

# Identifying, Understanding, Avoiding, and Traversing Gray Areas

An Introduction to Research Ethics

Sarah Schaack

Reed College

By the end of today I want each of you to....

- 1) Find out more about research misconduct, its frequency, and its consequences.
- 2) Recognize that there are lots of gray areas, which often require thought and discussion to avoid.
- 3) Learn some guiding principles that can help you navigate ambiguous situations.
- 4) Understand the importance of communicating about ethical questions with colleagues, supervisors, and mentors.
- 5) Know the resources available to you, should you need to report research misconduct.

# Today's Agenda

Classic research misconduct

Fabrication, Falsification, Plagiarism

Other forms of misconduct

Including some that you may have not considered misconduct

New and emerging forms of misconduct

Related to technology, large datasets, the current reward structure of science

What is and is not misconduct?

Why do people violate research ethics?

What can you do?

Guiding principles and courses of action

# The Basics

- Classic misconduct
  - Fabrication
  - Falsification
  - Plagiarism
- Relatively easy to avoid
  - Report only what you have observed
  - Cite your work
- *Retaliation against someone reporting misconduct is also misconduct*



The screenshot shows the website for the Office of Research Integrity (ORI), part of the U.S. Department of Health & Human Services. The page is titled "Definition of Research Misconduct" and includes a navigation menu with options like Home, About ORI, News & Events, Research Misconduct, RCR Resources, and Programs. The main content area defines research misconduct as fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results. It lists four categories: (a) Fabrication, (b) Falsification, (c) Plagiarism, and (d) Research misconduct does not include honest error or differences of opinion. The page also features a "Printer Friendly" link and a "Last Updated" timestamp.

U.S. Department of Health & Human Services

ORI THE OFFICE OF RESEARCH INTEGRITY

Home About ORI News & Events Research Misconduct RCR Resources Programs

Home >> Definition of Research Misconduct

Printer Friendly

## Definition of Research Misconduct

Research misconduct means fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results.

(a) Fabrication is making up data or results and recording or reporting them.

(b) Falsification is manipulating research materials, equipment, or processes, or changing or omitting data or results such that the research is not accurately represented in the research record.

(c) Plagiarism is the appropriation of another person's ideas, processes, results, or words without giving appropriate credit.

(d) Research misconduct does not include honest error or differences of opinion.

Last Updated on Mon, 2011-04-25 12:05.

# More Than Just a Bad Apple?

- The number of cases has increased over time
- There are more detailed patterns that might illuminate motives

