



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 was 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!



Rules of Good Scientific Practice

Who's setting them up?

The decisive scandal 1997 (Herrmann/Brach scandal):

According to an independent commission, the oncologist F. Herrmann, together with R. Mertelsmann, A. Lindemann, M. Brach and W. Oster, published 94 papers (out of 400) based on false data and ideas stolen from others. (https://de.wikipedia.org/wiki/Friedhelm_Herrmann, 17.8.2018)

Hochschulrektorenkonferenz (HRK) (first in 1998)

Deutsche Forschungsgemeinschaft (DFG)

- first in 1998 as recommendations, amended 2013;
- 2019 as obligatory **code of conduct**: no DFG funding if institution does not comply with the rules (i.e. sets up ways to deal with misconduct)



Rules of Good Scientific Practice

Who's accusing and where?

Who?

Principally: Everybody

– and everybody is responsible

That's not the point!



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 information must be provided "in good faith".

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)



Rules of Good Scientific Practice

Who's accusing and where?

Where?

- ‚boss‘
- Ombudspersons of the University/Research Institution

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
- Ombuds Committee for scientific integrity in Germany (DFG)

→ Anonymity is safeguarded!



Rules of Good Scientific Practice

Who's accusing and where?

Where?

- ‚boss‘
- Ombudspersons of the University/Research Institution

In serious cases involvement of:

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

Tasks: evaluate whether allegations are correct by hearing:

- Wistleblower
- Person accused
- Checking all available material
- Giving recommendation to the University Heads

→ this takes time!



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!



Rules of Good Scientific Practice

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 patents; safety rules (GMOs and else)...

→ Plenty of room for misconduct ☹️



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 the Humanities people copy

--- in Natural Science people fake

data

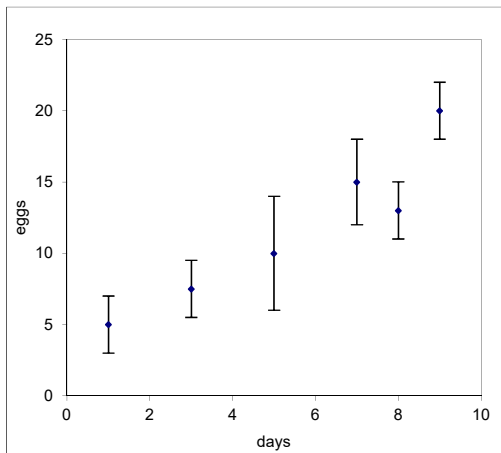


Fig. 1

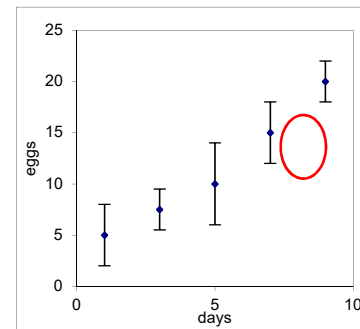


Fig. 2

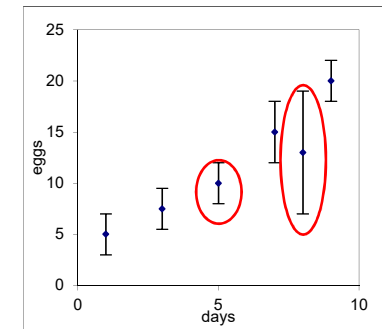
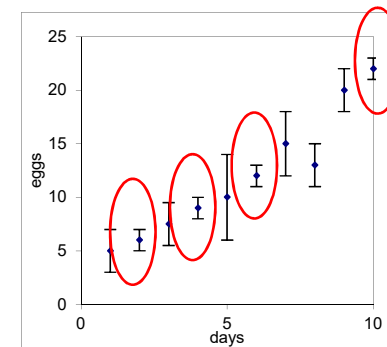


