

Good and Bad Research Practice

Tom Britton

Department of Mathematics

Who am I?

- Professor at Dept of Mathematics (Appl math, Infectious Dis Mod)
- **Responsibilities:** PhD supervisor, Director of PhD Education, Head of Department, Section Dean
- **Ethics experience:** Group leader at this course, lectured for Humanities PhD ethics course, current member of **NPOF** since 2 years
- Many slides by Christina Moberg, KTH (previous lecturer on ethics course I have “inherited”)

Today's lecture

- What is research integrity
- What is good research practice
- What is responsibility of researcher
- What is research misconduct
- What control mechanisms are in place
- What are some typical research misconducts

Responsible Conduct of Research (RCR)

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graph TD; RCR[Responsible Conduct of Research (RCR)] --> RE[Research Ethics]; RCR --> RI[Research Integrity];
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Research Ethics

Research behavior viewed
from the perspective of moral
principles

Research Integrity

Research behavior viewed
from the perspective of
professional standards

after: N. H. Steneck, *Science and Engineering Ethics*, **2006**, 12, 53–74

Research ethics

- Rules of scientific ethics (not laws)
- *Ethics in science requires researchers to pay due attention to the effects on their subject group, including also animals, as well as to wider society and to minimise harmful effects on their research subjects. (**ALLEA** – all european academies)*

Research integrity

- Rules of scientific conduct (not laws)
- *Research integrity touches on the ethos of science and is guided by the rules imposed on the research community by itself. As such, research integrity aims at providing a comprehensive framework for scientists as to how to carry out their work within accepted ethical frameworks as well as following good scientific practice (ALLEA – all european academies)*

Research integrity

- Conducting research so others have trust and confidence in methods and findings
- Meeting professional standards
- Should boost quality, relevance and reliability
- Something we should all strive for
- Needs attention and continuous training for improvements

(Nature, Vol 570)

- If not, research is useless: results no longer reliable, trust is lost, funding will disappear
- Probably requires some control system (which also needs to be improved continuously)

The European Code of Conduct for Research Integrity

“Science is expected to enlarge mankind’s knowledge base, provide answers to global challenges, and guide decisions that shape our societies.”

ESF and ALLEA

It's a fact! Scientists are the most trusted people in world

Ipsos MORI News & Polls 2019

Please look at this list of different types of people. In general, do you think each is trustworthy or untrustworthy in [COUNTRY]?

Please use a scale of 1 to 5, where 1 is very trustworthy and 5 is very untrustworthy.