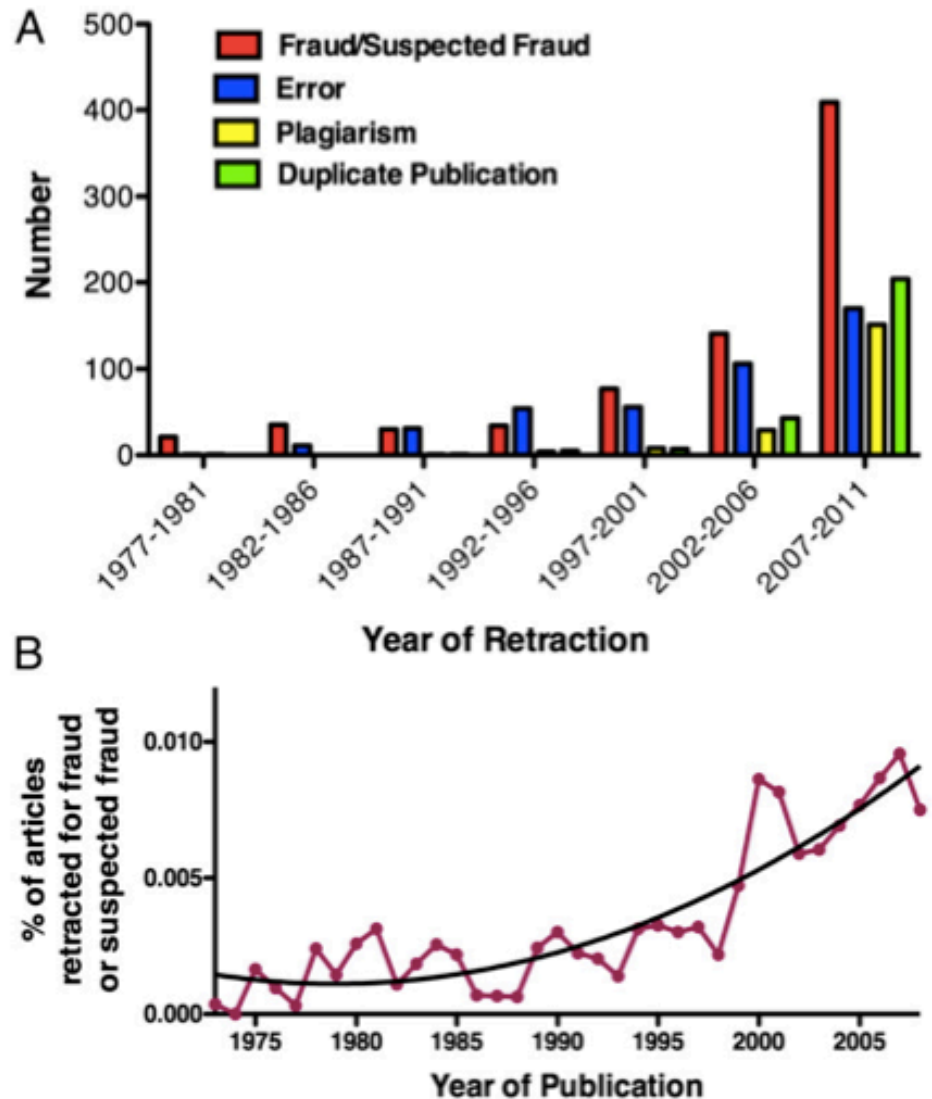
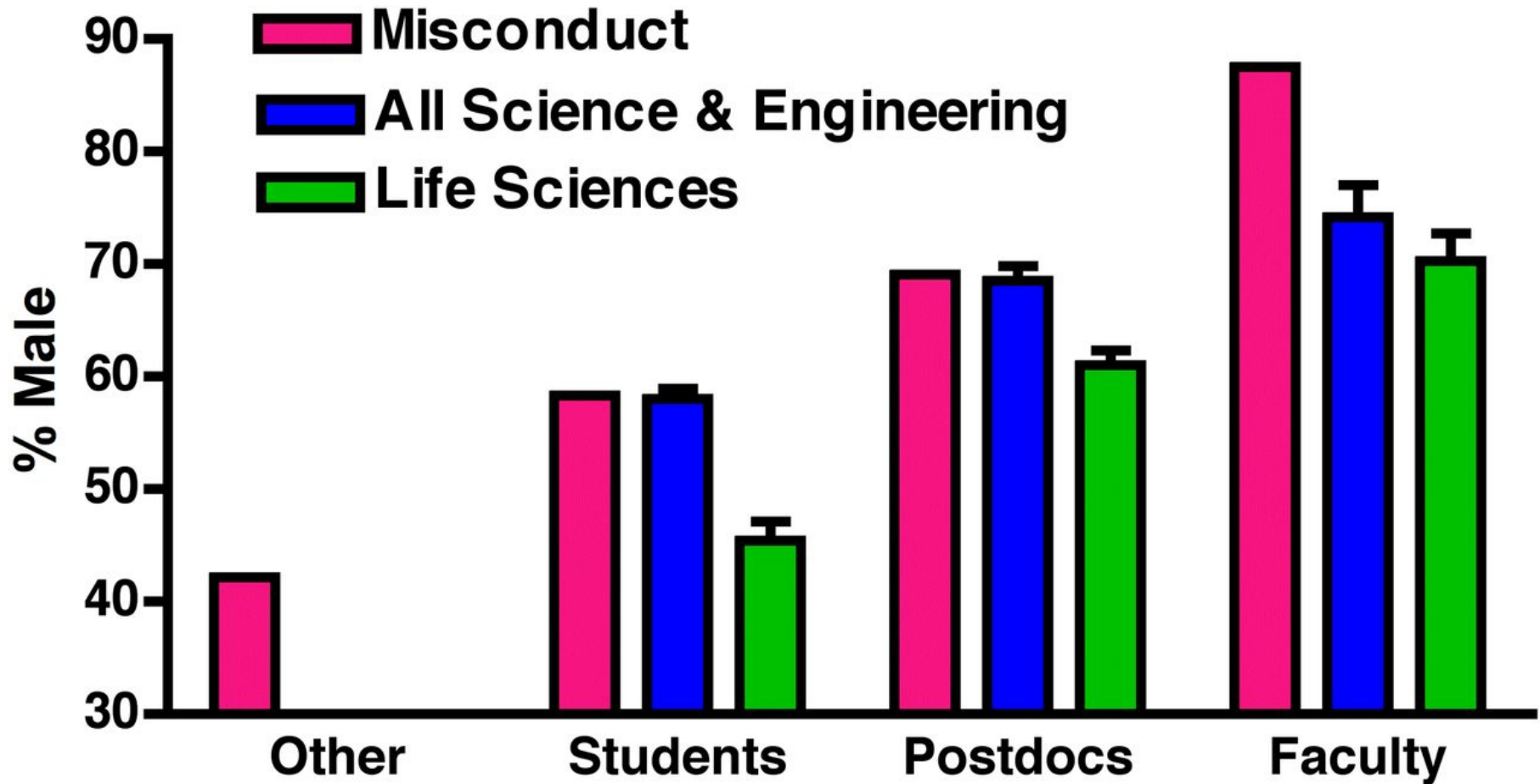


Fig. 1. (A) Number of retracted articles for specific causes by year of retraction. (B) Percentage of published articles retracted for fraud or suspected fraud by year of publication.

# Misconduct occurs at all levels



# Fraud Appears in “Good” Journals

**Table 1. Journals with most retracted articles**

Journal	No. of articles	IF
Total		
<i>Science</i>	70	32.45
<i>Proceedings of the National Academy of Sciences</i>	69	10.47
<i>The Journal of Biological Chemistry</i>	54	5.12
<i>Nature</i>	44	36.24
<i>Anesthesia &amp; Analgesia</i>	40	3.07
<i>The Journal of Immunology</i>	34	5.86
<i>Blood</i>	28	9.79
<i>The Journal of Clinical Investigation</i>	23	15.43
<i>Cell</i>	22	34.77
<i>Biochemical and Biophysical Research Communications</i>	18	2.52
<i>The New England Journal of Medicine</i>	16	50.08
<i>The EMBO Journal</i>	15	8.83
<i>Journal of Hazardous Materials</i>	15	4.55
<i>Molecular and Cellular Biology</i>	15	5.77
<i>Infection and Immunity</i>	14	4.06

# 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

In conclusion, several surveys asking scientists about misconduct have been conducted to date, and the differences in their results are largely due to differences in methods. Only by controlling for these latter can the effects of country, discipline, and other demographic characteristics be studied in detail. Therefore, there appears to be little scope for conducting more small descriptive surveys, unless they adopted standard methodologies. On the other hand, there is ample scope for surveys aimed at identifying sociological factors associated with scientific misconduct. Overall, admission rates are consistent with the highest estimates of misconduct obtained using other sources of data, in particular FDA data audits [11], [18].

