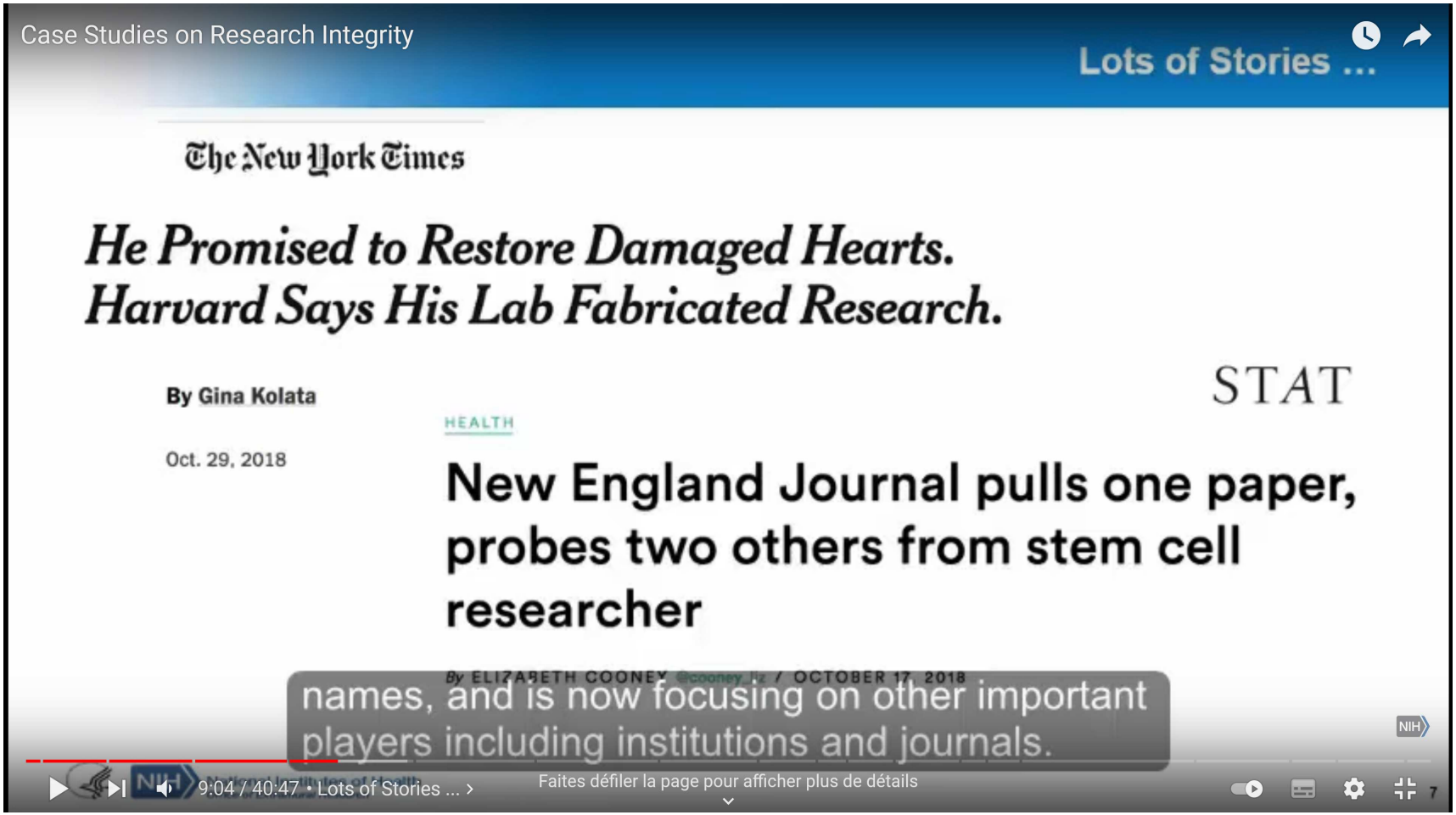
The majority of retractions have involved scientific fraud (fabrication, falsification, and plagiarism) or other kinds of misconduct (such as fake peer review).



