

Good Scientific Practice *versus* Scientific Misconduct

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Outline:

Rules for Good Scientific Practice

- Who is setting them up?
- What are the rules?
- Who's ,accusing'?
- How is misconduct punished?

Serious scientific misconduct and

some relevant cases as well as borderline situations

- Treatment of Data
- Rules of Citation
- Lab book
- Publications: Authorships/conflicts of interest
- Whistle Blower

Addresses



Rules of Good Scientific Practice

Who's setting them up?

History:

,**Code of Honour**': Quality assessment by peers, honesty and integrity is presumed

- Trust between Scientists (e.g. in case of referees for publications/grant applications)
- Trust of PI in his/her students (nobody can be at the bench all the time watching the student)
- Trust of students in their PI (e.g. no doubling of topics, correctness concerning authorships)

Until the 1990ies no written rules

After too much scandal:

Set out (in Germany) by:

Deutsche Forschungsgemeinschaft (DFG) (first in 1998)

Hochschulrektorenkonferenz (HRK) (first in 1998)

as a reaction to Herrmann/Brach scandal



Rules of Good Scientific Practice

Taken from: DFG, Vorschläge zur Sicherung guter wissenschaftlicher Praxis, 2. ergänzte Auflage (2013) WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, (incl.: Ergänzung der Empfehlungen der Deutschen Forschungsgemeinschaft zur Sicherung guter wissenschaftlicher Praxis Juli 2013)

– both documents are in German and English!

Recommendation 1: Good Scientific Practice

...fundamentals of scientific work:

- *observing professional standards,*
- *documenting results,*
- *consistently questioning one's own findings,*
- *practising strict honesty with regard to the contributions of partners, competitors, and predecessors*
-

→ Professional standards include *inter alia*:
Rules for the protection of animals, personal data and patience; safety rules (GMOs and else)...



Rules of Good Scientific Practice

Recommendation 2: Institutional Rules

Universities and independent research institutes shall formulate rules of good scientific practice.[...] These rules shall be made known to, and shall be binding for, all members of each institution. They shall be a constituent part of teaching curricula and of the education of young scientists and scholars

Recommendation 3: Organisation

Heads of universities and research institutes are responsible for an adequate organizational structure. [...] the responsibilities for direction, supervision, conflict resolution, and quality assurance must be clearly allocated, and their effective fulfilment must be verifiable.



Rules of Good Scientific Practice

Recommendation 4: Supervision of young scientists

The education and development of young scientists and scholars need special attention. Universities and research institutes shall develop standards for mentorship and make them binding for the heads of the individual scientific working units.

Recommendation 5: Ombudsperson

Universities and research institutes shall appoint independent mediators (ombudspersons) to whom their members may turn with questions concerning good scientific practice and in cases of suspected scientific misconduct. Universities and research institutions shall ensure that the identities of the independent mediators (ombudspersons) are known throughout the institution.



Rules of Good Scientific Practice

Recommendation 6: Performance Evaluation

Universities and research institutes shall always give originality and quality precedence before quantity in their criteria for performance evaluation. This applies to academic degrees, to career advancement, appointments and the allocation of resources.

Recommendation 7: Safeguarding and storing of primary data

Primary data as the basis for publications shall be securely stored for ten years in a durable form in the institution of their origin.



Rules of Good Scientific Practice

Recommendation 8: Procedures in case of Misconduct

Universities and research institutes shall establish procedures for dealing with allegations of scientific misconduct.

→ ‚Satzung‘ Goethe University Frankfurt (German only)



Rules of Good Scientific Practice

Recommendation 9: Cooperation of independent institutes

Recommendation 10: Learned Societies



Rules of Good Scientific Practice

Recommendation 11: Authorship

Authors of scientific publications are always jointly responsible for their content. Only someone who has made a significant contribution to a scientific publication is deemed to be its author. A so-called “honorary authorship” is inadmissible.

Recommendation 12: Scientific Journals

Scientific journals shall make it clear in their guidelines for authors that they are committed to best international practice with regard to the originality of submitted papers and the criteria for authorship. Reviewers of submitted manuscripts shall be bound to respect confidentiality and to disclose conflicts of interest.