Fig. 3

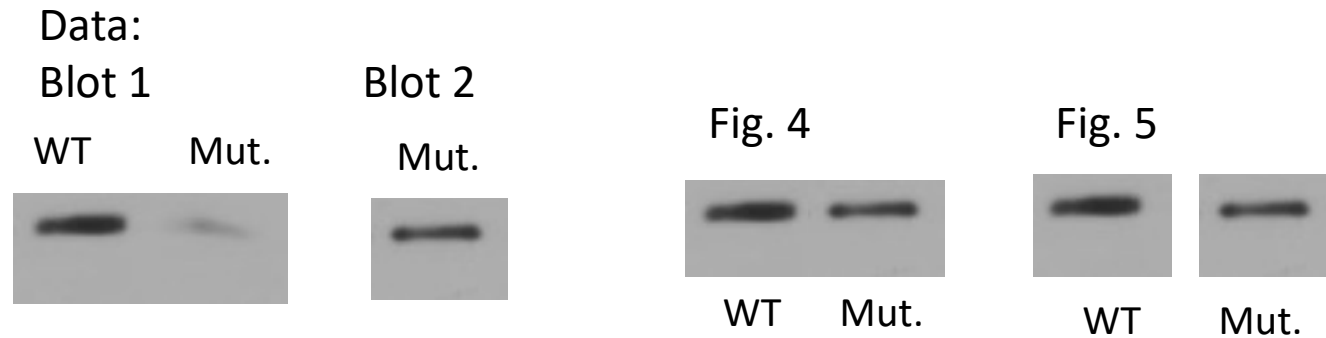


1. The invention of data (Fig. 3)
2. ‚change‘ of data
 - by selecting and omitting results (Fig. 1)
 - by changing data points/results (Fig. 2)



Serious Scientific Misconduct

In Natural Science people fake ---



Conceptual mistake? → loading control missing

What about Fig. 4? → absolute ,no go'

Statement in publication:

