Scientific Misconduct

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Adapted from a presentation by
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What is Misconduct?

Federal policy on misconduct in science defines research misconduct *as "fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results".*

http://www.ostp.gov/html/001207_3.html

What Are the Consequences of Misconduct?

For the Individual

- Loss of grant support
- Loss of job
- Loss of freedom
- Loss of reputation

For the Institution

For the Scientific Enterprise

For Society

Werner Bezwoda, South African researcher, falsified data on breast cancer treatment involving high doses of chemotherapy and bone marrow transplantation:

Thousands of women were treated
Many did not survive the therapy


ONCOLOGY TIMES

THE INDEPENDENT NEWSPAPER FOR CANCER SPECIALISTS

More Fraud Found in Earlier Bezwoda Data

Should Clinical Trials on HDC/BMT for Breast Cancer Continue?

Consensus Panel: Antiangiogenesis Drugs Unlikely as Single Agents

(Self-Reported) Major Misconduct is Rare

Table 1 | Percentage of scientists who say that they engaged in the behaviour listed within the previous three years ($n = 3,247$)

Top ten behaviours	All	Mid-career	Early-career
1. Falsifying or 'cooking' research data	0.3	0.2	0.5
2. Ignoring major aspects of human-subject requirements	0.3	0.3	0.4
3. Not properly disclosing involvement in firms whose products are based on one's own research	0.3	0.4	0.3
4. Relationships with students, research subjects or clients that may be interpreted as questionable	1.4	1.3	1.4
5. Using another's ideas without obtaining permission or giving due credit	1.4	1.7	1.0
6. Unauthorized use of confidential information in connection with one's own research	1.7	2.4	0.8 ***
7. Failing to present data that contradict one's own previous research	6.0	6.5	5.3
8. Circumventing certain minor aspects of human-subject requirements	7.6	9.0	6.0 **
9. Overlooking others' use of flawed data or questionable interpretation of data	12.5	12.2	12.8
10. Changing the design, methodology or results of a study in response to pressure from a funding source	15.5	20.6	9.5 ***
Other behaviours			
11. Publishing the same data or results in two or more publications	4.7	5.9	3.4 **
12. Inappropriately assigning authorship credit	10.0	12.3	7.4 ***
13. Withholding details of methodology or results in papers or proposals	10.8	12.4	8.9 **
14. Using inadequate or inappropriate research designs	13.5	14.6	12.2
15. Dropping observations or data points from analyses based on a gut feeling that they were inaccurate	15.3	14.3	16.5
16. Inadequate record keeping related to research projects	27.5	27.7	27.3

Note: significance of χ^2 tests of differences between mid- and early-career scientists are noted by ** ($P < 0.01$) and *** ($P < 0.001$).

Martinson, B.C. et al. Nature 435:737, 2005.