→ This sounds rather self-evident....



Rules of Good Scientific Practice

Recommendation 13: Guidelines for Research Proposals

Research funding agencies shall, in conformity with their individual legal status, issue clear guidelines on their requirements for information to be provided in research proposals on (i) the proposers' previous work and (ii) other work and information relevant to the proposal. The consequences of incorrect statements should be pointed out.



Rules of Good Scientific Practice

Recommendation 14: Rules for the Use of Funds

In the rules for the use of funds granted, the principal investigator shall be obliged to adhere to good scientific practice. When a university or a research institute is the sole or joint grantee, it must have rules of good scientific practice (Recommendation 1) and procedures for handling allegations of scientific misconduct (Recommendation 8).

Institutions which do not conform to Recommendations 1 to 8 above shall not be eligible to receive grants.

→ In most cases a PI will have signed that s/he adheres to the rules!



Rules of Good Scientific Practice

Recommendation 15: Reviewers

Funding organizations shall oblige their honorary reviewers to treat proposals submitted to them confidentially and to disclose conflicts of interest. [...]
Quantitative indicators of scientific performance, e. g. so-called impact factors, shall not by themselves serve as the basis for funding decisions.



Rules of Good Scientific Practice

Recommendation 16: Ombudsman for Science

The Deutsche Forschungsgemeinschaft should appoint an independent authority in the form of an Ombudsman [...] Its mandate should be to advise and assist scientists and scholars in questions of good scientific practice and its impairment through scientific dishonesty, and to give an annual public report on its work.



Rules of Good Scientific Practice

Recommendation 17: Whistleblower

Researchers who suspect scientific misconduct and can provide specific information (whistleblowers) must not suffer disadvantage in their own scientific and career progress as result. The independent mediator (ombudsman) and the institutions who verify a suspicion must protect them in an appropriate manner.

The information must be provided “in good faith”.



Rules of Good Scientific Practice

Who's accusing and where?

Who?

Principally: Everybody

– and everybody is responsible



That's not the point!



Rules of Good Scientific Practice

Who's accusing and where?

Where?

- ‚boss‘
- Ombudspersons of the University:

Tasks:

- To verify an accusation
- To mediate in disputes

- But also: to give advice
 - before something goes wrong (if things are unclear)
 - If you are accused by somebody

In serious cases involvement of:

- Commission of the University that deals with allegations of scientific misconduct (Kommission zum Umgang mit wissenschaftlichem Fehlverhalten), in some cases together with the DFG

→ Anonymity is safeguarded!



Rules of Good Scientific Practice

What happens?

Depending on the case (seriousness) and the situation the person is in:

- Publications: Erratum
- Publications: Retraction
- Failing the exam
- Withdrawal of qualification (Diploma, BSc, MSc)
- Withdrawal of title (PhD, Habilitation, Prof)
- Disciplinary actions up to prosecution according to public service law
- Prosecution according to criminal law

→ in each case there is a loss of reputation,
in some cases loss of profession!



Serious Scientific Misconduct

- **Misrepresentation** (concerning **data**)
- Violation of intellectual property (by incorrect citation or plagiarism concerning ideas)
- Sabotage or destruction of data

- Denying authorship
- Making somebody an author without his/her consent
- 'honorary authorships'