The figure demonstrates that both WT and mutant express the protein

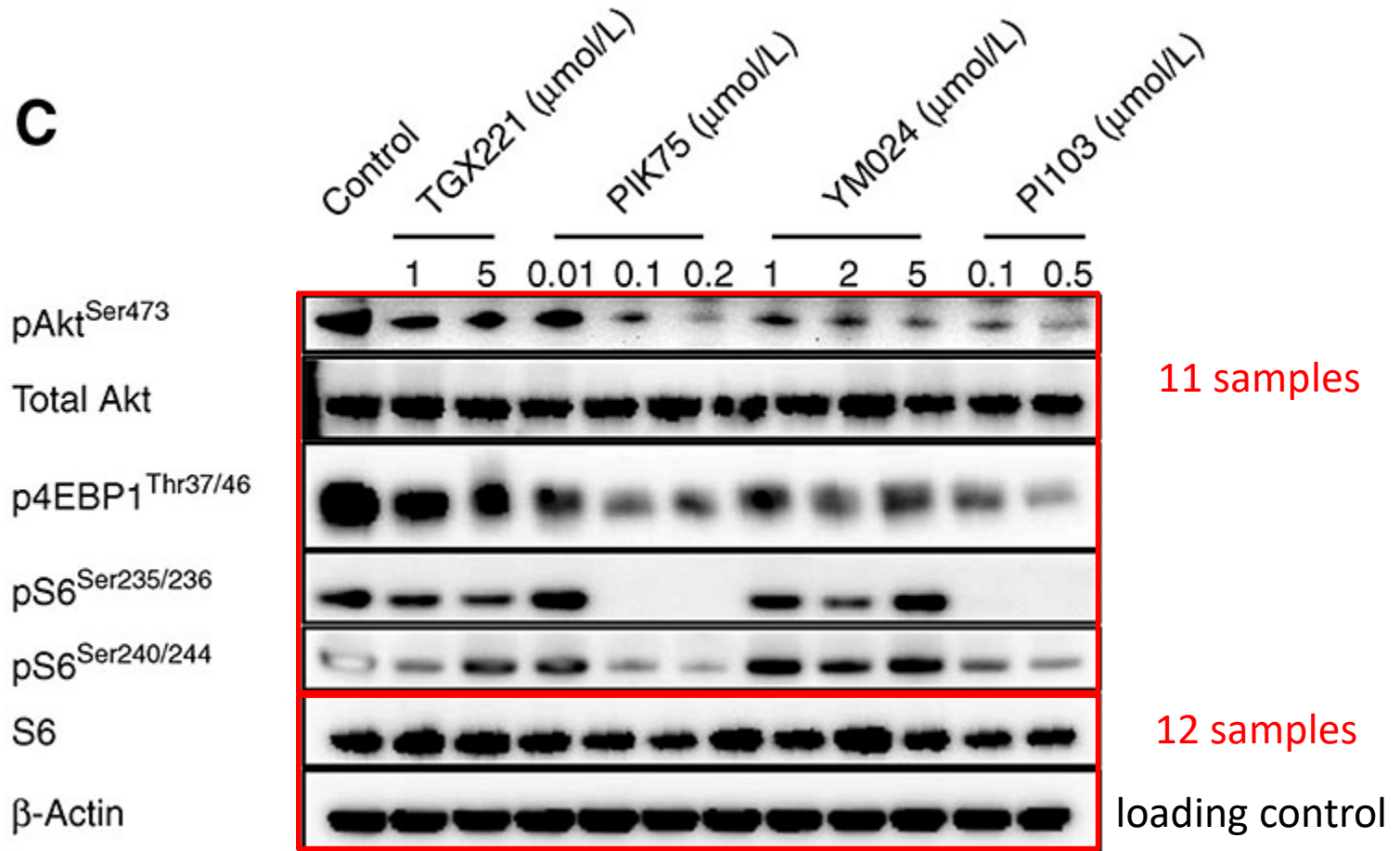
→ ok for Fig. 5

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

→ absolute ,no go'



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



rather sloppiness than fake, but still...

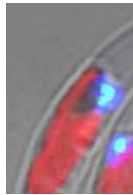


Serious Scientific Misconduct

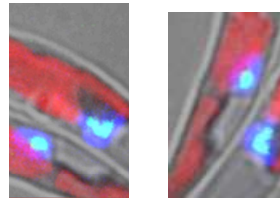
In Natural Science people fake ---

Fig. 6

WT



Mutants



The figure demonstrates the similar appearance of wild type and mutant cells (my pictures, but in analogy to a real case)



Serious Scientific Misconduct

In Natural Science people fake ---

„Fraud“

1. The invention of data (Fig. 3/6)
2. „change“ of data
 - by selecting (and/or omitting) unwanted results (Fig. 1)
 - by changing data points/results (Fig. 2)
 - by manipulation of figures (Fig. 4)
3. Wrong statements in job applications or grant proposals
 - Invention of papers
 - Inventing authorship
 - wrong statements concerning journal or status („in press“)
 - ...



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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.

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 of protein aggregation.

---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 into chemical energy.

→ textbook, no citation of original work

Example:

The redox potential of the primary donor of photosystem II is -1.2V (Rutherford et al. **2021**), 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:
Photosystem II is a dimer in green algae (Ruban et al. 1980). Later, this was demonstrated 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)

- In principle this is wrong
- Possible, but not nice: (see review by Meyer and Müller 2014)
- Optimal: (Ruban et al 1980, Hardworking 2003, see also review by Meyer and Müller 2014)



Rules of Citation

Ruban et al. 1980: Photosystem II of green algae is a dimer

Masterstudi et al. 2015

Photosystem II of green algae is a dimer (Repeater et al. 2000).

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

(and if Repeater only mentions this fact in his introduction
you've done an extremely bad job!)

Masterstudi et al. 2015

Photosystem II of green algae is a dimer (Ruban et al. 1980, Repeater
et al. 2000).

→ ok



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 (publicly available in the library) and has to be cited!

Further reading:

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



Rules of Citation

„special case“ Masterthesis:

This is not a publication on ist own!