[What a massive database of retracted papers reveals about science publishing's 'death penalty'](#) J Brainard, J You (Science, Oct 2018)

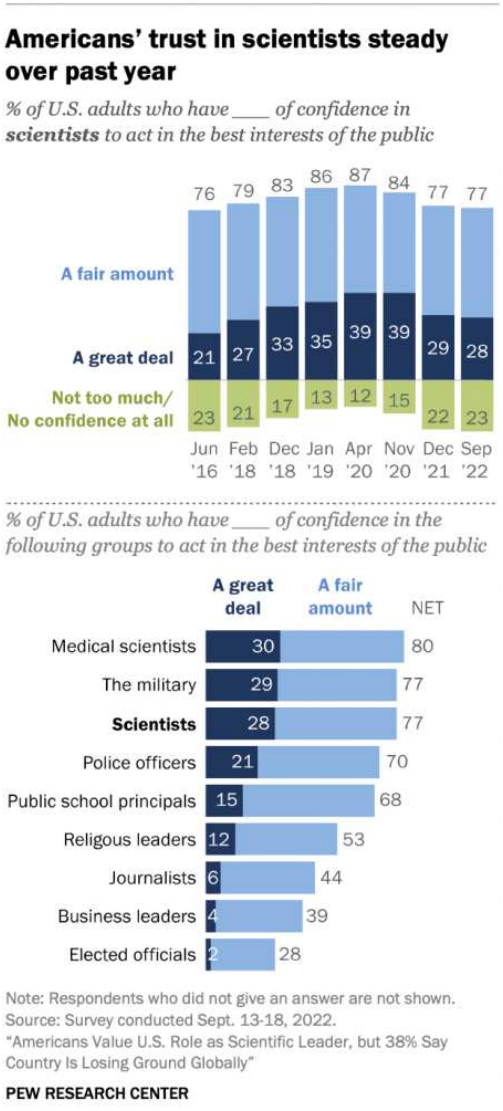
Better editorial oversight might explain flood of retractions

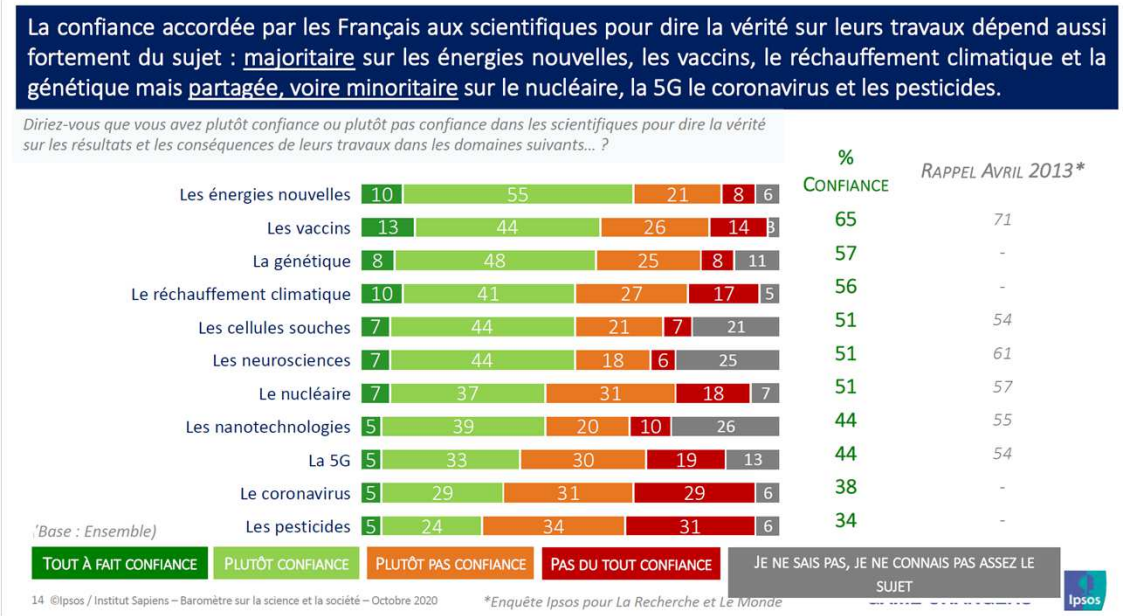
Integrity is an institutional problem



Case studies on Research Integrity, Dr M Lauer, May 2019
« The Role of Research Integrity in Promoting Excellence: Tools for Colleges and University Leaders" https://youtu.be/ZKwpe77iZws?t=509