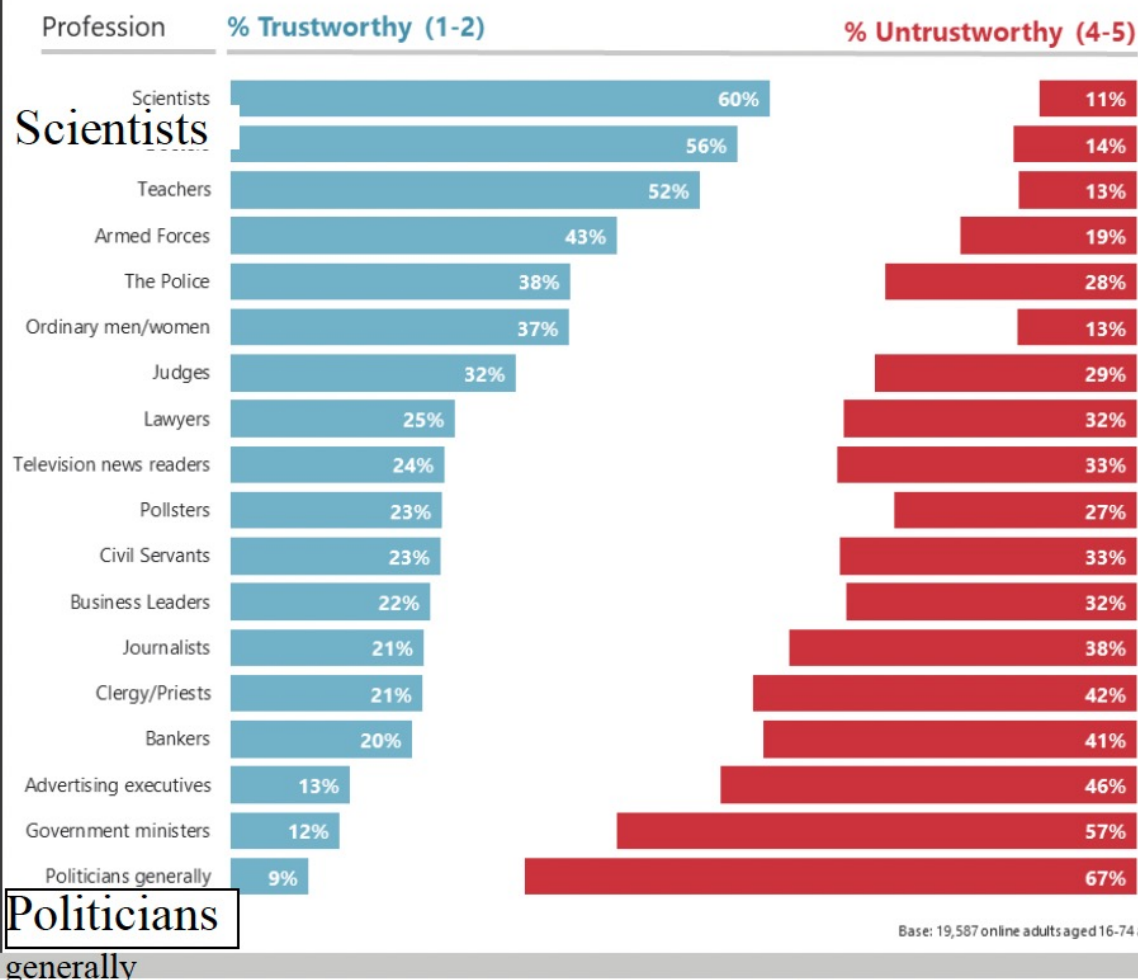
All countries ranking

Scientists are seen as the most trustworthy profession globally, followed by doctors and teachers.

Politicians and government ministers are the least trustworthy.



Global trust in professions August 2019 | Version 1 | Public



<https://www.ipsos.com/ipsos-mori/en-uk/its-fact-scientists-are-most-trusted-people-world>

How protect research integrity?

Prevention is better than cure

- *Honesty*
 - *Communication about results and their possible applications fully*
- *Fairness*
 - *Treating others (colleagues, students..) with respect*
- *Objectivity*
 - *Try to look beyond own preconceptions and biases*
- *Reliability*
 - *Adhere to accepted methods*
- *Skepticism*
- *Accountability*
 - *Be prepared to demonstrate that results or statements can be justified*
- *Openness*

Doing Global Science, IAP (2016)

The codified rules of good, honest scientific practice include

- *Observing professional standards*
 - *Documenting results*
 - *Consistently questioning ones own findings*
 - *Practicing strong honesty with regard to the contributions of partners, competitors, and predecessors*
 - *Cooperation and leadership responsibility in working groups*
 - *Securing and storing scientific data**
 - *Strict honesty in scientific publications*
 - *Mentorship for young scientists and scholars*
-
- *Primary data as the basis for publications shall be securely stored for 10 years in a durable form in the institution of their origin*

e.g. European code of conduct for research integrity

Social control mechanisms

- Self regulating mechanisms
 - Peer review
 - Reproducibility
- Courses/discussions/atmosphere in the research group
 - Research integrity courses
 - Articulation of research integrity codes
- Reporting: Adequate reporting procedures

A researcher's responsibility

- Every researcher has a responsibility to contribute to the development and dissemination of high standards and good practices, and every researcher has an obligation to maintain the integrity of research.
- Researchers bear the ultimate responsibility for ensuring the integrity of research data they generated or whose generation they supervised.
- Researchers have a responsibility both to maintain high standards of responsible conduct and to take appropriate actions when they witness or suspect irresponsible conduct.

IAP

InterAcademy Partnership

Authorship



Ethical Guidelines to Publication of Chemical Research

The co-authors of a paper should be all those persons who have made significant scientific contributions to the work reported and who share responsibility and accountability for the results.

Who is an author?

