# Good Scientific Practice

## Workshop Handout

## Hannover, 3/4 November 2016

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"The conduct of science rests on basic principles valid in all countries and in all scientific disciplines. The first among these is honesty towards oneself and towards others."

Deutsche Forschungsgemeinschaft: Safeguarding Good Scientific Practice. Recommendations of the Commission on Professional Self Regulation in Science, 2013:67

# Good Scientific Practice

## *DFG 2013: Safeguarding Good Scientific Practice, p. 69*

**“Recommendation 1: Good Scientific Practice**

*Rules of good scientific practice shall include principles for the following matters (in general, and specified for individual disciplines as necessary):*

- *fundamentals of scientific work, such as*
  - *observing professional standards,*
  - *documenting results,*
  - *consistently questioning one's own findings,*
  - *practising strict honesty with regard to the contributions of partners, competitors, and predecessors,*
- *cooperation and leadership responsibility in working groups (Recommendation 3),*
- *mentorship for young scientists and scholars (Recommendation 4),*
- *securing and storing primary data (Recommendation 7),*
- *scientific publications (Recommendation 11).”*

## *Basic Values and Norms in Science*

Honesty
Trust
Fairness
Objectivity
Independence
Transparency
Openness
Confidentiality
Assumption of responsibility towards patients, subjects, animals, matters, for future generations and the environment, for the team, the students, mentors and for the scientific community

...

## *Fields of Conflicts in Science*

Managing data, sources and ideas
Publication process and authorship
Applying for research funding
Hierarchy, dependence and organization culture
Scientific cooperation
Research with humans or animals
Research with toxic or dangerous substances
Industrial research
... and many others

Sometimes, there is no clear distinction between good scientific practice, questionable practice and misconduct.

# Data management and study design

## *What should be discussed in the team before collecting or generating data:*

- Do I need a permit to collect data (safety procedures, patent rights, legal regulations concerning research with humans or animals)?
- Which research methods are appropriate?
- What kind of data documentation is appropriate and necessary?
- How can the data be stored safely (safety regulations, confidentiality, protection from data theft or loss)?
- Who has access to the data?
- Who may publish the data and what qualifies to be an author?

## *Guidelines for Responsible Data Management in Scientific Research*

Meghan B Coulehan, Jonathan F Wells

p. 3: **Concepts of Data Management**

Before starting a new scientific research project, the PI and research team must address issues related to data management, including the following:

| Key Concept | How It Relates to Responsible Conduct of Research |
|---|---|
| Data Ownership | This pertains to who has the legal rights to the data and who retains the data after the project is completed, including the PI's right to transfer data between institutions. |
| Data Collection | This pertains to collecting project data in a consistent, systematic manner (i.e., reliability) and establishing an ongoing system for evaluating and recording changes to the project protocol (i.e., validity). |
| Data Storage | This concerns the amount of data that should be stored -- enough so that project results can be reconstructed. |
| Data Protection | This relates to protecting written and electronic data from physical damage and protecting data integrity, including damage from tampering or theft. |
| Data Retention | This refers to the length of time one needs to keep the project data according to the sponsor's or funder's guidelines. It also includes secure destruction of data. |
| Data Analysis | This pertains to how raw data are chosen, evaluated, and interpreted into meaningful and significant conclusions that other researchers and the public can understand and use. |
| Data Sharing | This concerns how project data and research results are disseminated to other researchers and the general public, and when data should not be shared. |
| Data Reporting | This pertains to the publication of conclusive findings, both positive and negative, after the project is completed. |

## *DFG 2013: Safeguarding Good Scientific Practice, p. 74ff.*

**“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.*

Commentary

...

Being able to refer to the original records is a necessary precaution for any group if only for reasons of working efficiency. It becomes even more important when published results are challenged by others. Primary data includes measurement results, collections, surveys, cell cultures, specimens of material, archaeological finds and questionnaires. Where justified, the institution can stipulate shorter retention periods for primary data which cannot be stored on permanent and secure carriers.

A distinction must be observed between the use and the retention of primary data. Researcher(s) who collect the data are entitled to use it. During a research project, those entitled to use the data (possibly subject to data protection regulations) decide whether third parties should have access to it. If more than one institution is involved in collecting the data, an agreement must be drawn up to regulate the matter.