However, it is likely that, if on average 2% of scientists admit to have falsified research at least once and up to 34% admit other questionable research practices, the actual frequencies of misconduct could be higher than this.



# Why Might Scientists Commit Fraud?

# What are some additional forms of research misconduct?

## *Human Subjects, Animal Welfare, and Collecting*

Working with live humans and some animals requires submitting research plans to the Institutional Review Board (Humans) or Animal Care and Use panels for review, obtaining consent, and/or obtaining permits.

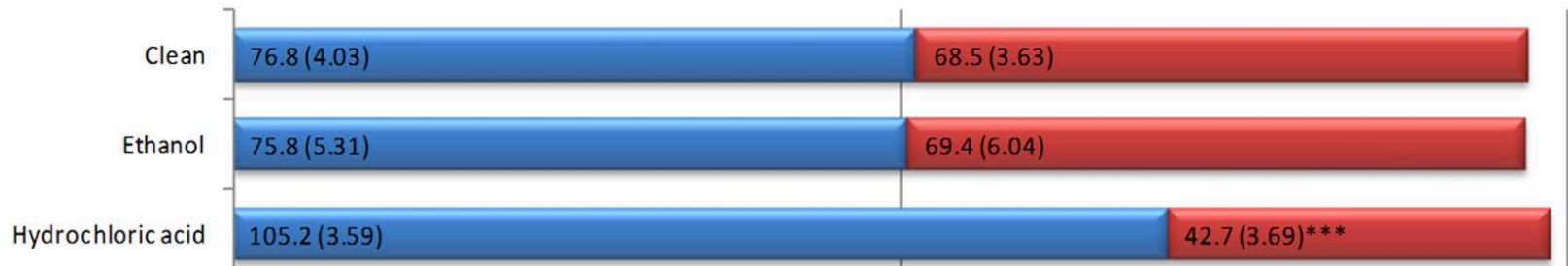
From the Belmont Report:

3 principles: respect for persons, beneficence, and justice

3 primary areas of application: informed consent, assessment of risks and benefits, and selection of subjects

Generally, the ethical foundations of using animals in research includes minimizing: risk, the loss of life, pain, and the destruction of samples.

**Controls**



**Anaesthetics**



n 75 150  
 \*P < 0.05 \*\*P < 0.01 \*\*\*P < 0.001

Time (seconds)

Readman et al. 2013  
 Wong et al. 2014

# Survey of the Quality of Experimental Design, Statistical Analysis and Reporting of Research Using Animals

Carol Kilkenny<sup>1\*</sup>, Nick Parsons<sup>2</sup>, Ed Kadyszewski<sup>3</sup>, Michael F. W. Festing<sup>4</sup>, Innes C. Cuthill<sup>5</sup>, Derek Fry<sup>6</sup>, Jane Hutton<sup>7</sup>, Douglas G. Altman<sup>8</sup>

**1** The National Centre for the Replacement, Refinement and Reduction of Animals in Research, London, United Kingdom, **2** Warwick Medical School, University of Warwick, Coventry, United Kingdom, **3** Pfizer Global Research and Development, Groton, Connecticut, United States of America, **4** Animal Procedures Committee, London, United Kingdom, **5** School of Biological Sciences, University of Bristol, Bristol, United Kingdom, **6** Animals Scientific Procedures Inspectorate, Home Office, Shrewsbury, United Kingdom, **7** Department of Statistics, University of Warwick, Coventry, United Kingdom, **8** Centre for Statistics in Medicine, University of Oxford, Oxford, United Kingdom

## Abstract

For scientific, ethical and economic reasons, experiments involving animals should be appropriately designed, correctly analysed and transparently reported. This increases the scientific validity of the results, and maximises the knowledge gained from each experiment. A minimum amount of relevant information must be included in scientific publications to ensure that the methods and results of a study can be reviewed, analysed and repeated. Omitting essential information can raise scientific and ethical concerns. We report the findings of a systematic survey of reporting, experimental design and statistical analysis in published biomedical research using laboratory animals. Medline and EMBASE were searched for studies reporting research on live rats, mice and non-human primates carried out in UK and US publicly funded research establishments. Detailed information was collected from 271 publications, about the objective or hypothesis of the study, the number, sex, age and/or weight of animals used, and experimental and statistical methods. Only 59% of the studies stated the hypothesis or objective of the study and the number and characteristics of the animals used. Appropriate and efficient experimental design is a critical component of high-quality science. Most of the papers surveyed did not use randomisation (87%) or blinding (86%), to reduce bias in animal selection and outcome assessment. Only 70% of the publications that used statistical methods described their methods and presented the results with a measure of error or variability. This survey has identified a number of issues that need to be addressed in order to improve experimental design and reporting in publications describing research using animals. Scientific publication is a powerful and important source of information; the authors of scientific publications therefore have a responsibility to describe their methods and results comprehensively, accurately and transparently, and peer reviewers and journal editors share the responsibility to ensure that published studies fulfil these criteria.