The ICMJE recommends that authorship be based on the following 4 criteria:

1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
2. Drafting the work or revising it critically for important intellectual content; AND
3. Final approval of the version to be published; AND
4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

In addition to being accountable for the parts of the work he or she has done, an author should be able to identify which co-authors are responsible for specific other parts of the work. In addition, authors should have confidence in the integrity of the contributions of their co-authors.

“The Vancouver guidelines”

Scientific misconduct

- Several different definitions, but VR's definition:
- "Scientific misconduct includes actions or failures in actions in connection with research which, knowingly or due to negligence, lead to false or fabricated results or fraudulent information about a person's contribution to research."
- Prior handling of misconduct in Sweden: Each university had ethics board, and on top of this there was a Central Ethical Review Board (CEPN)

A recent high profile case of scientific misconduct in Sweden

Prof Paolo Macchiarini accused of fabrication, falsification of data, unethical research on humans



<https://news.ki.se/macchiarini>

March, Aug 2015 – KI clears Macchiarini

Sept 2016 – CEPN

(etikprövningsnämnden) :

Macchiarini found guilty of scientific misconduct

Conclusions from Macchiarini scandal

- Universities not able to police their own researchers (conflict of interest)
- Universities not always willing to send cases to CEPN
- Need for an independent committee at the national level to take over all misconduct cases
- Swedish government initiates evaluation - report published in 2017
- New law proposed – effective 2020

Act on responsibility for good research practice and the examination of research misconduct (2019:504)

 Listen

This version contains amendments up to and including the Act on Amendment of the Act on responsibility for good research practice and the examination of research misconduct SFS 2019:1150.

Department/Agency: Ministry of Education and Research, Sweden
Issued: 27 June 2019

The translation is not an official translation.

Contents

Section 1

This Act contains provisions on the responsibility held by researchers and the entity responsible for research for research being conducted in accordance with good research practice.

The Act also contains provisions on the procedure for examining issues related to research misconduct.

Responsibility for good research practice

The responsibility of the researcher

Section 4

The researcher is responsible for compliance with good research practice in their research.

<https://www.uhr.se/en/start/laws-and-regulations/Laws-and-regulations/act-on-responsibility-for-good-research-practice/>

Defines research misconduct in the new law

Definitioner

2 § I denna lag avses med

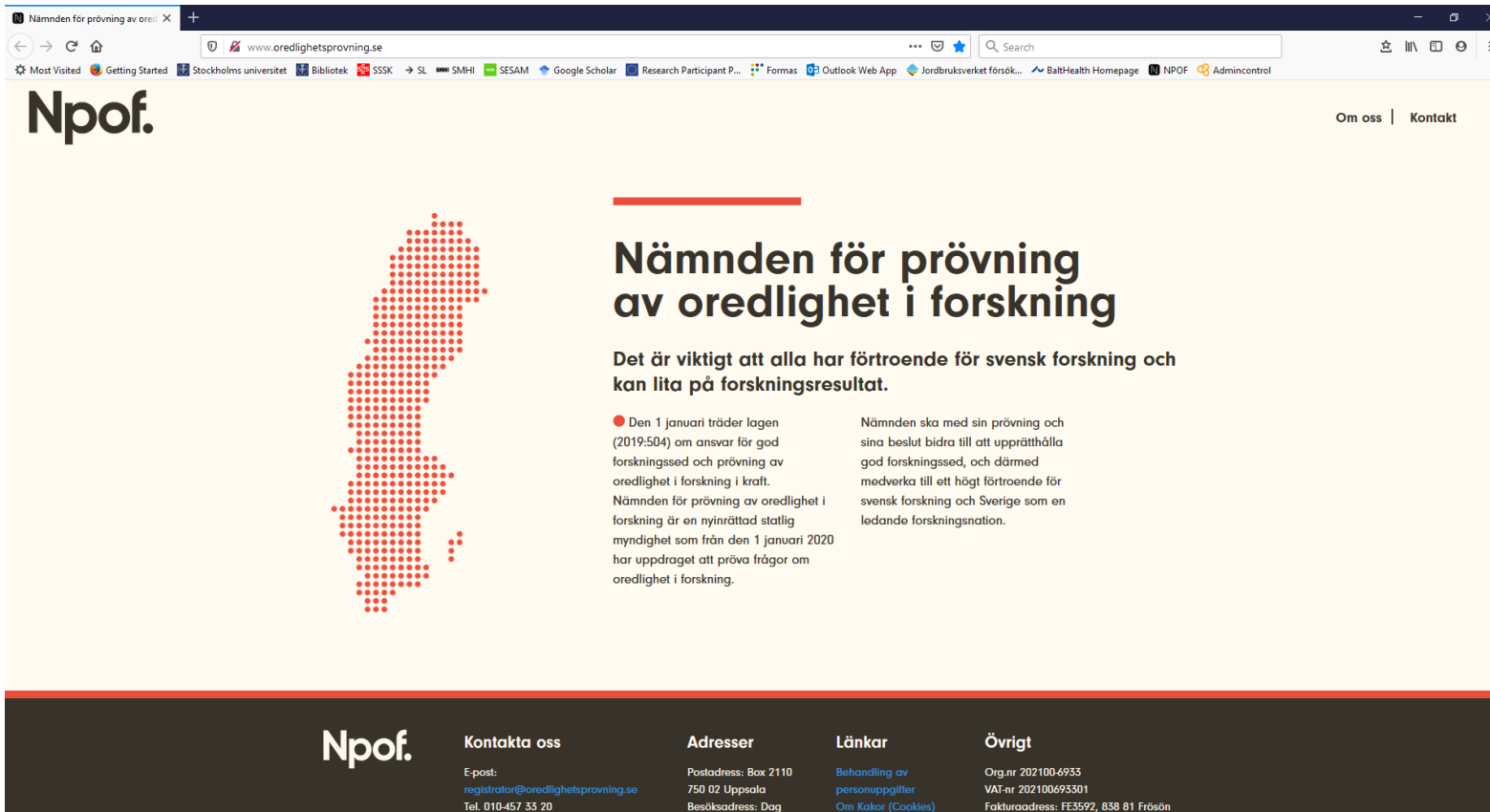
forskningshuvudman: en statlig myndighet eller en fysisk eller juridisk person i vars verksamhet forskning utförs, och