And a societal concern: public trust in Science





[IPSOS, 2020]

[Pew Research Center]
[B Kennedy, A Tyson, C Funk (2022)]

Main objectives of research integrity promotion

- **Quality of research and its results**

- Demonstration to society that the system and its contributions are **trustworthy**

Some historical background

- **Before world war II**
  - ✓ Society was not really concerned by what researchers did
  - ✓ **Nazi medicine and research on human beings without any consent**

- **Nuremberg trials (november 1945-october 1946)**
  - ✓ researchers have to be clear on how they conduct their research but had still their own regulation
- **Declaration of Helsinki (1964) - World Medical Association**
  - ✓ first worldwide attempt to establish an international model on how researchers must conduct themselves ethically
  - ✓ scientific review must be done prior the beginning of a medical research
  - ✓ amended 7 times (current version written in 2013)
  - ✓ complemented by the declaration of Taipei (2016) on ethical considerations regarding health databases and biobanks
- **Belmont report (1979)**
  - ✓ governmental regulations required to guide responsible conducts of research

- **First world conferences on research integrity** in 2007
  - ✓ 47 countries (2007) to 52 countries (2017)

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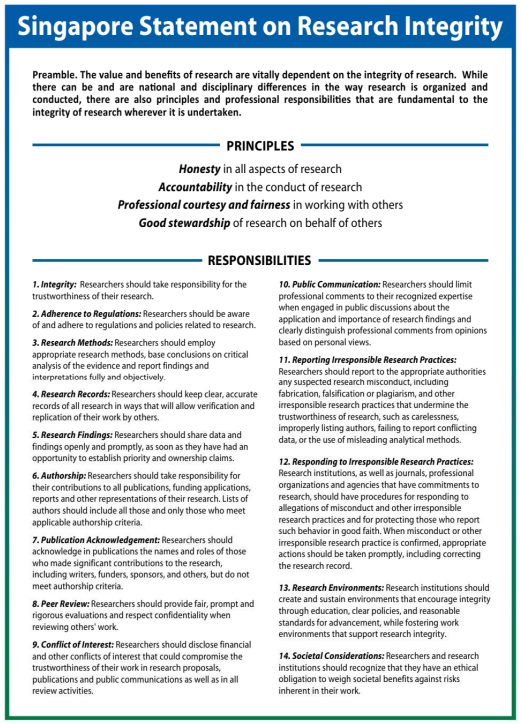
International guidelines

- **Singapore statement** (2010)
  - Honesty in all aspects of research
  - Accountability in the conduct of research
  - Professional courtesy and fairness in working with others
  - Good stewardship of research on behalf of others



Singapore Statement on Research Integrity

Preamble. The value and benefits of research are vitally dependent on the integrity of research. While there can be and are national and disciplinary differences in the way research is organized and conducted, there are also principles and professional responsibilities that are fundamental to the integrity of research wherever it is undertaken.

PRINCIPLES

Honesty in all aspects of research
Accountability in the conduct of research
Professional courtesy and fairness in working with others
Good stewardship of research on behalf of others

RESPONSIBILITIES

1. Integrity: Researchers should take responsibility for the trustworthiness of their research.

2. Adherence to Regulations: Researchers should be aware of and adhere to regulations and policies related to research.

3. Research Methods: Researchers should employ appropriate research methods, base conclusions on critical analysis of the evidence and report findings and interpretations fully and objectively.

4. Research Records: Researchers should keep clear, accurate records of all research in ways that will allow verification and replication of their work by others.

5. Research Findings: Researchers should share data and findings openly and promptly, as soon as they have had an opportunity to establish priority and ownership claims.

6. Authorship: Researchers should take responsibility for their contributions to all publications, funding applications, reports and other representations of their research. Lists of authors should include all those and only those who meet applicable authorship criteria.

7. Publication Acknowledgement: Researchers should acknowledge in publications the names and roles of those who made significant contributions to the research, including writers, funders, sponsors, and others, but do not meet authorship criteria.

8. Peer Review: Researchers should provide fair, prompt and rigorous evaluations and respect confidentiality when reviewing others' work.

9. Conflict of Interest: Researchers should disclose financial and other conflicts of interest that could compromise the trustworthiness of their work in research proposals, publications and public communications as well as in all review activities.