# Are these examples of misconduct?

- Performing a large experiment where animals have to be sacrificed based on no preliminary data
- Sacrificing invertebrates or plants without consent
- Analyzing samples collected without permits, if the results would have societal benefits

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## *Perspectives on Animal Use*

### **The Moral Status of Mice**

Harold A. Herzog, Jr.

In a Panglossian “best of all possible worlds,” the codes of morality are simple as well as just, but in reality, those interested in moral philosophy soon find themselves treading murky waters. This simple fact is as true when contemplating the moral status of animals as it is when making moral decisions that pertain to people. For example, readers of the *American Psychologist* have recently been exposed to impassioned, yet well-reasoned arguments both attacking (Rollin, 1985) and defending (Miller, 1985; Feeney, 1987) the

ago, a state-of-the-art animal facility was incorporated into the building’s design. The section of the building that houses animals is a model of cleanliness, and the animals seem well cared for by diligent personnel. A consulting veterinarian is on the staff. The facility is fully accredited by the American Association for the Accreditation of Laboratory Animal Care, and it is inspected regularly by representatives of the United States Department of Agriculture. In addition, every experiment undertaken at the university that uses



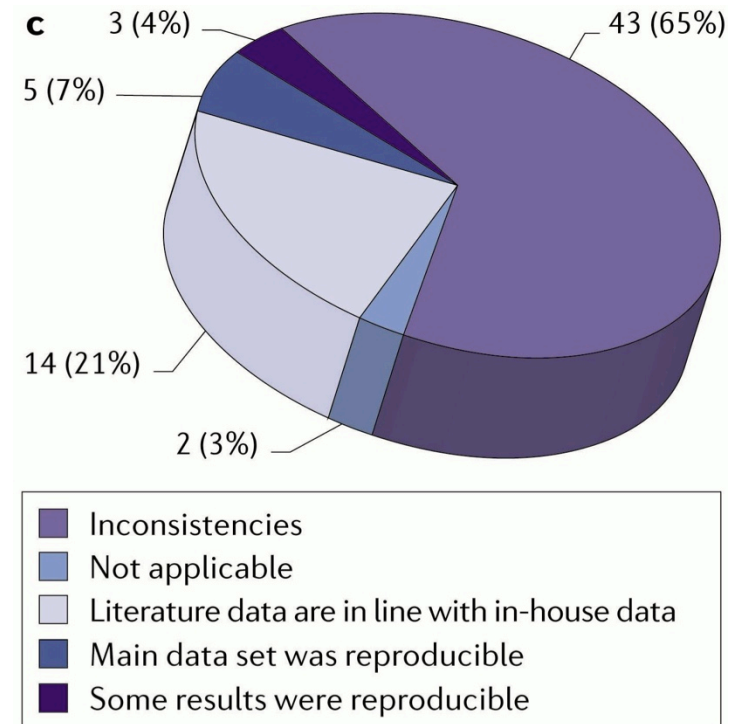
The “good”,  
the “bad”,  
and the  
“feeder”  
mice.

# Where is the line between “mistakes” and unethical practice?

- Lack of/Inappropriate controls
- Non-randomization
- Bias in assigning groups
- Poor or pseudoreplication
- Labeling correctly, lab notebook keeping
- Contamination
- Calibration
- “Cleaning” datasets
- Eliminating “outliers”

# Reproducibility

- Data management, organization, reusability
- Replicability versus reproducibility
- Probably one of the biggest topics in research ethics discussions currently



67 studies examined  
7% were reproducible

- When, if ever, is it okay to ignore outliers?
- Is it important to make raw data, not just analyzed data, available?
- If you realize you made a mistake, what do you do?