oredlighet i forskning: en allvarlig avvikelse från god forskningssed i form av fabricering, förfalskning eller plagiering som begås med uppsåt eller av grov oaktsamhet vid planering, genomförande eller rapportering av forskning.

Serious breaches of good scientific practice in the form of fabrication, falsification or plagiarism that are committed intentionally or with gross negligence in the planning, performance or reporting of research.

Created a new national agency

- National Board for Assessment of Research Misconduct (Nämnden för prövning av oredlighet i forskning **NPOF**)
- I am member since Jan 1 2024



The screenshot shows the homepage of the National Board for Assessment of Research Misconduct (Npof). The browser address bar displays 'www.oredlighetsprovning.se'. The website features a large red dotted map of Sweden on the left. The main heading is 'Nämnden för prövning av oredlighet i forskning'. Below this, a paragraph states: 'Det är viktigt att alla har förtroende för svensk forskning och kan lita på forskningsresultat.' Two columns of text follow. The left column, starting with a red dot, mentions the 2019:504 law and the board's role in assessing research misconduct. The right column states the board's commitment to maintaining good research ethics and its role as a leading research nation. The footer contains contact information, addresses, links, and other details.

Npof.

Om oss | Kontakt

Nämnden för prövning av oredlighet i forskning

Det är viktigt att alla har förtroende för svensk forskning och kan lita på forskningsresultat.

● Den 1 januari träder lagen (2019:504) om ansvar för god forskningssed och prövning av oredlighet i forskning i kraft. Nämnden för prövning av oredlighet i forskning är en nyinrättad statlig myndighet som från den 1 januari 2020 har uppdraget att pröva frågor om oredlighet i forskning.

Nämnden ska med sin prövning och sina beslut bidra till att upprätthålla god forskningssed, och därmed medverka till ett högt förtroende för svensk forskning och Sverige som en ledande forskningsnation.

Npof.