Therefore every research institute applying professional standards in its work has a clear policy for retaining research records and for the storage of primary data and data carriers and access to the original data and data carriers, even when this is not obligatory on legal or comparable grounds following regulations laid down e. g. in German laws on medical drugs, on recombinant DNA technology, on animal protection, or in professional codes such as Good Clinical Practice. It is recommended that this policy also includes arrangements for the event that the working group member responsible for creating the data changes. As a rule, the original data and documentation remain where they were created. However, duplicates can be made or access rights specified.

...

The published reports on scientific misconduct are full of accounts of vanished original data and of the circumstances under which they had reputedly been lost. This, if nothing else, shows the importance of the following statement: The disappearance of primary data from a laboratory is an infraction of basic principles of careful scientific practice and justifies a prima facie assumption of dishonesty or gross negligence...“

Each field of science and each work group should discuss what their primary data are. They can be columns of numbers, observation protocols, pictures, videos, computer files, questionnaires, texts, transcripts. The team should also discuss an appropriate and safe way of storing the data, and what has actually got to be stored on top of the generated experimental data: laboratory diaries, DVDs, photographs, biological specimens, samples, communications, e-mails... As a rule, you should consider everything that is necessary to recreate the same result of your scientific efforts, or a similar result, and reproduce the process associated with that, as “primary data.”

# Scientific Misconduct

## *Max Planck Society:*
## *Rules of Procedure in Cases of Suspected Scientific Misconduct, 2000:4-5*

"I. Scientific misconduct occurs when in a scientifically significant context, false statements are made knowingly or as a result of gross negligence when the intellectual property of others is infringed, or if their research work is impaired in some other way.
In particular, the following may amount to misconduct:

< False statements >
1. the fabrication of data;
2. the falsification of data, e.g.
   a) through the undisclosed selective reporting and rejection of unwanted results,
   b) through the manipulation of a representation or illustration;
3. incorrect statements in a letter of application or in an application for support (including false statements concerning the publication in which work is said to have appeared, and concerning work accepted for publication);

< Infringement of intellectual property >
4. with respect to a copyright work of another person or the significant scientific findings, hypotheses, theories or research methods of others
   a) the unauthorized exploitation involving usurpation of authorship (plagiarism),
   b) the misappropriation, particularly in an expert opinion, of research methods and ideas (theft of ideas),
   c) the usurpation of scientific authorship or co-authorship, or the unjustified acceptance thereof,
   d) the falsification of the contents or
   e) the unauthorized publishing and making accessible to third persons of work, findings, hypothesis, theory or research method not yet published;

5. the assertion of the (co-)authorship of another person without his or her consent;

< Impairment of the research work of others >
6. the sabotage of research work (including damaging, destroying or manipulating experimental arrangements, equipment, documents, hardware, software, chemicals or other items required by another person for carrying out an experiment).

< Joint accountability >
II. Joint accountability may, inter alia, be the result of
1. active participation in the misconduct of others;
2. having knowledge of falsification committed by others;
3. co-authorship of falsified publications;
4. gross dereliction of supervisory duties.
Final decisions must depend upon the circumstances of each case."

Scientific misconduct can occur in all these fields. There is no clear line between good scientific practice, questionable practice and malpractice.

## *Office of Science and Technology Policy (OSTP) 2002. Federal Policy on Research Misconduct*

> “Research misconduct is defined as fabrication, falsification, or plagiarism in proposing, performing, or reviewing research, or in reporting research results.
>
> 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
>
> Plagiarism is the appropriation of another person’s ideas, processes, results, or words without giving appropriate credit.
>
> Research misconduct does not include differences of opinion.”