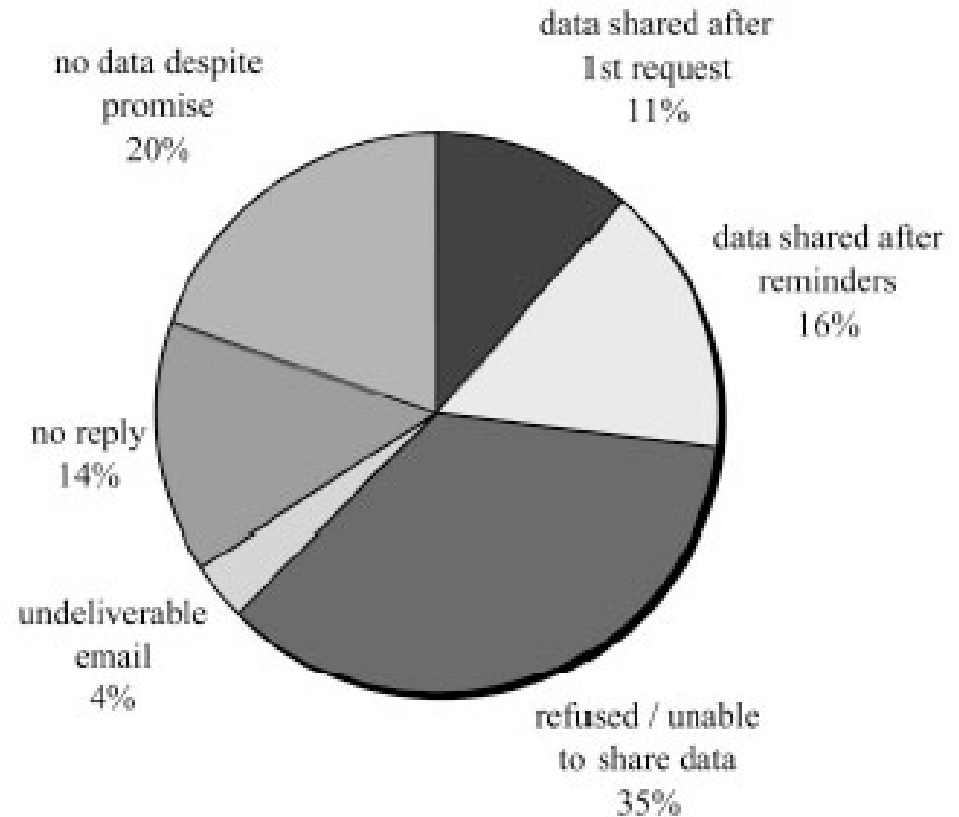




# Sharing Data

- Depositing specimens in museums
- Depositing sequences in GenBank
- Publishing complete methods
- Sharing constructs
- Making datasets available
- Sharing tissues, cell lines

**Figure 1.**  
*Percentages of Empirical Articles' Corresponding Authors in Different Response Categories*

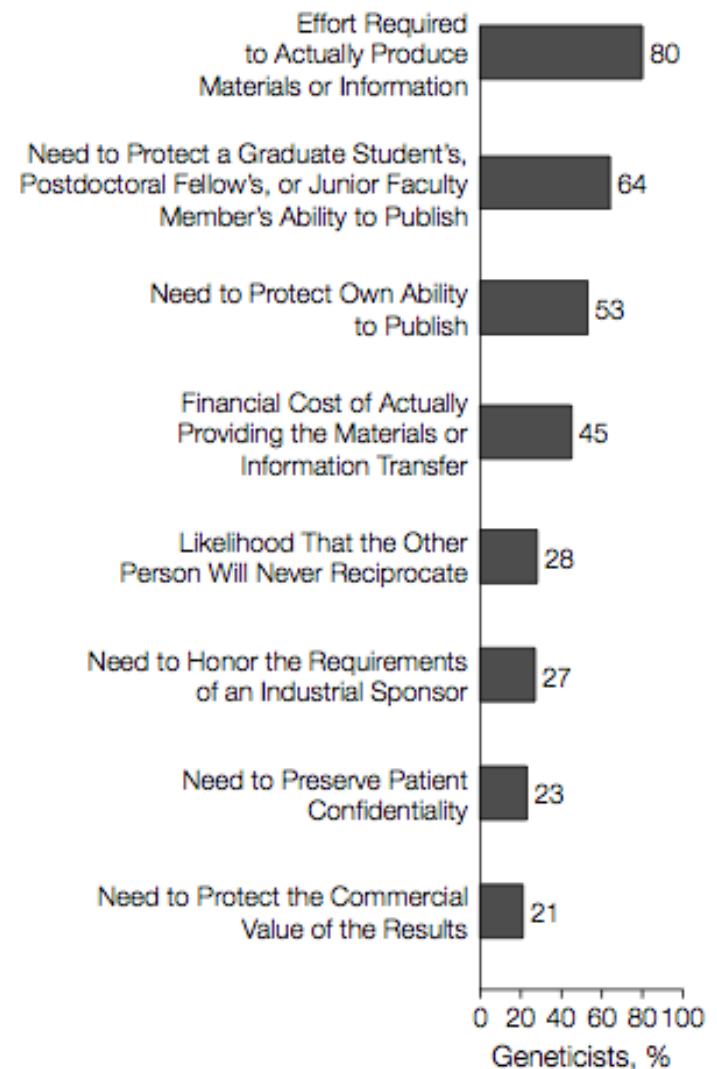


# Giving Credit

- Citations
  - Essential, but is it possible to cite ALL relevant papers? Many times there is a citation limit.
- Contributions
  - Acknowledgment
  - Authorship
  - Ownership

- Do you have to make data available if you're not done analyzing it?
- Is providing a sample enough to "get" authorship?
- Should you cite papers you've never read?

**Figure.** Geneticists' Reasons for Withholding Postpublication Information, Data, or Materials



Respondents who considered these motivating factors very important or important.

# Peer Review, Confidentiality, and Conflicts of Interest

- Peer Review (Manuscripts and Proposals)
  - Considered a cornerstone of science– why?
  - Can be blind, double-blind,....
  - Why is confidentiality important for peer review?
- Avoid conflicts of interest
  - reviewing papers written by friends or enemies
  - reviewing proposals by collaborators, current or former (how long?)