Kontakta oss	Adresser	Länkar	Övrigt
E-post: registrator@oredlighetsprovning.se Tel. 010-457 33 20	Postadress: Box 2110 750 02 Uppsala Besöksadress: Dag	Behandling av personuppgifter Om Kakor (Cookies)	Org.nr 202100-6933 VAT-nr 202100693301 Fakturaadress: FE3592, 838 81 Frösön

NPOF

- 10 professors from different universities/fields
 - Chair and co-chair: high Swedish judges
 - All above **appointed by Swe Government**
 - 6 full times staff members (all with PhD in various fields)
 - Located in Uppsala
 - 10 full day meetings per year
-
- Turnaround: 14 Msek per year

Who is covered by the law?

- All Swedish universities and colleges, both public and private
- All Swe government agencies
- All Swe government-owned companies
- All Swe government-run foundations (MISTRA, SSF etc)
- Swe Municipalities and regions (kommuner, regioner)
- Any Swe companies or similar run by municipalities or regions

Who can report to NPOF?

- Anyone can report a case to NPOF, even anonymously
- NPOF has taken over all relevant active cases from universities and colleges
- NPOF can open a case if it sees the need

Who actually submits cases?

- Quite often anonymous but ...
- Former collaborators – now in conflict
- Competitors
- Individuals discovering cheating
- Groups or individuals using search engines to find figure manipulations
- Universities (often forwarding internal case)

What is research misconduct? FFP

- **Serious** breaches of good scientific practice in the form of **fabrication**, **falsification** or **plagiarism** that are committed **intentionally or with gross negligence** in the planning, performance or reporting of **research**.
- Has to fulfill all of these:
 - Is it research?
 - Is it fabrication, falsification, or plagiarism (including self-plagiarism) (FFP)

Fabrication involves making up results and recording them as if they were real;

Falsification involves manipulating research processes or changing or omitting data;

Plagiarism is the appropriation of other people's material without giving proper credit;

- Is it a serious breach?
- Was it committed intentionally or with gross negligence?

NPOF Praxis

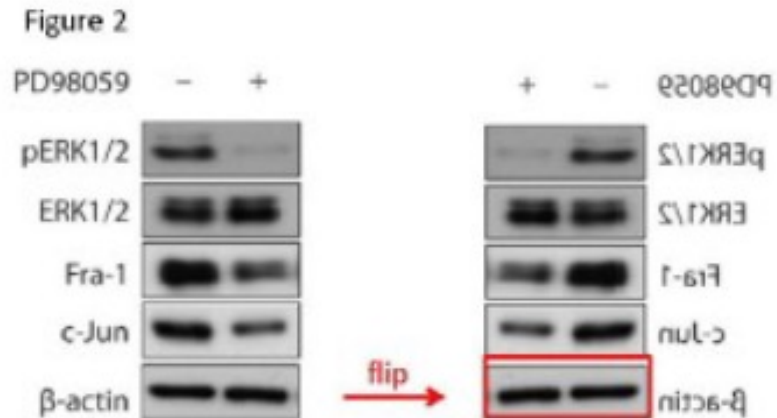
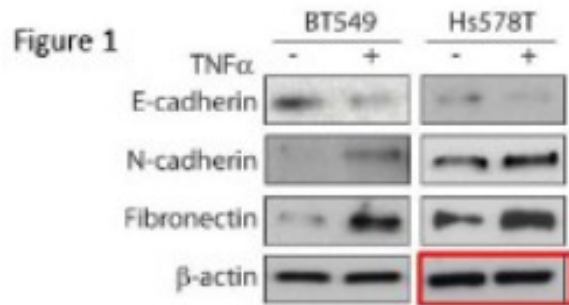
- Step 1 – is it research and were researchers active in Sweden?
 - Example – popular science report is not research, Worked abroad then.
- Step 2 – does it fall within FFP?
- Step 3 – is it a serious breach?
 - Bit of a gray zone
 - Manipulating data or pictures always serious
- Step 4 – was it done intentionally or with gross negligence?
 - Once maybe okay (mistake), but repeatedly implies gross negligence/intention

What is not considered?

- If it's not research
- Cases more than 10 years old unless special circumstances apply
- Authorship issues (except ...)
- Ethical permit issues
- Other types of fraudulent behavior or digression from good scientific conduct
- Less serious breaches
- "Wrong" methodology
- Mistakes

FFP – picture manipulation

- Western plots most common ...