…But Other Behaviors are not

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…and Bad Science is Common

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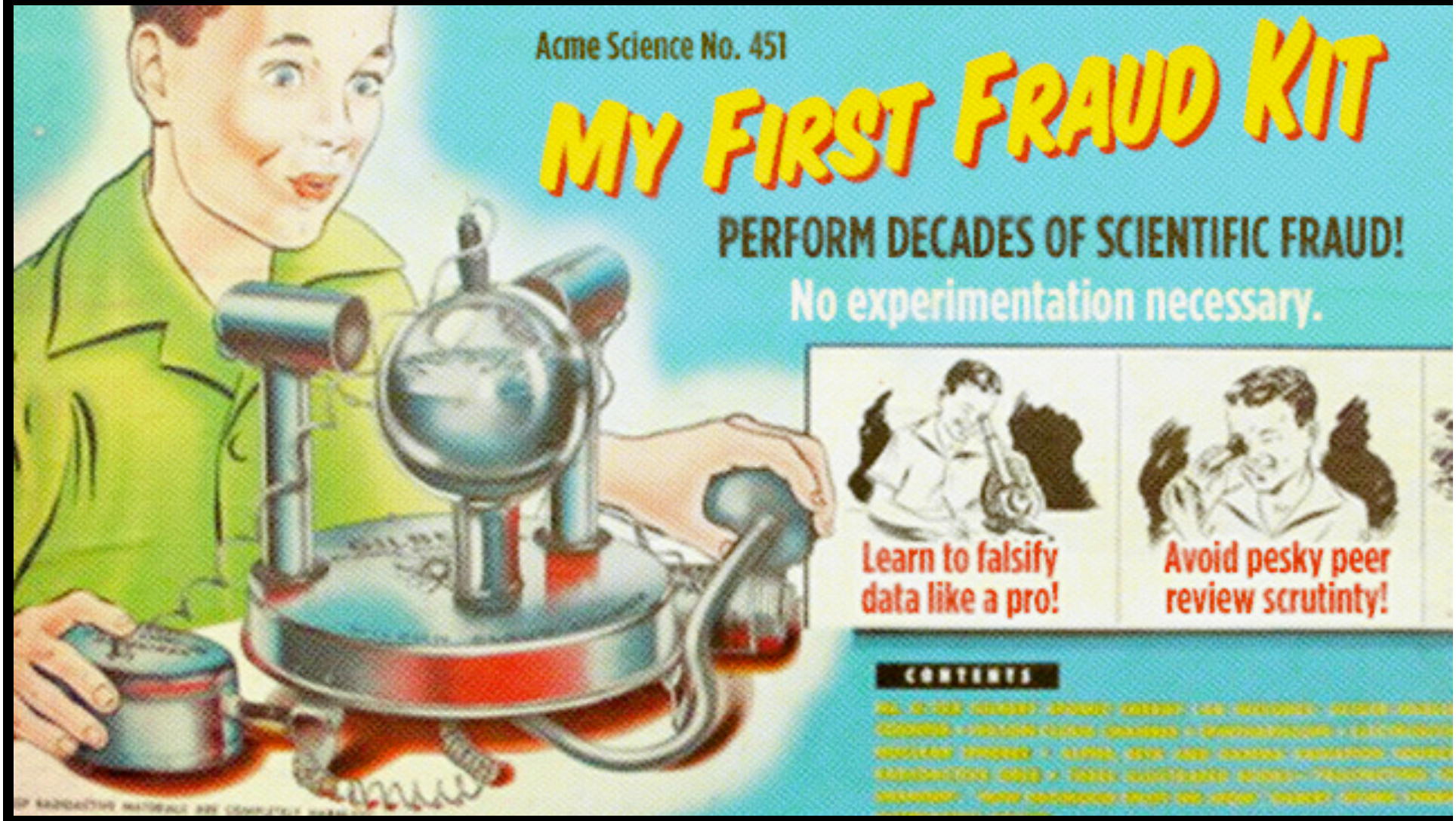
Over 65% of published retractions involve scientific misconduct

~300 retractions/year

Published retractions have increased 10 fold over the last decade

From “Fraud in the Scientific Literature”, NYT, October 12, 2012



Timmer, ArsTechnica, July 18, 2012

What constitutes ethical behavior is not always clear-cut

It may be unhelpful to regard misconduct as something we can eliminate by getting rid of a few "bad apples".

"Not all cases of misconduct are equally egregious, and not all perpetrators deserve to be branded as cheaters for the rest of their careers. There is often room for honest mistakes and differences of opinion…... Within individual labs, airing complex matters — such as decisions about when data can be justifiably excluded from analysis…. may reduce the chance that any single investigator's decision will later lead to accusations of misconduct."

- Nature Editorial (2008)

How is Misconduct Defined?

- ***Plagiarism*** is the appropriation of another person's ideas, processes, results, or words without giving appropriate credit.
- ***Fabrication*** is making up data or results and recording or reporting them.
- ***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.

http://www.ostp.gov/html/001207_3.html

Plagiarism

Common Types of Plagiarism

- Copying & pasting text from websites, or transcribing text from printed material is plagiarism. *So is simple translation of text from one language to another.*
- Unacknowledged modification of text is plagiarism (e.g., replacing a few words, by using a thesaurus, or rearranging the text slightly is not original scholarship).
- Unpermitted or unacknowledged use of videos, photos, slides or images is plagiarism.

http://www.ehhs.cmich.edu/~mspears/whatis.html (no longer online)
http://uwf.edu/dupserv/plagbroch.pdf

Reasons Honest People Plagiarize

Lack of understanding of the concept of plagiarism. ***You can help!*** *Some junior trainees may not understand what plagiarism is. By explaining it, you'll be doing them a big favor.*

Writing is hard. People may lack experience in writing & have difficulty expressing themselves well. So they lift or rearrange sentences. *There is no magic solution; only* ***practice and effort.***

Lack of scientific knowledge. If you do not fully understand the science, you cannot tell which words/phrases are important; this may cause you to lift sentences or phrases verbatim. *The solution is to ask questions;* ***know the science - then write your report.***