10. Public Communication: Researchers should limit professional comments to their recognized expertise when engaged in public discussions about the application and importance of research findings and clearly distinguish professional comments from opinions based on personal views.

11. Reporting Irresponsible Research Practices: Researchers should report to the appropriate authorities any suspected research misconduct, including fabrication, falsification or plagiarism, and other irresponsible research practices that undermine the trustworthiness of research, such as carelessness, improperly listing authors, failing to report conflicting data, or the use of misleading analytical methods.

12. Responding to Irresponsible Research Practices: Research institutions, as well as journals, professional organizations and agencies that have commitments to research, should have procedures for responding to allegations of misconduct and other irresponsible research practices and for protecting those who report such behavior in good faith. When misconduct or other irresponsible research practice is confirmed, appropriate actions should be taken promptly, including correcting the research record.

13. Research Environments: Research institutions should create and sustain environments that encourage integrity through education, clear policies, and reasonable standards for advancement, while fostering work environments that support research integrity.

14. Societal Considerations: Researchers and research institutions should recognize that they have an ethical obligation to weigh societal benefits against risks inherent in their work.

The Singapore Statement on Research Integrity was developed as part of the 2nd World Conference on Research Integrity, 21-24 July 2010, in Singapore, as a global guide to the responsible conduct of research. It is not a regulatory document and does not represent the official policies of the countries and organizations that funded and/or participated in the Conference. For official policies, guidance, and regulations relating to research integrity, appropriate national bodies and organizations should be consulted. Available at: **www.singaporestatement.org**

- **Montreal statements**, cross-Boundary collaborations (2013)
  - Integrity
  - Trust
  - Purpose
  - Goals

- **Hong Kong principles**, assessing researchers (2019)
  - Value complete reporting
  - Reward the practice of open science
  - Acknowledge a broad range of research activities
  - Recognize essential other tasks like peer review and mentoring

- **Global guides toward comprehensive standards, codes, policies but not regulatory documents**

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European and French guidelines

- European code of conduct for research integrity (2011 revised in 2017)
  - **Reliability**
  - **Honesty**
  - **Respect**
  - **Accountability**

- **French agencies**
  - ✓ Office Français à l'intégrité scientifique, Haut Conseil pour l'évaluation de la Recherche et de l'enseignement supérieur (Hcéres)
    https://www.hceres.fr/en/french-office-research-integrity
  - ✓ Agence National de la Recherche (ANR)
    https://anr.fr/en/anrs-role-in-research/values-and-commitments/scientific-integrity/

- ***Organismes de recherche***
  - ✓ CNRS
    https://www.cnrs.fr/en/research
  - ✓ Université de Montpellier
    https://www.umontpellier.fr/recherche/publications-scientifiques
  - ✓ Inserm
    https://pro.inserm.fr/
    LORIER Programm

Responsible conduct of research

- **Active adherence** to the regulatory and ethical principles and professional standards essential for the.adherence
- All the stages of the research process:
  - **Study design**
  - **Conducting** the research (data collection, analyses, interpretation)
  - **Dissemination** of the results
  - **Reflections** on the social impacts

The serious violation of research integrity

- **FFP categorization**
  - fabrication
  - falsification
  - plagiarism

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The questionable research practices

- **The most frequent misconducts done to "improve" the outcome**
  - to not consider contradictory results or to alter results
  - errors in statistics, calculations
  - modified pictures (photoshoped images)
  - undisclosed conflicts of interest (patents, company stock…)
  - lack of ethical approval or consents
  - excessive self-citations…

- **Different perception of misconducts** depending upon
  - cultures
  - disciplines
  - positions