FFP – picture manipulation

Figure 2

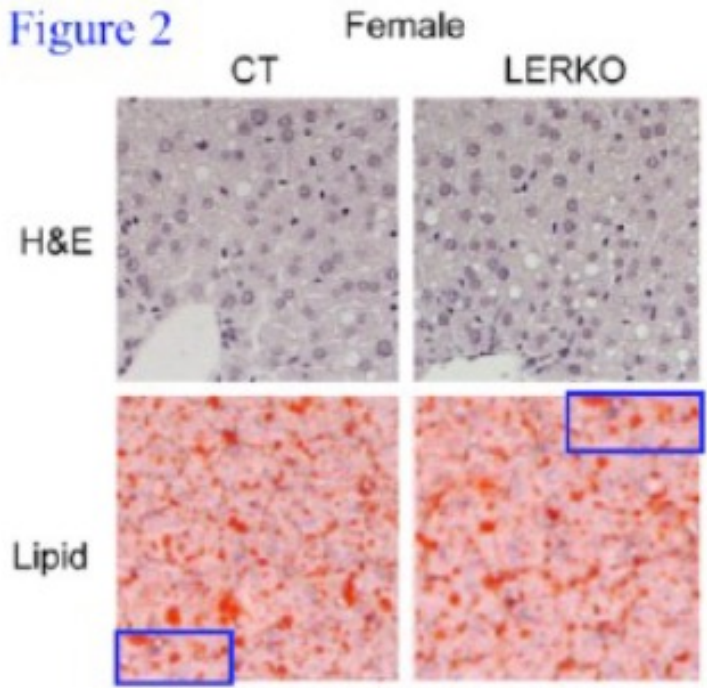
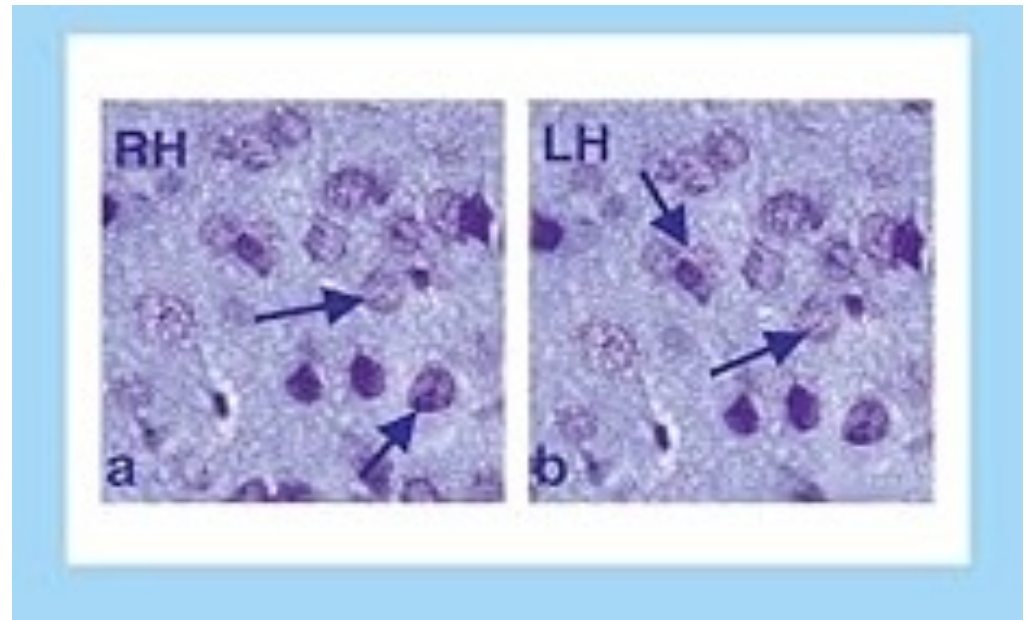
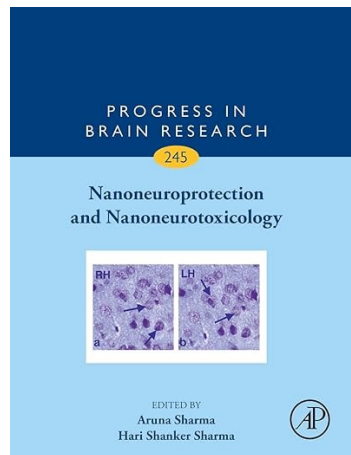


Table manipulation

- Tables taken from elsewhere
- Numbers are too good
- Two decimals always next to each other on keyboard ...
- **Unfortunately:** only the worst cheaters get caught
- **But (at least I think):** Cheaters continue to cheat, sloppier and sloppier. Eventually many are caught!