# New Problems (and New Versions of Old Problems)

- Republication
- Multiple/inappropriate funding sources
- Consent
- Recombinant DNA and Synthetic Nucleic Acid Molecules
  - Institutional Biosafety Committee (IBC)
- Stem Cell Research
- Intellectual Theft
- Safety training

# Funding and Double-Dipping

HOME PAGE TODAY'S PAPER VIDEO MOST POPULAR U.S. Edition ▼

The New York Times

N.Y. / Region

WORLD U.S. N.Y. / REGION BUSINESS TECHNOLOGY SCIENCE HEALTH SPORTS OPINION

**FOR EVERYONE**



### 3 N.Y.U. Scientists Accepted Bribes From China, U.S. Says

By BENJAMIN WEISER  
Published: May 20, 2013

It was, the chief federal prosecutor in Manhattan said on Monday, “a case of inviting and paying for foxes in the henhouse.”

Three researchers at the [New York University School of Medicine](#) who specialized in magnetic resonance imaging technology had been working on research sponsored by a grant from the National Institutes of Health.

But, [prosecutors charged](#) on Monday, the three had their eyes on other business as well. They conspired to take bribes from a Chinese medical imaging company and a Chinese-sponsored research institute to share nonpublic information about their N.Y.U. work, according to the United States attorney’s office in Manhattan.

The defendants, all Chinese citizens, included [Yudong Zhu](#), 44, of Scarsdale, N.Y., an associate professor in the school’s radiology department who was described by the authorities as “an accomplished researcher and innovator.” He was hired by the university around 2008 to teach and conduct research related to innovations in M.R.I. technology, the authorities said.

After the National Institutes of Health awarded the university millions of dollars over five years to pay for Professor Zhu’s research, he arranged for the two other defendants to move to New York from China to work with him, prosecutors said. He also arranged for them to receive financial support from an executive of the Chinese imaging company who was also affiliated with the government-sponsored institute, officials said.

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THE WAY BACK  
WATCH TRAILER

Is it okay to obtain funding for a project from multiple organizations?

Is it okay to be paid for two internships simultaneously if you are willing to work 80 hrs per week?

Should research by private companies be secret if there are benefits for human health?

# Chemist to Court Over Assistant's Death

**A UCLA researcher could face more than 4 years in jail for the death of his research assistant in a lab accident.**

By Bob Grant | April 30, 2013

3 Comments



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WIKIMEDIA, StockMonkeys.com

Patrick Harran, a University of California, Los Angeles, organic chemist, will stand trial in a California court for the death of his research assistant, Sheharbano "Sheri" Sangji, who died 4 years ago, at the age of 23, when she caught fire in the lab. Sangji was working with t-butyl lithium, a highly reactive chemical, in the lab on December 29, 2008, when the volatile liquid contacted air and burst into flames, setting her clothes ablaze. She suffered third-degree burns and died after spending 18 days in the hospital.

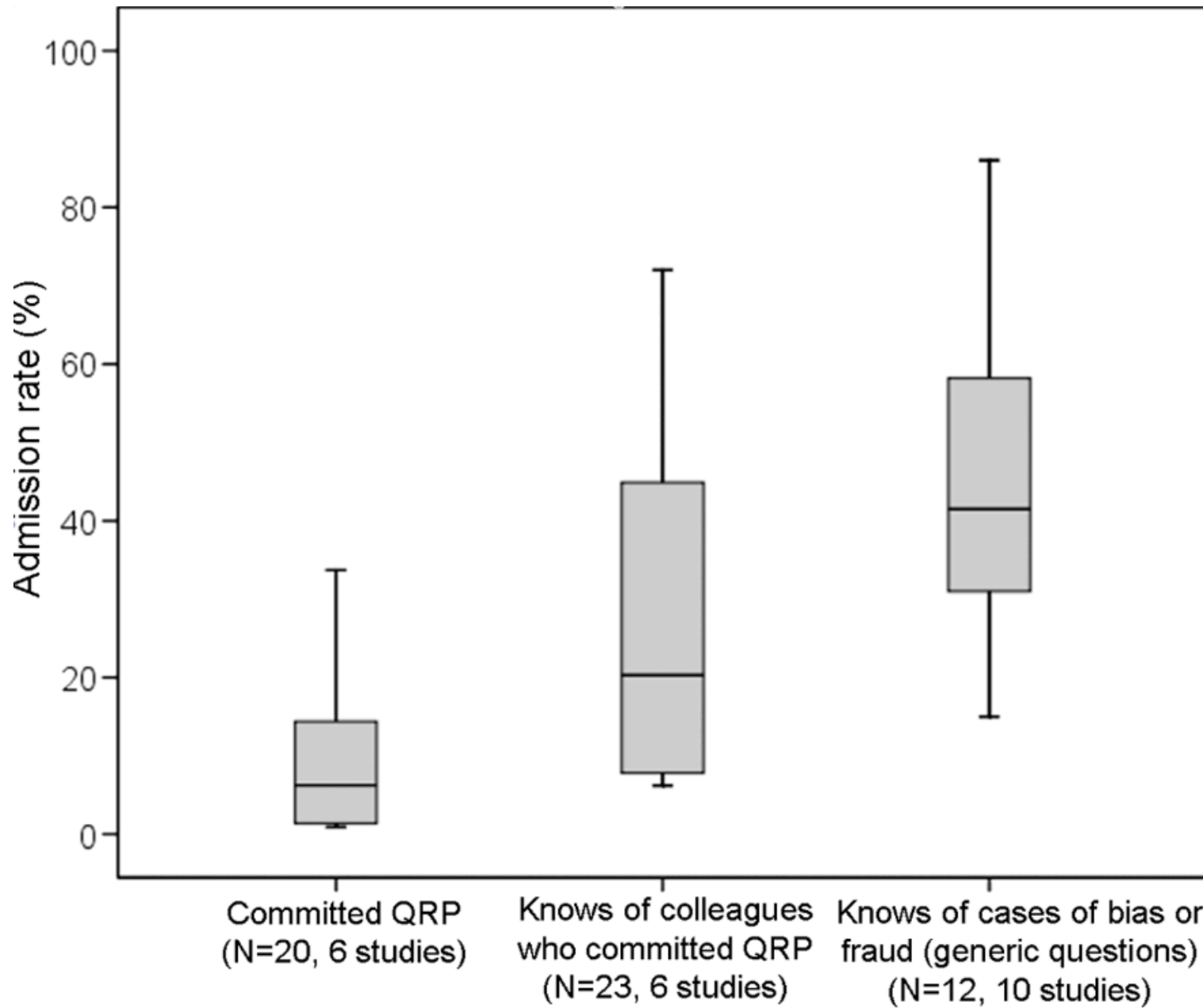
Sangji was not wearing a flame-retardant lab coat, which contributed to her polyester sweater catching fire. In 2011, the Los Angeles district attorney charged Harran with 3 counts of "willful violation of an occupational health and safety standard." It was the first time that a criminal prosecution had ever resulted from an accident in a US academic lab, and Harran is the first scientist to go to trial under such circumstances.