- **Grey area between licit, questionable and fraudulent practices**

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No universal perception

Abstract

Breaches of research integrity have shocked the academic community. Initially explanations were sought at the level of individual researchers but over time increased recognition emerged of the important role that the research integrity climate may play in influencing researchers' (mis)behavior. In this study we aim to assess whether researchers from different academic ranks and disciplinary fields experience the research integrity climate differently. We sent an online questionnaire to academic researchers in Amsterdam using the Survey of Organizational Research Climate. Bonferroni corrected mean differences showed that junior researchers (PhD students, postdocs and assistant professors) perceive the research integrity climate more negatively than senior researchers (associate and full professors). Junior researchers note that their supervisors are less committed to talk about key research integrity principles compared to senior researchers (*MD* = -.39, *CI* = -.55, -.24). PhD students perceive more competition and suspicion among colleagues (*MD* = -.19, *CI* = -.35, -.05) than associate and full professors. We found that researchers from the natural sciences overall express a more positive perception of the research integrity climate. Researchers from social sciences as well as from the humanities perceive less fairness of their departments' expectations in terms of publishing and acquiring funding compared to natural sciences and biomedical sciences (*MD* = -.44, *CI* = -.74, -.15; *MD* = -.36, *CI* = -.61, -.11). Results suggest that department leaders in the humanities and social sciences should do more to set fairer expectations for their researchers and that senior scientists should ensure junior researchers are socialized into research integrity practices and foster a climate in their group where suspicion among colleagues has no place.

Perceptions of research integrity climate differ between academic ranks and disciplinary fields: Results from a survey among academic researchers in Amsterdam. Haven TL, Tijdink JK, Martinson BC, Bouter LM. PLoS ONE 14(1): e0210599 (2019).

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Frequency of research misconducts

How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data

Daniele Fanelli*

INNOGEN and ISSTI-Institute for the Study of Science, Technology & Innovation, The University of Edinburgh, Edinburgh, United Kingdom

Abstract

The frequency with which scientists fabricate and falsify data, or commit other forms of scientific misconduct is a matter of controversy. Many surveys have asked scientists directly whether they have committed or know of a colleague who committed research misconduct, but their results appeared difficult to compare and synthesize. This is the first meta-analysis of these surveys. To standardize outcomes, the number of respondents who recalled at least one incident of misconduct was calculated for each question, and the analysis was limited to behaviours that distort scientific knowledge: fabrication, falsification, "cooking" of data, etc… Survey questions on plagiarism and other forms of professional misconduct were excluded. The final sample consisted of 21 surveys that were included in the systematic review, and 18 in the meta-analysis. A pooled weighted average of 1.97% (N = 7, 95%CI: 0.86–4.45) of scientists admitted to have fabricated, falsified or modified data or results at least once –a serious form of misconduct by any standard– and up to 33.7% admitted other questionable research practices. In surveys asking about the behaviour of colleagues, admission rates were 14.12% (N = 12, 95% CI: 9.91–19.72) for falsification, and up to 72% for other questionable research practices. Meta-regression showed that self reports surveys, surveys using the words "falsification" or "fabrication", and mailed surveys yielded lower percentages of misconduct. When these factors were controlled for, misconduct was reported more frequently by medical/pharmacological researchers than others. Considering that these surveys ask sensitive questions and have other limitations, it appears likely that this is a conservative estimate of the true prevalence of scientific misconduct.

Citation: Fanelli D (2009) How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data. PLoS ONE 4(5): e5738. doi:10.1371/journal.pone.0005738

Editor: Tom Tregenza, University of Exeter, United Kingdom

Received January 6, 2009; **Accepted** April 19, 2009; **Published** May 29, 2009

Funding: The author is supported by a Marie Curie Intra European Fellowship (Grant Agreement Number PIEF-GA-2008-221441). The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Competing Interests: The author has declared that no competing interests exist.

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Frequency of research misconducts