Serious Scientific Misconduct

In Natural Science people fake ---

--- in the Humanities people copy

data

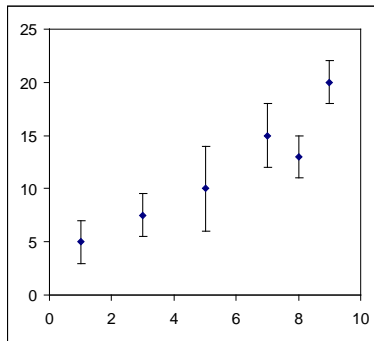


Fig. 1

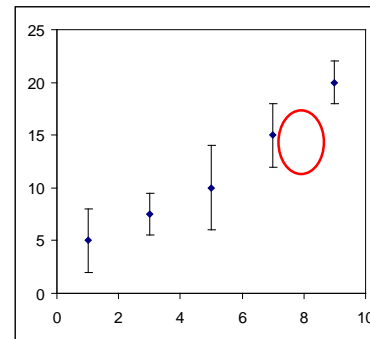


Fig. 2

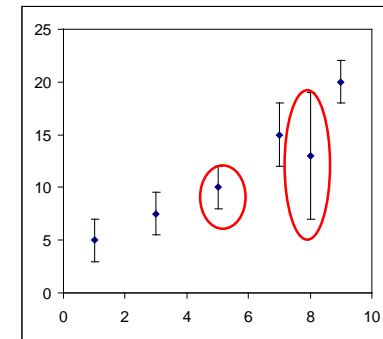
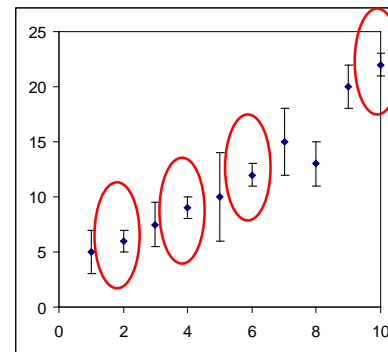


Fig. 3



Serious Scientific Misconduct

In Natural Science people fake ---

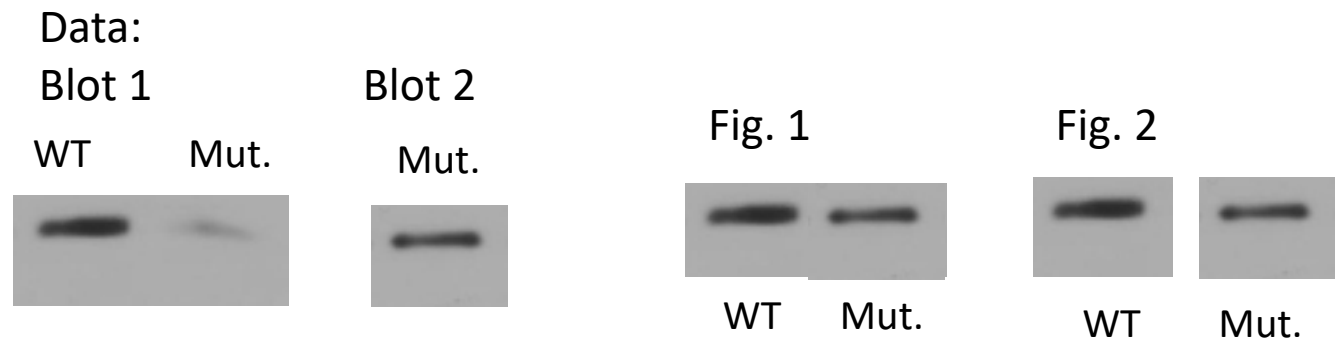
„Fraud“

1. The invention of data (Fig. 3)
2. „change“ data
 - by selecting (and/or omitting) unwanted results (Fig. 1)
 - by changing data points/results (Fig. 2)



Schwerwiegendes wissenschaftliches Fehlverhalten

In Natural Science people fake ---



The figure demonstrates that both WT and mutant express the protein

→ ok for Fig. 2

The figure demonstrates that about equal amounts of protein are found in WT and mutant

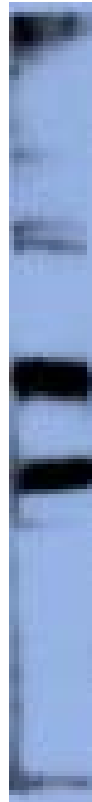
→ absolute ,no go', Fig. 1 is also impossible!