Detection of Plagiarism

- **A piece of text is just too good:** A student who ordinarily does not write well turns in a paper in which some sections are grammatically incorrect and have spelling errors (the ones they wrote themselves) while other sections are fabulous and read just like a textbook.
- **A piece of text seems awfully familiar:** A student turns in a paper that it is somehow very familiar (in whole or in part) to the reader.
- Text search/plagiarism detection software: Readily available and used by some medical journal publishers. Deja vu is an example: http://spore.swmed.edu/dejavu/browse

ORIGINAL	UNVERIFIED POTENTIAL DUPLICATE
J Clin Microbiol. 1999 Jan;37(1):74-80. *Vincelette J, Schirm J, Bogard M, Bourgault AM, Luijt DS, Bianchi A, van Voorst Vader PC, Butcher A, Rosenstraus M.*	J Clin Microbiol. 2000 Mar;38(3):1105-12. *Van Der Pol B, Quinn TC, Gaydos CA, Crotchfelt K, Schachter J, Moncada J, Jungkind D, Martin DH, Turner B, Peyton C, Jones RB.*
The fully automated COBAS AMPLICOR CT/NG test for the detection of Chlamydia trachomatis was **evaluated in a multicenter trial. Test performance was evaluated for** 2,014 endocervical swab and 1,278 urine specimens obtained from women and for 373 urethral swab and 254 urine specimens obtained from men. Culture served as the reference test. **Culture-negative,** COBAS AMPLICOR**-positive specimens that tested positive in a confirmatory PCR test for an alternative target sequence** within the C. trachomatis major outer membrane protein gene **were resolved as true positives. The overall prevalence of chlamydia was** 4.3% in cervical swabs and 11.0% in urethral swabs from men. When the results for each specimen type were considered separately, **the resolved sensitivities were** 96.5%.....**The internal control** provided in the COBAS AMPLICOR test **revealed that** 2.9% **of specimens were inhibitory when they were initially tested. Nevertheless, valid results were obtained for** 99. 1% **of specimens because** 68.7% **of the inhibitory specimens were not inhibitory when a second aliquot** of the original sample **was tested**. Two additional COBAS AMPLICOR-positive specimens were detected by retesting inhibitory specimens. **The COBAS AMPLICOR CT/NG test for the detection of C. trachomatis exhibited equally high sensitivities and specificities with both urogenital swab and urine specimens and, thus,** is **well-suited for use in screening.**	**The fully automated COBAS AMPLICOR CT/NG** and semiautomated AMPLICOR CT/NG tests were **evaluated in a multicenter trial** for the ability to detect Chlamydia trachomatis infections**. Test performance** compared to that of culture **was evaluated for** 2,236 matched endocervical swab and urine specimens obtained from women and for 1,940 matched urethral swab and urine specimens obtained from men. **Culture-negative,** PCR-**positive specimens that tested positive** in a direct fluorescent-antibody test or **in a confirmatory PCR test for an alternative target sequence were resolved as true positives**. **The overall prevalences of chlamydia were** 2.4% in women and 7.2% in men. The COBAS AMPLICOR and AMPLICOR formats yielded concordant results for 98.1% of the specimens. With the infected patient as the reference standard, **the resolved sensitivities** of COBAS AMPLICOR were 89.7%.....**The internal control revealed that** 2.4% **of the specimens were inhibitory when initially tested. Nevertheless, valid results were obtained for** 98.6% **of the specimens because** 59.1% **of the inhibitory specimens were not inhibitory when a second aliquot was tested. The COBAS AMPLICOR and AMPLICOR CT/NG tests for C. trachomatis exhibited equally high sensitivity and specificity with both urogenital swab and urine specimens and thus** are **well suited for screening** for C. trachomatis infection.

Why is this plagiarism?

- Significant chunks of text are copied verbatim
- The structure and organization of the abstracts are identical. This exemplifies "patchwriting", which is when the scientific design of a paper is plagiarized (along with much of the text) and the author's data are essentially plugged in, replacing the original data.
- 21 of 36 references are identical
- There are no common authors between the two papers. *The original article IS cited in the duplicate article, which is unusual for a plagiarized article.*

What is NOT plagiarism?