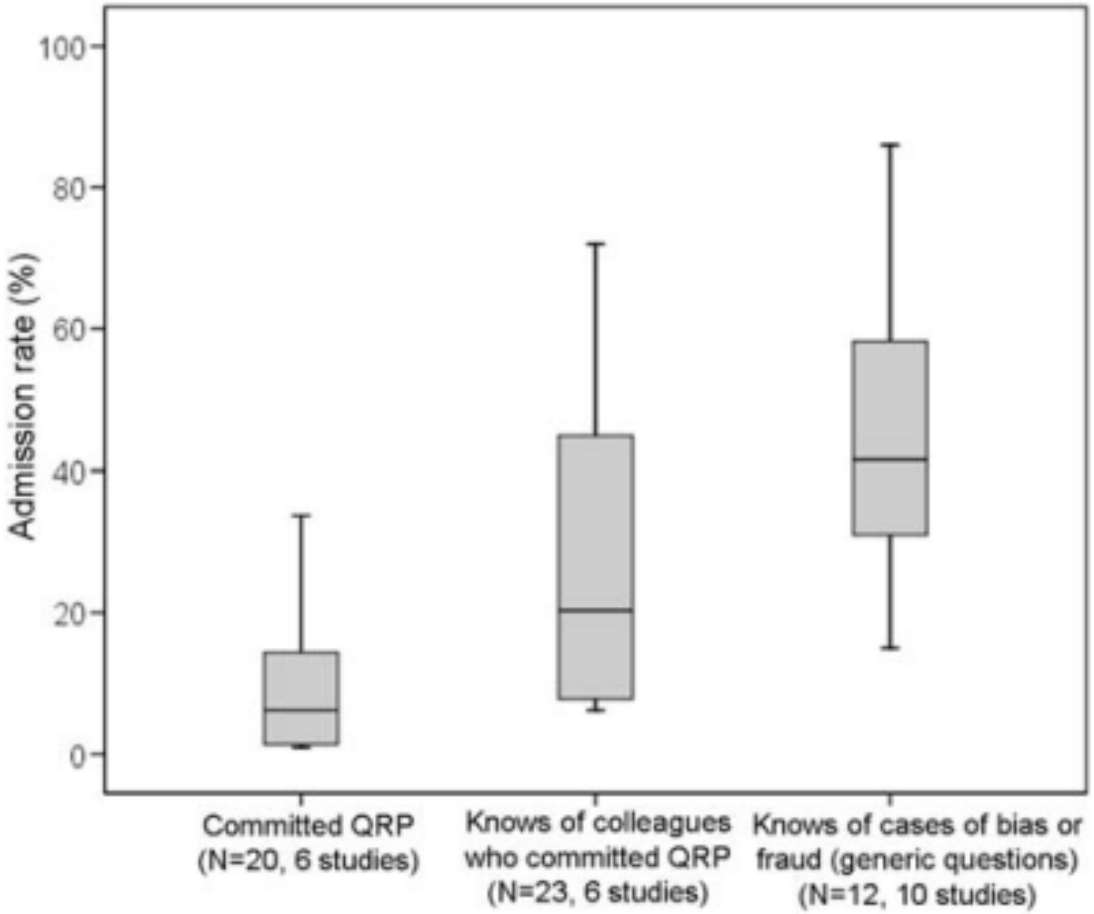

Figure 3. Admission rates of Questionable Research Practices (QRP) in self- and non-self-reports. N indicates the number of survey questions. Boxplots show median and interquartiles.
doi:10.1371/journal.pone.0005738.g003

Community sanctions against researchers

- **Associations, personnel investigations …**

  (https://scienceintegritydigest.com/...)

- **PubPeer , The online journal club (https://pubpeer.com)**

The PubPeer Foundation is a California-registered public-benefit corporation with nonprofit status in the United States. **The overarching goal of the Foundation is to improve the quality of scientific research by enabling innovative approaches for community interaction**. The bylaws of the Foundation establish pubpeer.com as a service run for the benefit of its readers and commenters, who create its content. Our current focus is maintaining and developing the **PubPeer** online platform for post-publication peer review.

- **Institutions**

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Institutional sanctions against researchers

Table 2. Actions taken against misconduct.

ID	N cases	Action taken	%
Tangney, 1987 [32]	78	Took some action to verify their suspicions of fraud or to remedy the situation	46
Rankin, 1997 [57]	31 [ffp]	In alleged cases of scientific misconduct a disciplinary action was taken by the dean	32.4
		Some authority was involved in a disciplinary action	20.5
Ranstam, 2000 [46]	49	I interfered to prevent it from happening	28.6
		I reported it to a relevant person or organization	22.4
Kattenbraker, 2007 [61]	33	Confronted individual	55.5
		Reported to supervisor	36.4
		Reported to Institutional Review Board	12.1
		Discussed with colleagues	36.4
Titus, 2008 [31]	115 [ffp]	The suspected misconduct was reported by the survey respondent	24.4
		The suspected misconduct was reported by someone else	33.3

Abbreviations: "N cases" is the total number of cases of misconduct observed by respondents, [ffp] indicates that the number includes cases of plagiarism, "%" is the percentage of cases that had the specified action taken against them. All responses are mutually exclusive except in Kattenbraker 2007.
doi:10.1371/journal.pone.0005738.t002

- The Office of Research Integrity (US)
- **Institut Pasteur, Inserm, CNRS : Rapport d'instruction à propos des signalements concernant dix publications de deux chercheurs travaillant à l'Institut Pasteur - *19 mars 2021***

Why scientific misconducts?