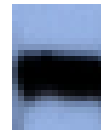
Serious Scientific Misconduct

In Natural Science people fake ---

data



Figure

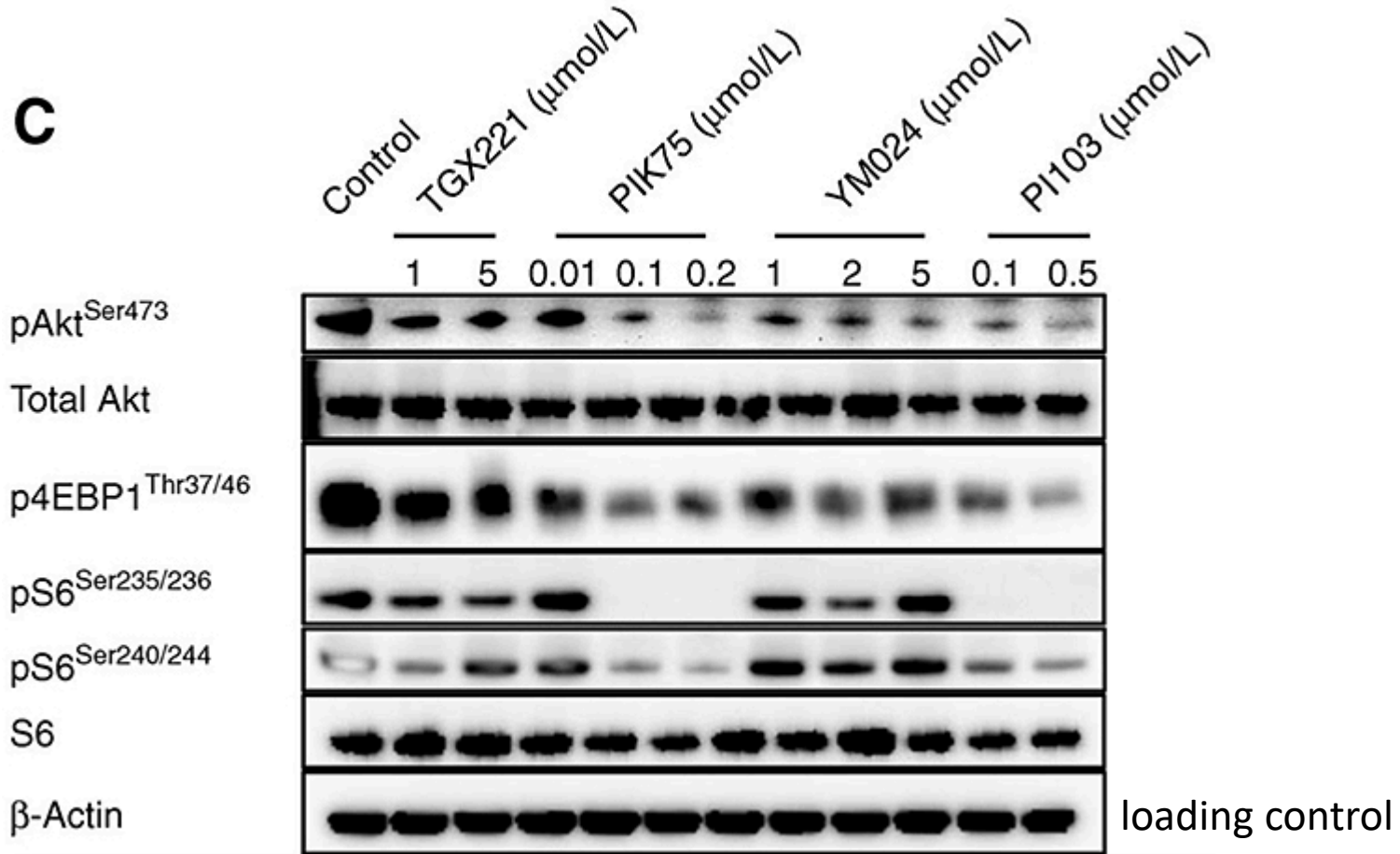


The figure shows a strong, specific signal of our antibody with the new protein

Hardly!

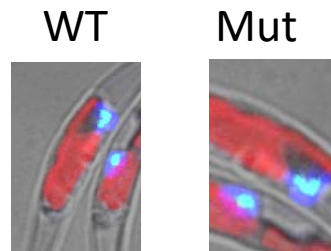


...and now a real case: what's wrong here?