The worst case (on national news)

- Neurobiology
- 6 researchers found guilty: 155 occasions in **56 papers!** Mainly figures and tables
- "Paper mill" (industry of fake research)
- Probably few or no experiments performed ...
- Picture below: falsification (Front cover with same photo for two "experiments"!)



Other examples (not all “guilty”)

- Research result “stolen” from colleague or student
 - Leaving out or biasing significant information
 - Obvious undeclared use of AI
 - Self-plagiarism
 - “Wrong” scientific method
 - Mistakes by journal in proofs
 - Citing others incorrectly
-
- Some authors can be found guilty and others not (but remember authorship conventions!)

Self plagiarism

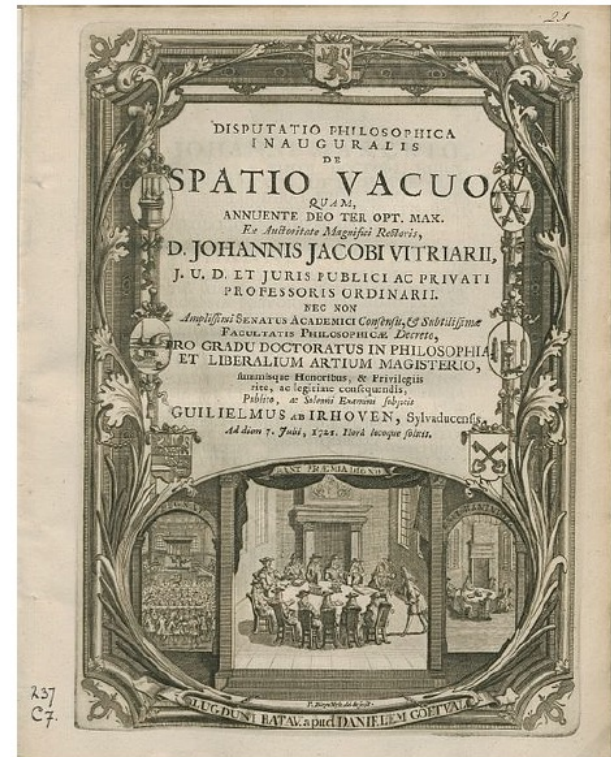
Thesis/Dissertation

Copy from papers included in the thesis; Copyright

SU: If the doctoral student in his thesis reproduces material and wording from his own previous publications and essays, this **must be marked with a reference and, where appropriate, quotation marks**. This applies to both monographs and summary theses. You must also have **permission from any copyright owner** other than yourself.

Publish material from the thesis

IC: Journals generally accept papers based on work already written up in a thesis, see individual journal policies.



Effect if found guilty by NPOF

- Possible to appeal to Kammarrätten (no effect if declared not guilty there)
- No prison or fine ...
- University informed - must report back about actions taken (e.g. stopped supervision, retracted papers, ...)
- Research councils informed (current grant may be retracted)
- Negative for Swedish career (International career?)
- Not sent to NPOF's of other countries (of e.g. international coauthors)

Common defense (figures/tables)

- I did not produce the figure/table and couldn't spot the manipulation
- How could I have spotted manipulation if referee did not?
- The figure/table is not manipulated
- The figure has been manipulated by mistake (e.g. wrong figure)
- The figure was manipulated by mistake but it did not change conclusions
- The figure/table has been manipulated by mistake – I am very sorry

Our impressions of accused researchers

- Some are only sloppy
- Some are lazy (why not re-use old figure – new experiment probably similar)
- Some want to strengthen a result they believe in
- Some make no experiment and only want fame/attention/grants
- It's a slippery slope ...

Important to think about

- Save all your data and notes – 10 years
- Authorship – if a co-author is found guilty of scientific misconduct in an article that you are also a co-author on, you will also be affected. In the worst case you will also be found guilty of scientific misconduct.

To use somebody's results and ideas

Until a research idea is publicly and ethically disseminated, researchers have an obligation to protect privileged information about planned and proposed research.