Table 1 Good practices of research. Percent agreement that selected examples of good practices in research were present in the context of the case of research misconduct. Respondents were not included in the calculated percentages if they noted that they did not remember (or did not know about) a particular item or that it was not applicable

	Agree or Strongly Agree (n of N, %)	Don't remember (n)	Not applicable (n)	No answer (n)
… open and transparent with each other about their work.	4 of 21, 19%	2	1	0
… had a good understanding of statistical methods or sought out the necessary expertise.	5 of 12, 42%	2	10	0
… considered authorship to be both a credit and a source of responsibility.	7 of 18, 39%	3	3	0
… felt empowered to speak up if something didn't seem right or they had questions.	4 of 17, 24%	3	4	0
… leader of the research group/team was a good manager of:				
people.	5 of 21, 24%	0	1	2
budgets.	4 of 11, 36%	5	7	1
the research operations.	10 of 22, 45%	1	0	1
the research data.	6 of 21, 29%	1	1	1
… designed research studies to protect themselves from the risk of bias.	5 of 19, 26%	1	3	1
… kept research records sufficient for others to reconstruct what had or had not been done.	9 of 22, 41%	0	1	1

Survey study of research integrity officers' perceptions of research practices associated with instances of research misconduct.
Kallchman et al., Research Integrity and Peer Review (2020)

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(Not exhaustive) list of factors

- Individual traits
  - vanity
  - rigor…
- Cultural factors
  - difference in understanding what constitutes good scientific practice
- Circumstances
  - financial
  - Personal…
- Organizational factors
  - complex interpersonal relationships at the workplace
  - inadequate training or mentoring…
- Structural elements (“publish-or-perish” culture)
  - hyper-competitiveness
  - biases in peer-review and evaluation…

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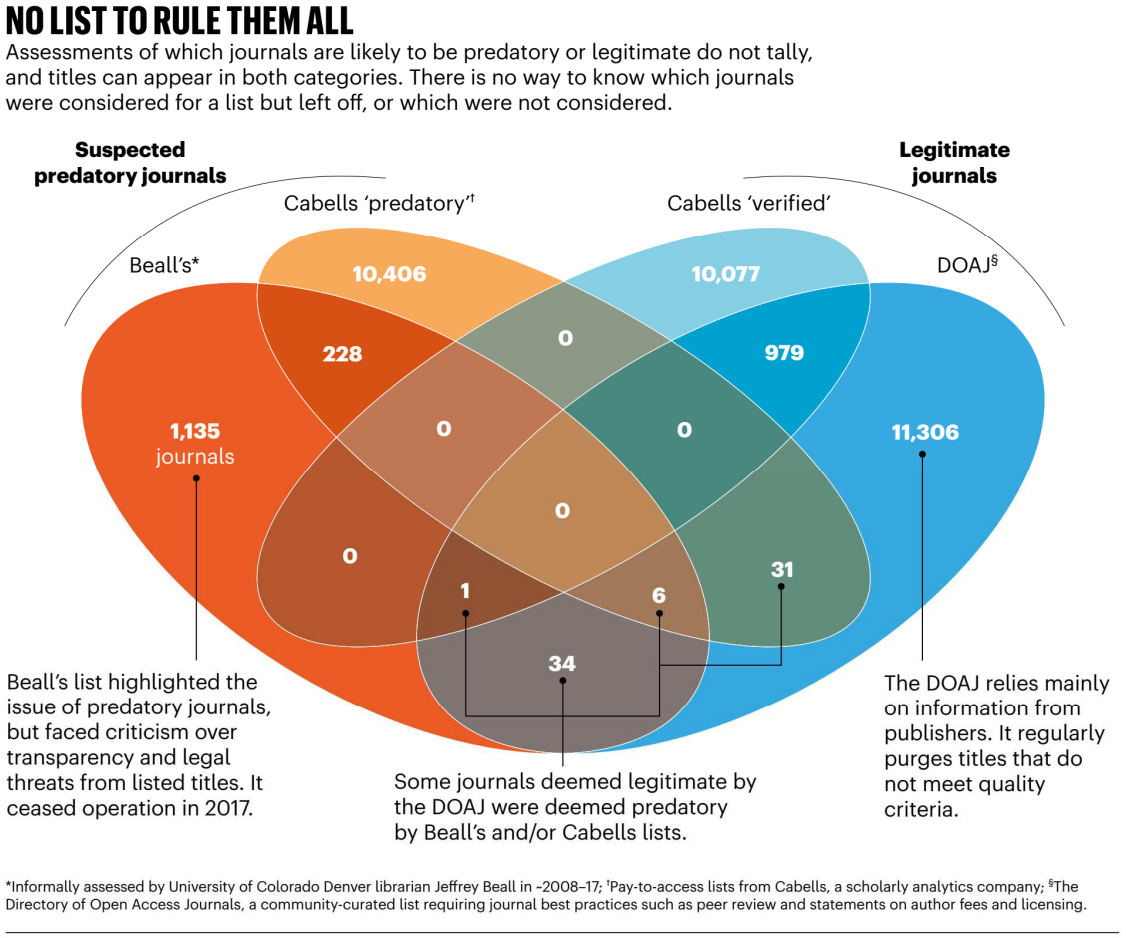
(Not exhaustive) list of factors