Serious Scientific Misconduct

In Natural Science people fake ---



The figure demonstrates the similar appearance of wild type and mutant cells

Serious Scientific Misconduct

In Natural Science people fake ---

„Fraud“

1. The invention of data (Fig. 3)
2. „change“ data
 - by selecting (and/or omitting) unwanted results (Fig. 1)
 - by changing data points/results (Fig. 2)
 - by manipulation of figures
3. Wrong statements in job applications or grant proposals (including wrong statements concerning journal or status („in press“) of a publication)



Serious Scientific Misconduct

- Misrepresentation (concerning data)
- Violation of intellectual property (by **incorrect citation** or plagiarism concerning ideas)
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Rules of Citation

Plagiarism – also present in Natural Sciences!

Original (Müller et al. 2012):

Lack of protein-protein interaction is in sharp contrast to the data from Mayer and Schmidt (2010) and can only be interpreted as an influence of protein aggregation. However, the data from Mayer and Schmidt (2010) were obtained using another method, thus differences might be explained by insufficient calibration.

Plagiarism (Lout et al. 2014):

Lack of protein-protein interaction is in sharp contrast to the data from Mayer and Schmidt (2010) and can only be interpreted as an influence an influence of protein aggregation. However, the data from Mayer and Schmidt (2010) were obtained using another method, thus differences might be explained by insufficient calibration.

---only cut and paste, absolutely ,no go'---



Rules of Citation

Paraphrase vs. Citation

In Natural Sciences we usually use paraphrases, but take care:

Original (Müller et al. 2012):

...as shown in Fig. 1, the pH sensitivity of FCP was directly correlated with protein density. This is in sharp contrast to the data from Mayer and Schmidt (2010) and can only be interpreted as an influence of direct protein-protein interactions.

Masterstudi et al. 2014:

According to Müller et al. (2012) there is a direct correlation of the pH sensitivity with protein density. This is in sharp contrast to the data from Mayer and Schmidt (2010) and can only be interpreted as an influence of direct protein-protein interactions.

What's right, what's wrong????

First sentence is more or less a paraphrase,
second sentence is a direct citation and must
be marked as such



Rules of Citation

Borderline: Content of Textbooks

Still: if the fact is important for your own work, cite the original publication!

Example: Photosynthesis is the conversion of light energy to chemical energy.

→ textbook, no citation of original work

Example: The redox potential of the primary donor is -1.2V (Rutherford et al. 2013), which is much lower than assumed for years.

→ New finding, maybe some textbooks cite it already, but still Rutherford deserves the 'honour' of being cited



Rules of Citation

Borderline: Reviews

Meyer und Müller (2014) wrote in their review article:

In green algae it has long been shown that photosystem II is a dimer (Ruban et al. 1980), but later it was shown for all other organisms as well (Hardworking 2003).

Masterstudi et al 2015:

In green algae it has long been shown that photosystem II is a dimer (Meyer and Müller 2014)

→ wrong, since Ruban et al 1980 made the discovery



Rules of Citation

Borderline: Reviews

Meyer und Müller (2014) wrote in their review article:
In green algae it has long been shown that photosystem II is a dimer (Ruban et al. 1980), but later it was shown for all other organisms as well (Hardworking 2003).

Masterstudi et al 2015:

In all organisms studied so far photosystem II is a dimer (Meyer and Müller 2014)

- Possible (but not nice) if the oligomeric state is of minor importance
- Wrong, if the text is about the oligomeric state of photosystem II in different organisms, then: Ruban et al. 1980 for green algae, Hardworking 2003 for the other organisms
- Optimal: In all organisms studied so far, photosystem II is a dimer (Ruban et al 1980, Hardworking 2003, see also review by Meyer and Müller 2014)



Rules of Citation

Ruban et al. 1980: In green algae it has long been shown that photosystem II is a dimer

Masterstudi et al. 2015

In green algae it has been shown that photosystem II is a dimer (Repeater et al. 2000).