NIH Office of Research Integrity (ORI):

ORI generally does not pursue the limited use of identical or nearly-identical phrases which describe a commonly-used methodology.....because ORI does not consider such use as substantially misleading to the reader or of great significance."

http://ori.dhhs.gov/policies/plagiarism.shtml

The Thesis

"The doctoral thesis is expected to be an original critical or synthetic treatment of an appropriate subject, an original work of creative art, or an extended report of independent research, formulated in a scholarly manner and of a general excellence consistent with publication as a book or in scholarly journals of quality."

http://www.rochester.edu/Theses/index.html

Common Issues in Theses

- Inclusion of the author's previously published papers: *This is acceptable and even routine, with proper acknowledgement.*
- Inclusion of data from experiments performed by others: *Acceptable, with suitable acknowledgement.*
- Inclusion of information from a grant application: *Acceptable, with suitable acknowledgement.*

Avoiding Plagiarism

Guideline 1: ALWAYS acknowledge the contributions of others and the source of your ideas.

Guideline 2: Any verbatim text taken from another author must be enclosed in quotation marks.

Guideline 7: In order to make a proper paraphrase, we must have a thorough understanding of the ideas and terminology being used.

Guideline 10: When we submit a manuscript for publication containing data that have already been disseminated in some significant manner (e.g., published in another journal, presented at a conference, posted on the web) we must clearly indicate this.

http://facpub.stjohns.edu/~roigm/plagiarism/Plagiarism.html

Fabrication and Falsification

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Photoshopping & Its Consequences

Researcher suspended for falsifying data

The Ottawa Health Research Institute last week suspended postdoctoral fellow Kristin Roovers after learning that she had manipulated and falsified data published in several papers.

Roovers was hired by the institute in 2005. But in July 2007, the US Office of Research Integrity concluded that Roovers, while a graduate student and postdoctoral fellow at the University of Pennsylvania in Philadelphia, had manipulated 19 panels of western blot data. She had used Photoshop to copy a set of bands and paste them into other blots representing data from different experiments. The data ultimately appeared in 11 figures in three publications.

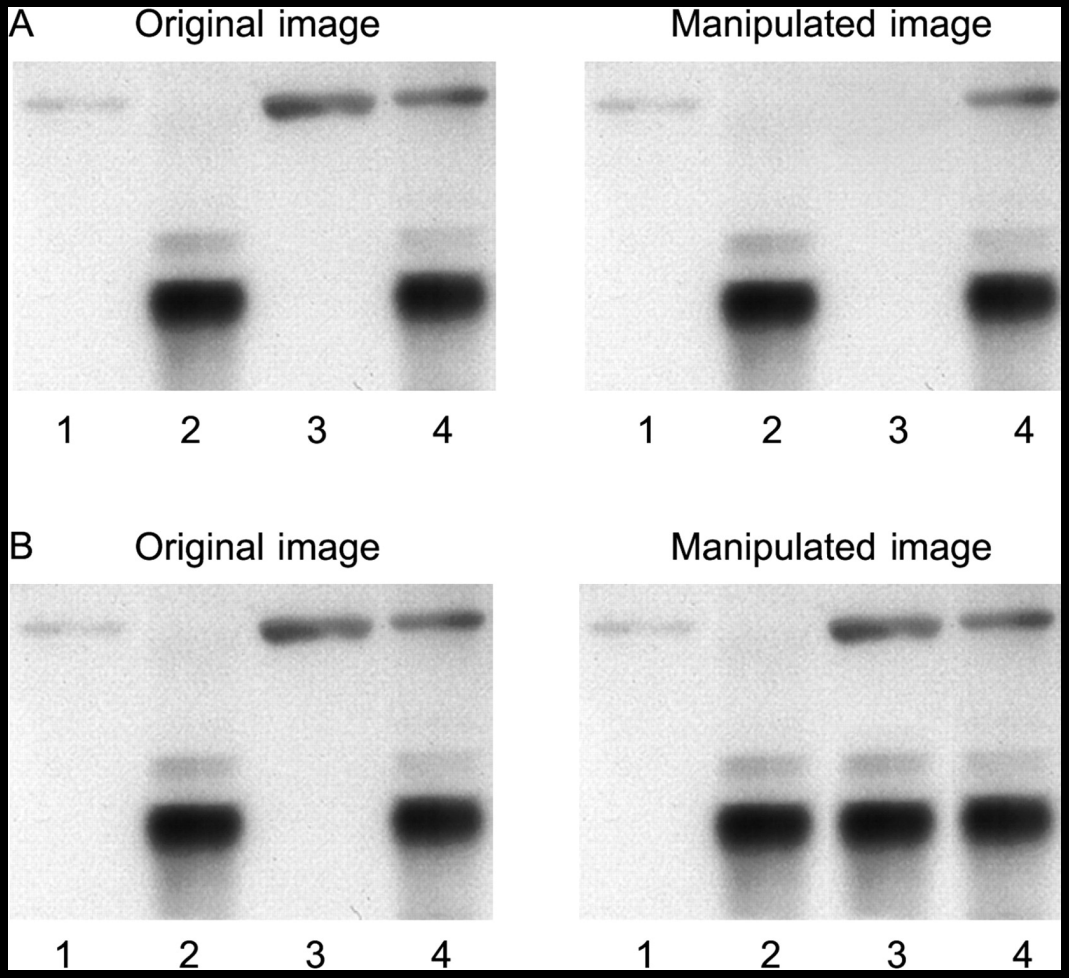
Two of the papers (K. Roovers and R. K. Assoian *Mol. Cell. Biol.* 23, 4283–4294; 2003, and K. Roovers *et al. Dev. Cell* 5, 273–284; 2003) have been retracted. A decision on the third (C. F. Welsh *et al. Nature Cell Biol.* 3, 950–957; 2001) is pending.