## *DFG 2013: Safeguarding Good Scientific Practice, p. 92*

> “Research in an idealized sense is the quest for truth. Truth is categorically opposed to dishonest methods. Dishonesty therefore not merely throws research open to doubt; it destroys it. ...
>
> Researchers depend on each other, in cooperation and as competitors. They cannot be successful unless they are able to trust each other and their predecessors – and even their present rivals. ...
>
> Thus, honesty is not merely the obvious basic rule of professional conduct in science in the sense that “within the confines of the lecture theatre, there is simply no other virtue but straight intellectual honesty” (49); it is the very foundation of science as a social system.“

(49): Max Weber: Wissenschaft als Beruf (1919), in: Max Weber: Gesammelte Aufsätze zur Wissenschaftslehre, 3rd edition, Tübingen: Mohr 1968, p. 582–613.

# Publication of research

Many journals provide very detailed information about publication and authorship on their websites. In general, the **process of publication** has several steps:

- Submission of the original manuscript
- Peer review process
- If the manuscript requires revision after peer review, it must be revised, and the revised manuscript must be submitted
- Acceptance and publishing

## *Criteria for publication – Nature Publishing Group*

"Nature journals receive many more submissions than they can publish. Therefore, we ask peer-reviewers to keep in mind that every paper that is accepted means that another good paper must be rejected. To be published in a Nature journal, a paper should meet four general criteria:

- Provides strong evidence for its conclusions.
- Novel (we do not consider meeting report abstracts and preprints on community servers to compromise novelty).
- Of extreme importance to scientists in the specific field.
- Ideally, interesting to researchers in other related disciplines.

In general, to be acceptable, a paper should represent an advance in understanding likely to influence thinking in the field. There should be a discernible reason why the work deserves the visibility of publication in a Nature journal rather than the best of the specialist journals."

## *Nature journals' policy on duplicate publication*

"Material submitted to a Nature journal must be original and not published or submitted for publication elsewhere. This rule applies to material submitted elsewhere while the Nature journal contribution is under consideration.

Authors submitting a contribution to a Nature journal who have related material under consideration or in press elsewhere should upload a clearly marked copy at the time of submission, and draw the editors' attention to it in their cover letter. Authors must disclose any such information while their contributions are under consideration by a Nature journal - for example, if they submit a related manuscript elsewhere that was not written at the time of the original Nature journal submission.

If part of a contribution that an author wishes to submit to a Nature journal has appeared or will appear elsewhere, the author must specify the details in the covering letter accompanying the Nature submission. Consideration by the Nature journal is possible if the main result, conclusion, or implications are not apparent from the other work, or if there are other factors, for example if the other work is published in a language other than English."

## *Correcting the scientific record*

If you find an error in your published paper, a correction should be published in the journal as a corrigendum (authors' error) or an erratum (publisher's error). If you find severe mistakes in your published paper, so that the whole conclusion is wrong, you can retract the paper. If a published paper has been identified in an investigation as a product of scientific misconduct, based on false or invented data etc, the editor should be promptly informed that a fraudulent paper has been published. The journal will then print a retraction of the paper.

# Authorship

## *DFG 2013: Safeguarding Good Scientific Practice, p. 82f.*

„Recommendation 12: 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.*

...

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. ...

Therefore, the following contributions on their own are not sufficient to justify authorship:

- merely organisational responsibility for obtaining the funds for the research,
- providing standard investigation material,
- the training of staff in standard methods,
- merely technical work on data collection,
- merely technical support, such as only providing equipment or experimental animals,
- regularly providing datasets only,
- only reading the manuscript without substantial contributions to its content,
- directing an institution or working unit in which the publication originates

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

"Honorary authorship" is generally not considered to be acceptable under any circumstances. Neither the position of institute director and supervisor nor former supervisor justify designation as co-author.

To avoid conflicts concerning authorship, timely and clear agreements are recommended, in particular when there is a large number of contributors to the findings, to serve as guidelines for resolving disputes.

The sequence in which authors are listed must take account of the particular conventions of the discipline in question. Equivalent standards should be applied in each discipline."

## *ICMJE Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals (updated December 2014), p. 2*

***"2. 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."

**Please remember: Publications are the currency of science in our present system of research.**

# Dealing with Conflicts

## *Check before acting*

- Do you have a clear picture of the situation? Can you separate facts from fiction?
- Do you know the interests, duties and values of the involved people?
- Please avoid snap judgements and stirring up rumours.
- Please remain fair.