→ ABSOLUTELY wrong, even if Repeater et al. 2000 has also shown it, the first one is cited

Masterstudi and PhD 2015

In green algae it has been shown that photosystem II is a dimer (Ruban et al. 1980, Repeater et al. 2000).

→ Possible if Rubans work got challenged in between and Repeater finally demonstrated that Ruban was right



Rules of Citation

Self plagiarism

In principle:

- Own work has to be cited in the same manner as other people's work
- No ,recycling' allowed, neither in Introduction, certainly not in Results, nor in Discussion, only exception: nobody is really strict about Material and Methods (concerning self-plagiarism!)
- ,double publication' is also forbidden (even if different languages are used!)

Problem Dissertation:

In Natural Sciences the Dissertation is sometimes not really considered ,a book', but still:

Your dissertation is a publication and has to be cited!

Further reading:

Harriman and Patel: Text recycling: acceptable or misconduct? BMC Medicine 12:148-149 (2014)



Serious Scientific Misconduct

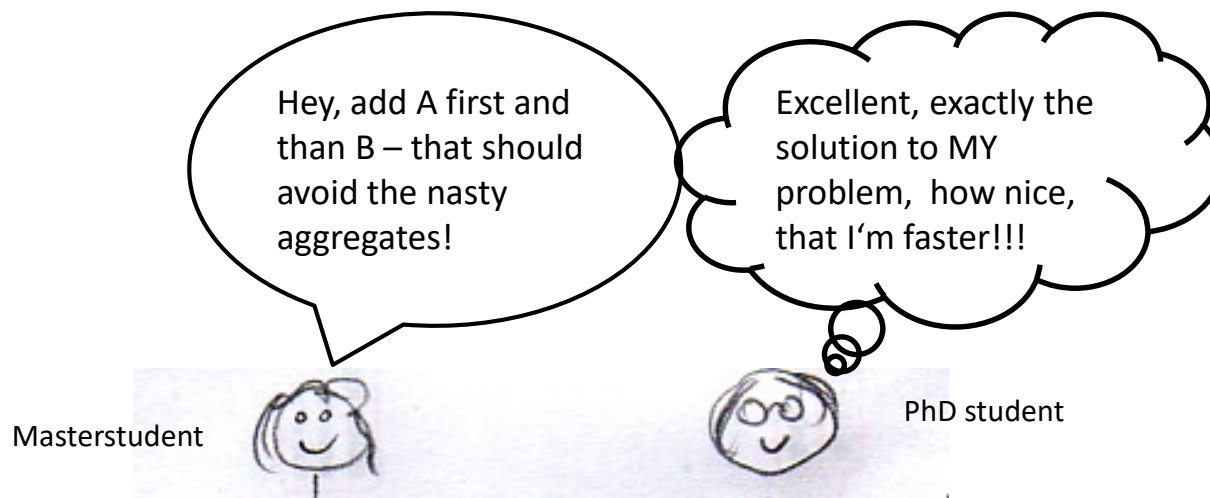
- Misrepresentation (concerning data)
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- Denying authorship
- Making somebody an author without his/her consent
- 'honorary authorships'



„Ideenklau“

- On conferences (talks or posters): the presented methods and results are the property of the author, and can only be used with his/her consent/by proper citation
- Same for reviewers for grant proposals
- Same for the idea of the bench-mate!



PhD student, Masterstudent & boss:

Newly developed method improves protein purification
Nature Meth 8, 5-10 (2014)



Serious Scientific Misconduct

- Misrepresentation (concerning data)
- Violation of intellectual property (by incorrect citation or plagiarism concerning ideas)
- **Sabotage or destruction of data**

- Denying authorship
- Making somebody an author without his/her consent
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Sabotage/Destruction of Data

- Data have to be stored in a durable form, they have to be comprehensibly documented, and these records stay with the PI! (s/he is obliged to store them for 10 years)
- Neither the data of your own or of others (!) may be deleted
- and nobody is allowed to spit in the Eppendorf of the neighbour at the bench or to exchange samples!