UCLA, which has been fined and threatened with similar charges, is standing by Harran. "The accident that took Sheri Sangji's life was a terrible tragedy for our campus, and I can't begin to imagine the devastation to her family," UCLA chancellor Gene Block said in a statement released on Friday (April 26). "We must remember, however, that this was an accident, not a crime. Patrick Harran is a talented and

# What You Can Do

- Be most excellent
- Discuss the gray areas
- Communicate concerns
- Ask for help
- Report ethical breaches
- Use resources, whistleblower protection
- Consider the consequences of your actions
- *Hold yourself to the same standards you hold others*





What if someone doesn't *intend* to be unethical?

# Guiding Principles

Honesty

Truth

Fairness

Openness

Transparency

Accuracy

Competency

(modified) Golden Rule:

Do as you expect others to do

# What You Can Do

- In your research
  - Seek out and follow best practices
  - Admit doubt
  - **Communicate**
  - Provide raw data
  - Note programs, instruments, software (and versions) used for data collection and analysis
  - Report parameters chosen and/or share custom methods
  - Other ideas?

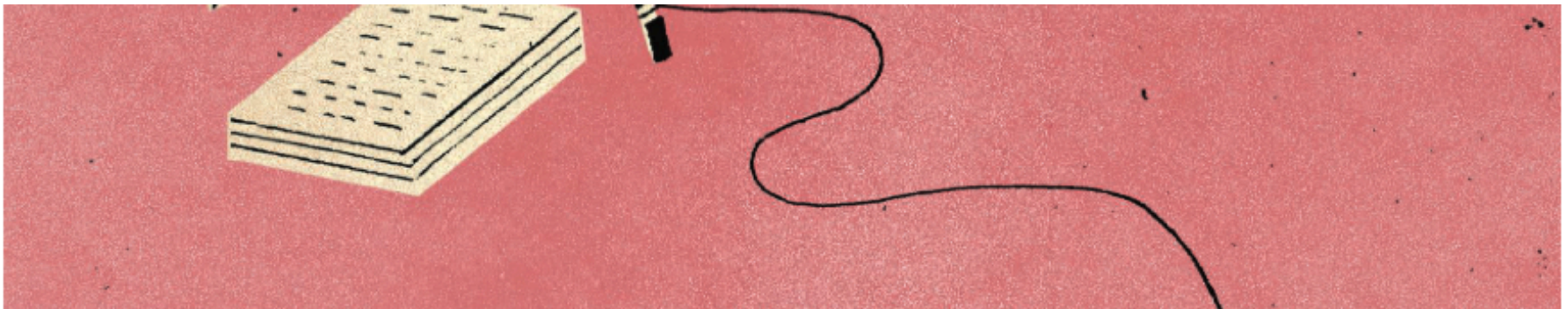
# Won't Peer Review Fix Everything?

**Fake paper submitted**

Accepted at 157

Rejected at 98

No response from 49



## Who's Afraid of Peer Review?

A spoof paper concocted by *Science* reveals little or no scrutiny at many open-access journals

On 4 July, good news arrived in the inbox of Ocorrafoo Cobange, a biologist at the Wasse Institute of Medicine in Asmara. It was the official letter of acceptance for a paper he had submitted 2 months earlier to the *Journal of Natural Pharmaceuticals*, describing the anticancer properties of a chemical that Cobange had extracted from a lichen.