RCR: Responsible Conduct of Research

QRP: Questionable Research Practices

FFP: Fabrication, Falsification and Plagiarism

after: N. H. Steneck, *Science and Engineering Ethics*, **2006**, 12, 53–74

Questionable research practices (QRP) are likely to be far more prevalent and, therefore, ultimately more damaging to the research enterprise than FFP.

Science Europe Briefing Paper: Research Integrity: What it Means, Why it Is Important and How we Might Protect it, Dec 2015

Questionable Research Practices

- Selectively delete data, modify data or add fabricated data after performing initial data-analyses
- Insufficiently report study flaws and limitations
- Not publish a valid “negative” study
- Choose a cleanly inadequate research design or using evidently unsuitable measurement instruments
- Ignore basic principles of quality assurance
- Conceal results that contradict your earlier findings or convictions
- Selectively cite to enhance your own findings or convictions or to please editors, reviewers, or colleagues

Bouter, Tijdkink, Axelsen, Martinson, ter Riet, *Research Integ. Peer Rev.* **2016**

Questionable Research Practices

- Use published ideas or phrases of others without referencing
- Demand or accept an authorship for which one does not qualify
- Unfairly review papers, grant applications or colleagues applying for promotion
- Ignore substantial safety risks of the study to participants, workers, or environment
- Inadequately handle or store data or materials
- Keep inadequate notes of the research process
- Insufficiently supervise or mentor junior coworkers
- Turn a blind eye to putative breaches of research integrity by others

Bouter, Tijdink, Axelsen, Martinson, ter Riet, *Research Integ. Peer Rev.* **2016**

Examples of bad research practice (without data use)

- Selective citations from other reference
- Adding famous author who did not contribute substantially
- Using ideas from colleagues without giving proper credit (e.g. authorship)
- Not mentioning other publications with related results
- Asking ChatGPT to write the background section

How to minimize risk of Scientific misconduct

- **Data:** Save and document (10 years)
- **Figures and tables:** Be careful – never manipulate
- **Authorship:** all authors are responsible for everything. Should anyone more be author?
- **Cite:** text, figures but also ideas from other sources must be cited!
- **AI:** use with caution and be open (many journals have rules)
- **Facts:** Never leave out relevant facts

Scientific misconduct

Consequences

- Spoilt resources
- Spoilt reputation
- Spoilt careers
- Spoilt confidence in journals
- Spoilt confidence in science

How common is misconduct?

Rooting out scientific misconduct

- *More than 10,000 retractions in 2023—reflecting about 0.2% of the literature across all fields,.*
- *This is a 10-fold increase compared with two decades ago.*
- *Two-thirds of retractions are due to misconduct*

New forms of misconduct: AI

- Hard to say what will become appropriate use but ...
- Be transparent in use of AI
- Never let AI write original text
- You must be head pilot – AI co-pilot
- Research societies and scientific journals are writing rules for AI: read them!
- Currently: extensive mis-use

Literature

- ALLEA - European Code of Conduct for Research Integrity 2023 (2017)
<https://allea.org/code-of-conduct/>
- On Being a Scientist: A Guide to Responsible Conduct in Research; Committee on Science, Engineering, and Public Policy, National Academy of Sciences, National Academy of Engineering, and National Institute of Medicine,
<https://www.nap.edu/catalog/12192/on-being-a-scientist-a-guide-to-responsible-conduct-in>
- IAP – Doing Global Science 2016 <https://www.interacademies.org/publication/doing-global-science-guide-responsible-conduct-global-research-enterprise>
- Seven Reasons to Care about Integrity in Research, Science Europe 2015,
<https://www.scienceeurope.org/our-resources/seven-reasons-to-care-about-integrity-in-research>
- R. Noyori, J. P. Richmond, “Ethical Conduct in Chemical Research and Publishing”, *Adv. Synth. Catal.* **2013**, 355, 3–8.
- W. F. van Gunsteren, “The Seven Sins in Academic Behavior in the Natural Sciences”, *Angew. Chem. Int. Ed.* **2013**, 52, 118–122.
- Web site: <http://retractionwatch.wordpress.com/>
- <https://ori.hhs.gov/content/thelab>