The Office of Research Integrity barred Roovers from receiving any US government grants for five years.

See Editorial, page 957.

Nature 453:969, 2008

Examples of Image Manipulation



Rossner M & Yamada KM. J Cell Biol 166:11, 2004.

Journal Policy on Image Manipulation

"No specific feature within an image may be enhanced, obscured, moved, removed, or introduced."

"The grouping of images from different parts of the same gel, or from different gels, fields, or exposures must be made explicit."

"Adjustments of brightness, contrast, or color balance are acceptable if they are applied to the whole image and as long as they do not obscure or eliminate any information."

- J. Cell Biol.

Common Forms of Image Manipulation

1. **Gross misrepresentation** (e.g., deleting lanes, cutting-and-pasting the same control lanes onto multiple gels)

2. **Selective removal** of background bands or blemishes

3. **Selective enhancement** of specific regions of an image

4. **Juxtaposition of data from different gels (or photographs)** onto the same final figure (the gel should be re-run!)

Rossner M & Yamada KM. J Cell Biol 166:11, 2004.

Formal Procedures (I)

Initial Reporting and Inquiry

- A written allegation is provided to the person's supervisor, who then informs the dean.
- The dean informs the provost and the senior VP and vice provost for health affairs (if this occurs in SMD or SON), who determines whether the allegations merit further scrutiny.
- If yes, an initial enquiry is carried out with input from the person whose actions are being questioned. The dean then decides if a formal investigation is warranted.

http://www.rochester.edu/provost/FacultyHandbook/
-> Misconduct

Formal Procedures (II)

Investigation

- The dean notifies the person being investigated and the director of ORPA, and appoints a fact-finding committee of at least 3 faculty members unaffected by the inquiry.
- The person(s) whose conduct is being investigated is given a written summary of all allegations and the opportunity to respond in writing.
- The committee files a report with the dean, stating whether or not the preponderance of the evidence indicates misconduct.

http://www.rochester.edu/provost/FacultyHandbook/
-> Misconduct

Formal Procedures (III)

Further Action

- If grant support is involved, ORPA will inform the sponsor.
- If publications are involved, the dept. chair will be asked to contact relevant journal editors.
- Disciplinary action will be taken, possibly including termination.
- If misconduct did not occur, reasonable efforts will be undertaken to restore the reputation of the individual whose conduct was questioned and to protect the standing of those who raised the questions – unless they acted in bad faith.

http://www.rochester.edu/provost/FacultyHandbook/
-> Misconduct

Possible Penalties at UR

- Requirement to repeat the assignment
- A request to write formal letter of apology
- An official letter of reprimand from the Dean
- Disciplinary probation, for a defined period
- A change in grade and/or issuance of a failing grade
- Academic suspension
- Explusion

http://www.rochester.edu/GradBulletin/ -> Regulations

Conclusions

- Scientific misconduct includes fabrication, falsification and plagiarism.
- Fabrication and falsification commonly involve manipulation of statistics or image data
- Bad science is much more more common than outright misconduct - and also damaging to the field
- Scientists have an obligation to act when they observe potential misconduct
- Many accusations of misconduct could be avoided through better communication