In fact, it should have been promptly rejected. Any reviewer with

subscriptions. Most of the players are murky. The identity and location of the journals' editors, as well as the financial workings of their publishers, are often purposefully obscured. But *Science's* investigation casts a powerful light. Internet Protocol (IP) address traces within the raw headers of e-mails sent by journal editors betray their locations. Invoices for publication fees

# Consequences


- Investigation
- Retraction
- Additional oversight
- Loss of funding
- Loss of employment
- Incarceration
  
- Damage to others (patients, colleagues, students, scientists in general, progress)

*Cerebral* **CORTEX**

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**NOTICE OF RETRACTION: ‘The Emergence of  Orthographic Word Representations in the Brain: Evaluating a Neural Shape-Based Framework Using fMRI and the HMAX Model’ by Wouter Braet, Jonas Kubilius, Johan Wagemans and Hans P. Op de Beeck. doi: 10.1093/Cercor/bhs355, published online November 16, 2013**

The authors retract this publication. Because of human errors by the first/corresponding author, the fMRI data reported in this retracted paper were not analyzed properly. The errors were detected when other lab members reanalyzed the data for another purpose. At that point, it turned out that the original data analyses by the first author included several operations which are hard to replicate and which do not fit fully with the methods as agreed upon with the co-authors and as described in the paper. Because of this we no longer consider these results trustworthy.

The computational work in the manuscript, which was the sole contribution of co-author, J. Kubilius, is not compromised *per se*, but we

# It's Okay to Make Mistakes

- Errata
- Partial and complete retractions
  - Retractions by authors
- Correction over time

# Identifying Fraud and Whistleblowing

Published online 28 July 2011 | Nature | doi:10.1038/news.2011.437

News

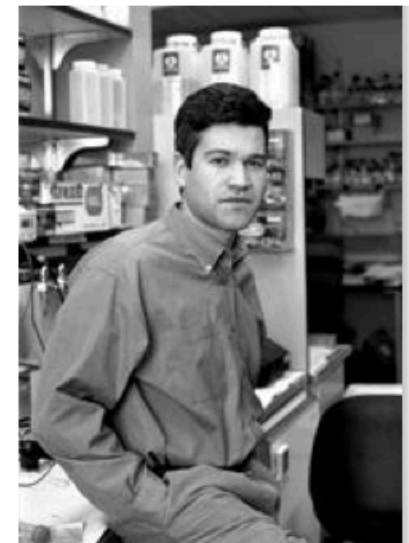
## Fraud case we might have seen coming

**Vigilance over early signs of misconduct is crucial to tackling scientific fraud.**

Eugenie Samuel Reich

Nobody likes to hear 'I told you so', not least over something that has had far-reaching consequences. But when David Baker read an [article](#) reporting that Luk Van Parijs, a former associate professor of immunology at the Massachusetts Institute of Technology (MIT) in Cambridge, had been convicted of grant fraud, he felt compelled to leave a brief anonymous comment noting that he had raised concerns over Van Parijs' data 14 years earlier.

Baker, a neuroimmunologist at Queen Mary, University of London, who voiced his concerns in an e-mail to the *Journal of Experimental Medicine (JEM)* in 1997 about a paper<sup>1</sup> authored by Van Parijs, feels that had the journal acted — perhaps by contacting other authors on the paper or by referring the matter to



Luk Van Parijs was sentenced in June to 6 months house arrest for grant fraud.

E. Quinn/Corbis



# Resources

Financial Conflict of Interest:

[http://www.lclark.edu/offices/human\\_resources/employee\\_resources/policies/institutional/general/grant\\_conflict\\_of\\_interest/](http://www.lclark.edu/offices/human_resources/employee_resources/policies/institutional/general/grant_conflict_of_interest/)

Conflict of Interest:

[http://www.lclark.edu/offices/human\\_resources/employee\\_resources/policies/institutional/general/code\\_of\\_ethics/](http://www.lclark.edu/offices/human_resources/employee_resources/policies/institutional/general/code_of_ethics/)

Possible Misconduct in Research: <http://www.lclark.edu/about/leadership/provost/handbook/>

Intellectual Property Rights Policy:

[http://www.lclark.edu/offices/human\\_resources/employee\\_resources/policies/institutional/general/intellectual\\_property/](http://www.lclark.edu/offices/human_resources/employee_resources/policies/institutional/general/intellectual_property/)

Research involving Human Subjects: [http://www.lclark.edu/committees/human\\_subjects\\_research/](http://www.lclark.edu/committees/human_subjects_research/)

Research involving Recombinant DNA:

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Research involving Animals: [http://college.lclark.edu/offices/sponsored\\_research/internal\\_resources/iacuc.php](http://college.lclark.edu/offices/sponsored_research/internal_resources/iacuc.php)

Lewis & Clark's Office of Institutional Research: [http://www.lclark.edu/offices/institutional\\_research/](http://www.lclark.edu/offices/institutional_research/)

Lewis & Clark's CAS Sponsored Research Office: [http://college.lclark.edu/offices/sponsored\\_research/](http://college.lclark.edu/offices/sponsored_research/)

Other related policies and procedures: [http://college.lclark.edu/offices/sponsored\\_research/policies/](http://college.lclark.edu/offices/sponsored_research/policies/)

<http://www.hhs.gov/news/factsheet/integrity.html>

<http://grants.nih.gov/training/responsibleconduct.htm>

Lewis & Clark's Research Integrity Officer is **Gary Reiness**.

Feel free to consult with him confidentially

Albany 201; [reiness@lclark.edu](mailto:reiness@lclark.edu); X7513

## Hopefully, you now....

- Know more about research misconduct, its frequency, and its consequences.
- Recognize that there are lots of gray areas, which often require thought and discussion to avoid.
- Understand some guiding principles that can help you navigate ambiguous situations.
- Realize the importance of communicating about ethical questions with colleagues, supervisors, and mentors early.
- Have information on the resources available to you, should you need to report research misconduct.