Serious Scientific Misconduct

- Misrepresentation (concerning data)
- Violation of intellectual property (by incorrect citation or plagiarism concerning ideas)
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→ The much-hated lab book:

Basic rule: everything which is not documented in the lab book does not exist!!!



Lab book

The 6 golden Rules

1. The Lab book is a document as defined by the law.

Only original records, no deleting, corrections made visible!

2. The lab book is an original document.

NOT a copy from a collection of slips of paper using your best handwriting!

3. The lab book is a chronological record of everything you have done.
EVERYTHING which was done is recorded, in case of repetition links are allowed (method, buffers...)



4. Everything can be recorded in the lab book, but not too little!

e.g. added 20 mM DDM is too little,
9 ml sample + 1 ml 200 mM DDM is correct

5. Because a lot of things are recorded electronically nowadays, the lab book has to contain the names of the files used to store the results!

...makes writing up easier anyway....

6. The lab book has to contain the info, where and under which name samples/mutants...are stored. With exact labelling!

Lab books have to be stored by the PIs for 10 years:

→ You have to give them back, but ask for a signature that you have done so!



Serious Scientific Misconduct

- Misrepresentation (concerning data)
- Violation of intellectual property (by incorrect citation or plagiarism concerning ideas)
- Sabotage or destruction of data

- **Denying authorship**
- **Making somebody an author without his/her consent**
- **'honorary authorships'**

→ Massive conflicts arise here!

Further reading:

The COPE report 2013: How to handle authorship disputes: a guide for new researchers



Publications

Process of Publication

- Submission
- Review process
- Revision
- Acceptance
- Publication

After the publication of an article ,mistakes and errors' can be corrected and published as an Erratum or Corrigendum.

Publishers usually request:

Methods, materials, data and results should be described **correctly, completely** and **understandably**, previous work by the authors and by others should be cited correctly.

The role of each author must be clear (Author, Co-author, Corresponding Author).



Authorship

DFG, Commentary to recommendation 11:

„Authors of an original scientific publication shall be all those, and only those, who have made significant contributions to the **conception** of studies or experiments, to the **generation, analysis** and **interpretation** of the data, and to **preparing the manuscript**, and who have **consented** to its publication, thereby assuming responsibility for it. [...]“.



Authorship

“...the following contributions **on their own** are not sufficient to justify authorship:

- merely organisational responsibility for obtaining the funds for the research, → to be balanced:
→ Conception of project
- providing standard investigation material, → ,standard‘
- the training of staff in standard methods, → ,standard‘
- merely technical work on data collection, → ,technical‘
- merely technical support, such as only providing equipment or experimental animals, → ,technical‘
- regularly providing datasets only, → without intellectual input
- only reading the manuscript without substantial contributions to its content, → without intellectual input
- directing an institution or working unit in which the publication originates. → absolute: no honorary authorship allowed

Help of this kind can be acknowledged in footnotes or in the foreword.“



Authorship

Biggest Problem:

Order of Authors

- this depends on the ‚culture‘ in the field, here only Life Science
- no written rules, only traditions (which can change!)

First Author

has contributed most, especially experimentally

Last Author

in most cases the PI, the person who gave the biggest conceptual input

Corresponding Author

responsible for dealing with the manuscript, often done by the last author

Shared first authorships

usually alphabetical, 😊 and ☹️



Authorship

Case studies

M = Master student

D = PhD student

P = Postdoc

L = PI

- M has very good results, obtained with a new method developed by D,
- the concept of the project was written by L and the project funded by the DFG
- P supervised D and M, the data were analysed and interpreted by all, and the manuscript was written by P with the help of D and L.

Who's author? Order?



Authorship

Case studies

M = Master student

D = PhD student

P = Postdoc

L = PI

- M has very good results, obtained with a new method developed by D,
- L payed for consumables and the positions of P and D
- P supervised D and M, the data were analysed and interpreted by those three, and the manuscript was written by P with the help of D.

Who's author? Order?



