Misconduct in Biomedical Research: Inappropriate Image Duplications

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Disclosures and Acknowledgements

- Consulting and speaker's honoraria - *Universities, scientific publishers*
- uBiome (2016-2018) - *four patents, founders charged with insurance fraud*
- Patreon account - [https://www.patreon.com/elisabethbik](https://www.patreon.com/elisabethbik)
Publications are the foundation of science

- Science is about finding the truth
- Science builds upon science: Publications as building blocks
- Scientists build upon each other's work
- Built on trust: Most scientists are honest
- Science is not immune to fraud
- Science misconduct: Plagiarism, Falsification, Fabrication

Why do people cheat in science?

- **Pressure to publish**
  - Publications as measure of productivity
  - Easier to publish positive results than negative results

- **Taste of success**
  - Successful postdoc, Nature or Science publication
  - Disappointing results after becoming professor

- **Power play**
  - Professor in power demanding experiments to succeed
  - Threatens to fire graduate student / postdoc
Research images are unique

None of these images are fraudulent!
Type I: Simple Duplication

University of South Carolina, USA
PLOS ONE, May 2014, DOI: 10.1371/journal.pone.0096343
Type II: Duplication with repositioning
Type II: Duplication with repositioning

A

University of Illinois College of Medicine at Peoria, USA
PLOS ONE (2010), DOI: 10.1371/journal.pone.0011813 - Cited 61 times
Reported to institute and journal in October 2019, not yet addressed
Type III: Duplication with alteration

Indian Institute of Technology Kharagpur, India
Biochimie (2013), DOI: 10.1016/j.biochi.2013.06.027, cited by 25
Type III: Duplication with alteration

Université de la Méditerranée, Marseille, France

Journal of Infectious Diseases (2003), DOI: 10.1086/379080, cited by 116 papers

Reported online March 2021, not addressed yet.
Type III: Duplication with alteration

University of Glasgow, UK
PLOS ONE, DOI: 10.1371/journal.pone.0106262, cited by 2
Reported to institution in March 2016, retracted August 2018
Type III: Duplication with alteration

University of Gdansk & Medical University of Gdansk, Poland
Reported to journal in November 2016, retracted January 2019
Type III: Duplication with alteration

Anna University, India, cited 179 times.
Journal of Molecular Catalysis A (2007), DOI: 10.1016/j.molcata.2006.10.051
Reported to journal editors in September 2019; will be retracted?
Type III: Duplication with alteration

Before laser treatment

Six months after laser treatment

Poole Hospital NHS Foundation Trust, UK
Reported to journal November 2019, retracted March 2020
Type III Duplication: NMR spectrum

Dumlupınar University, Turkey
Scientific Reports (2020), DOI: 10.1038/s41598-020-68709-5, cited by 2
Reported August 2020, retracted March 2021
Inappropriate image duplication

The Prevalence of Inappropriate Image Duplication in Biomedical Research Publications

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• I scanned 20,621 papers from 1995-2014 - by eye
• 40 journals from 14 publishers
• Found ~ 800 papers with duplicated figures (4%)
• 3 types: I. Simple - II. Repositioned - III. Altered
• Not all are misconduct! About half intentional: 2%
• Alteration in other data types much harder to detect
Journals are very slow to respond

782 papers reported to journals in 2014/2015
65% of papers have not been corrected/retracted five years after reporting

May 2022: 6,136 papers found; 2,647 reported to journals/institutions
Institutions often sweep it under the carpet

The New York Times

*Years of Ethics Charges, but Star Cancer Researcher Gets a Pass*

Investigation conclusions and handling opinions on 63 papers by academician X: "After investigation, no fraud, or plagiarism was found...."

www.most.gov.cn

Mare

Opposition to Colzato's anonymous fraud report: 'This seems to be from the secret service'

The Institute of Psychology, the Scientific Integrity Committee and the Faculty Board of Social Sciences oppose the anonymization of publications in which Leiden psychologist Lorenza Colzato committed fraud. "This hinders the entire scientific community."

Vincent Bongers and Sebastiaan van Loosbroek

www.complianceandethics.org
Reporting concerns about research misconduct

The Official Professional Way:
● Contact Editor-in-Chief of journal
● Contact Research Integrity Officer of university
● Investigation might follow - or not
● Original files might take away concerns

The Experienced, Frustrated, and Proactive Way
● Posting on PubPeer.com (5,543 of 6,163)
Image Duplication Detection Software


Journals adopt AI to spot duplicated images in manuscripts

A few publishers are using automated software to catch flaws in submitted papers.

Bioscience-scale automated detection of figure element reuse

Daniel E. Acuna, Paul S. Brookes, Konrad P. Kording
doi: https://doi.org/10.1101/269415
This article is a preprint and has not been certified by peer review [what does this mean?].
Artificial Intelligence can create fake photos

GAN = Generative Adversarial Network (Machine Learning)

https://this-person-does-not-exist.com/en
GAN technology has troubles with cats

https://TheseCatsDoNotExist.com/
GAN technology used in Paper Mills

- Scientific paper mills - China, Russia, Iran
- Sell authorships on already accepted papers
- Sell fake papers written by ghostwriters with fabricated data
- Credit: Anna Abalkina, Jana Christopher, Jennifer Byrne, Smut Clyde, Morty, Tiger, Cheshire

Tadpole paper mill, 600 papers so far
Science Misconduct: Discussion

• What is percentage of misconduct?
• Why do people commit science misconduct?
• Are we focusing too much on publications/productivity?
• Conflicts of interest (*publishers, institutions*)
• Whose role is it to detect science misconduct?
• Legal protection for whistleblowers
• Tremendous cost of science misconduct (*scientists, science*)