- BUT: it should be written according to the rules of good scientific practice (and you'll sign for that)
- all rules apply

- Additionally, it is an exam:
 - documents your own performance, experimentally as well as in writing
 - data obtained by others have to be indicated
 - only own Materials and Methods have to be described
(including **AI-platforms** you might have used for writing/data analysis
– in this case better ask before, if it was allowed)

→ if there was a publication already: only the publication is not sufficient as a thesis, since it usually has several authors, you have to write the thesis on your own!



Serious Scientific Misconduct

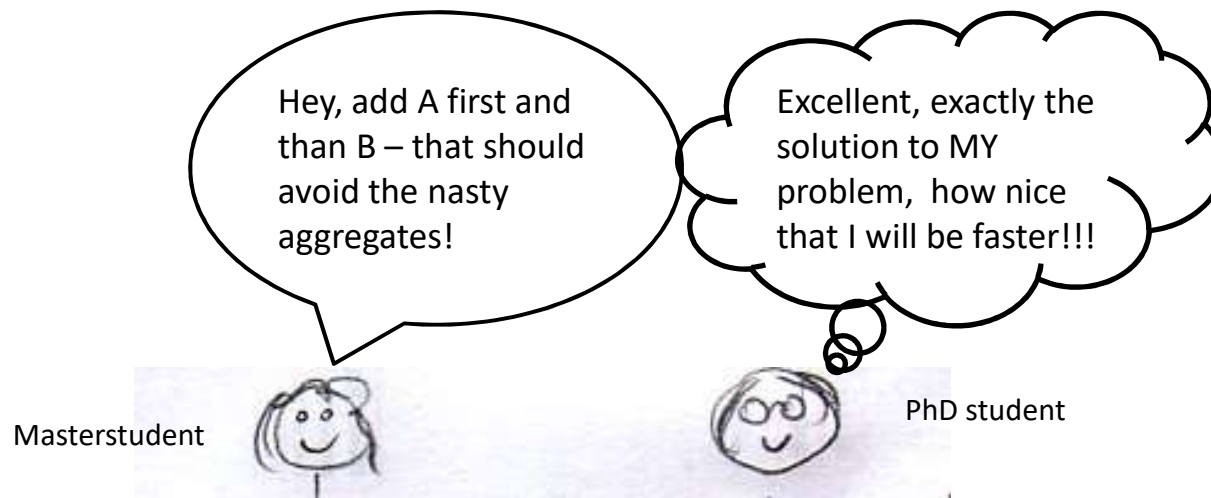
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stealing ideas:

- 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 and 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**

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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 nor those of others (!) may be deleted
- and nobody is allowed to spit in the Eppendorf of the neighbour at the bench, or to exchange/destroy samples!

→ 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!

electronic labbooks automatically work like that

2. The lab book is an original document.

NOT a copy from a collection of slips of paper using your best handwriting! *Also in case of e-labbooks*

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. “20 mM KCl added” is too little,
“9 ml sample + 1 ml 200 mM KCl” is correct

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

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

6. The lab book must 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, in case of hardcopies:
→ You have to give them back, but ask for a signature that you have done so!



Serious Scientific Misconduct

- Misrepresentation (concerning data)
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- 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). Best practice: to decide together latest at the beginning of writing!



Authorship

DFG, Commentary to recommendation 11 (2013):

„Authors ... 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.“

DFG, Code of conduct (2019):

An author is an individual who has made a **genuine, identifiable contribution** to the content of a research publication of text, data or software. All authors agree on the final version of the work to be published. Unless explicitly stated otherwise, they share responsibility for the publication.



Authorship

DFG, Commentary to recommendation 11 (2013):

“...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

One of the biggest problems in our field:

1. Who is Author

2. 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? Suggestions for the order of authors?



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?



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?



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 is second author

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 original 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



“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 misconduct is not proven, provided the allegations were not obviously groundless.”



Sources:

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

– both documents are in German and English!

DFG 2019: Guidelines for Safeguarding Good Research Practice, Code of Conduct
<https://wissenschaftliche-integritaet.de/en/code-of-conduct/>

Addresses:

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

Further reading:
<http://retractionwatch.com/>