Authorship

Case studies (adopted from real cases)

M = Master student

D = PhD student

P = Postdoc

L = PI

- D1 and D2 have very good results
- the concept of the project was written by L and the project funded by the DFG
- D1 and D2 have interpreted the data and wrote the manuscript together with L, the manuscript got rejected
- D1 and D2 write up their PhD thesis, finish their PhD and leave the group
- L decides that the paper will only be 'sexy' if the data of M are added
- L revises the manuscript, D1 and D2 are omitted from the list of authors

correct? If yes, how?



Authorship

Case studies (adopted from real cases)

M = Master student

D = PhD student

P = Postdoc

L = PI

- P has some good results
- the concept of the project was written by L and the project funded by the DFG
- P has a very busy time, so no time to do the statistics or write the paper, the same holds for L.
- P appoints an external writer (W) to write the manuscript.
- W does more statistics, does an extensive literature search, writes the manuscript and gets paid for this job
- The manuscript is submitted with P and L as authors

W wants to be an author, ok?



Authorship

Case studies (adopted from real cases)

M = Master student

D = PhD student

P = Postdoc

L = PI

- D1 has developed a new method and very good results,
- the concept of the project was written by L and the project funded by the DFG
- D1 has problems with L, finishes the PhD and leaves the group without settling the dispute, but removes lab books and part of the data documentation
- D2 now works on the project, improves the methods and obtains additional data
- L writes the manuscript together with D2

D1 wants to be First Author, ok?



Authorship

Case studies (adopted from real cases)

M = Master student

D = PhD student

P = Postdoc

L = PI

- a paper with the following list of authors is submitted:
D1, D2, P, L
- D2 informs the journal, that s/he does not consent with the order of authors, because s/he should be First Author,
- The journal correctly stops the publication process and informs all authors
- L asks for advice from the ombudsperson
- The ombudsperson as well as an external referee agree that the order of authors was correct
- D2 is not satisfied and still does not give his consent for the publication, without D2's data the publication is not possible

Stallmate? Any solution?



Authorship

DFG, Commentary to Recommendation 11

„It conflicts with the rules of good scientific practice to cease contributing without sufficient reason or, as a co-author on whose agreement publication depends, to prevent publication where there are no urgent grounds to do so. Refusals to publish must be justified with verifiable criticism of data, methods or results. Should co-authors suspect an obstructive refusal to give agreement, they must ask ombudspersons [...] to mediate. If the ombudsperson is persuaded that there is deliberate obstruction, he or she can issue a statement permitting the other researchers to publish. The matter must be disclosed in the publication, including the permission to publish by the ombudsperson or the ombuds committee.“

→ In short: obstructing the publication without reason is also misconduct!



„Whistle Blower“

DFG, Commentary to Recommendation 17



“Researchers who report their suspicions of possible scientific misconduct to the relevant institution perform an essential function for self-regulation in science and research. It is not the whistleblower who expresses a justified suspicion who damages research and the institution, but the researcher who is guilty of misconduct. Therefore, a whistleblower’s career should not be disadvantaged or academic progress hindered by a disclosure.”

“The whistleblower’s report must be made in good faith. Allegations must not be made without verification and without adequate knowledge of the facts. Frivolous allegations of scientific misconduct and the making of allegations known to be incorrect can represent a form of scientific misconduct.”

→ don’t use allegations for bullying! (do not bully anyway!!)

“The whistleblower should also be protected if scientific conduct is not proven, provided the allegations were not obviously groundless.”



Addresses:

Deutsche Forschungsgemeinschaft:

<http://www.ombudsman-fuer-die-wissenschaft.de>

Ombudspersons Goethe University Frankfurt:

(Website via Präsidium → Beauftragte / Vertrauenspersonen)

http://www.uni-frankfurt.de/47859946/ombuds_wiss_fehlverhalten

ombudspersonen-fehlverhalten@uni-frankfurt.de

c.buechel@bio.uni-frankfurt.de

GRADE e-learning tool:

<http://www.uni->

[frankfurt.de/53366494/300_gute_wissenschaftliche_praxis](http://www.uni-frankfurt.de/53366494/300_gute_wissenschaftliche_praxis)

Further reading:

<http://retractionwatch.com/>