Predatory publishing (and conferences)

- Consensus definition :

"Predatory journals and publishers are entities that prioritize self-interest at the expense of scholarship and are characterized by false or misleading information, deviation from best editorial and publication practices, a lack of transparency, and/or the use of aggressive and indiscriminate solicitation practices."



Grudniewicz et al., Nature, 2019

How to promote integrity / good practices?

- **Supportive rather than controlling policies**

BETTER RESEARCH: THREE AREAS, NINE TOPICS, MANY ACTIONS

Area	Topic	Action*
Support	Research environment	Ensure fair assessment procedures and prevent hypercompetition and excessive publication pressure.
	Supervision and mentoring	Create clear guidelines for PhD supervision (such as on meeting frequency); set up skills training and mentoring.
	Integrity training	Establish training and confidential counselling for all researchers.
Organization	Ethics structures	Establish review procedures that accommodate different types of research and disciplines.
	Integrity breaches	Formalize procedures that protect both whistle-blowers and those accused of misconduct.
	Data practices and management	Provide training, incentives and infrastructure to curate and share data according to FAIR principles.
Communication	Research collaboration	Establish sound rules for transparent working with industry and international partners.
	Declaration of interests	State conflicts (financial and personal) in research, review and other professional activities.
	Publication and communication	Respect guidelines for authorship and ensure openness and clarity in public engagement.

Mejlgaard et al., Nature 2020

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How to promote integrity / good practices?

- **Supportive rather than controlling policies**
- **Everyone's responsibility**
  - **Principal Investigators**
  - **Students**
  - **Institutions** to sustain healthy research groups

Modify the research assessment practices

- **The Declaration on Research Assessment (DORA) recognizes the need to improve the ways in which researchers and the outputs of scholarly research are evaluated.**

  - Do not use journal-based metrics, such as Journal Impact Factors, as a surrogate measure of the quality of individual research articles, to assess an individual scientist's contributions, or in hiring, promotion, or funding decisions.
  - Use other criteria such as collegiality, public conferences, tools development…
  - Promote training to research integrity
  - Have a local office and officer to research integrity

- Signed by 2685 organizations from 159 countries

- Exemple : **The European Molecular Biology Laboratory (EMBL)**

EMBL CV Instructions

To ensure all research outputs are considered during assessment, candidates are asked to include a narrative with significance of key research outputs within their CVs.

To help you being an responsible researcher

- **European code of conduct (Allea)**

  https://allea.org/code-of-conduct/

- **Office Français à l'intégrité scientifique (Hcéres)**

  https://www.hceres.fr/en/french-office-research-integrity

- **European Network of Research Integrity Office (ENRIO)**

  http://www.enrio.eu/

- **US research integrity office**

  https://ori.hhs.gov/

- **UK research integrity office**

  https://ukrio.org/

- **CNRS guide**

  https://comite-ethique.cnrs.fr/wp-content/uploads/2020/09/COMETS-GUIDE-EN.pdf