## *DFG 2013: Safeguarding Good Scientific Practice, p. 88f.*

“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”.*

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. Particularly for early career researchers a report of this nature should not result in delays or obstacles during their education; there should be no disadvantage to their final dissertations and doctorate; this applies to working conditions and to possible extensions to their contracts.

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.

Verification of anonymous reports must be considered by the authority or group to whom the allegation is reported. Generally speaking, it is more useful to an investigation if the whistleblower is named. The whistleblower’s name must remain confidential. It can be expeditious to reveal the name to the person against whom allegations have been made if he or she is otherwise unable to mount an appropriate defence.

Reports must be treated confidentially by all those involved… The procedure is no longer confidential if the whistleblower makes his or her suspicions public before notifying the university or research institution that they suspect scientific misconduct. The investigating institution must decide on a case-by-case basis how to deal with the breach of confidentiality. It is not acceptable that premature disclosure to the public should result in a loss of reputation for the person involved.”

### *Ombudsmen*

ETHICAL PRINCIPLES FOR OMBUDSPEOPLE
International Ombudsman Association IOA

"INDEPENDENCE
The Ombudsman is independent in structure, function, and appearance to the highest degree possible within the organization.

NEUTRALITY AND IMPARTIALITY
The Ombudsman, as a designated neutral, remains unaligned and impartial. The Ombudsman does not engage in any situation which could create a conflict of interest.

CONFIDENTIALITY
The Ombudsman holds all communications with those seeking assistance in strict confidence, and does not disclose confidential communications unless given permission to do so. The only exception to this privilege of confidentiality is where there appears to be imminent risk of serious harm.

INFORMALITY
The Ombudsman, as an informal resource, does not participate in any formal adjudicative or administrative procedure related to concerns brought to his/her attention."

### *The "Ombudsman für die Wissenschaft"*

If you do not trust your local ombudsmen or if you prefer to voice your suspicion of scientific misconduct outside your own institution, the "Ombudsman für die Wissenschaft" can be a useful address: http://www.ombudsman-fuer-die-wissenschaft.de/

## Consequences of scientific misconduct

The regulations on safeguarding good scientific practice of most institutions contain a chapter about the consequences of scientific misconduct. The consequences of severe misconduct may include

- The loss of academic degrees, e. g. a PhD
- Information of the scientific community, scientific journals, funding organisations, cooperation partners or the public about the perpetrator
- Formal lawsuits with the consequence of repayment of funds
- The dismissal from employment
- A long period of time of not being eligible for public funding

Above all: Scientific misconduct…
- Destroys the public trust into science
- Damages careers
- Wastes resources
- Wastes lifetime
- Increases risks for humans and animals
- Slows down the process of research
- Slows down the development of pharmaceuticals
- Increases the amount of control (regulations, sanctions)

# Literature and websites

Albert T, Wager E: How to handle authorship disputes: a guide for new researchers. The COPE Report 2003: 32-34

Bundesministerium der Justiz, Gesetze im Internet: http://www.gesetze-im-internet.de/

Committee on Publication Ethics COPE: http://publicationethics.org

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European Charter for Researchers & Code of Conduct for the Recruitment of Researchers http://ec.europa.eu/eracareers/pdf/am509774CEE_EN_E4.pdf

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Fanelli D (2009) How Many Scientists Fabricate and Falsify Research? A Systematic Review and Meta-Analysis of Survey Data. PLos ONE 4(5): 5738.doi:10.1371/journal.pone.0005738

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Handbuch der Deklarationen: http://www.bundesaerztekammer.de/downloads/handbuchwma.pdf

Helmholtz Gemeinschaft. Sicherung guter wissenschaftlicher Praxis und Verfahren bei wissenschaftlichem Fehlverhalten. http://www.helmholtz.de/fileadmin/user_upload/aktuelles/Reden-dokumente/GWP-Helmholtz.pdf

Hochschulrektorenkonferenz, Empfehlung des 185 Plenums vom 6. Juli 1998 „Zum Umgang mit wissenschaftlichem Fehlverhalten in den Hochschulen“: http://www.hrk.de/de/beschluesse/109_422.php?datum=185.+Plenum+am+6.+Juli+1998+

International Committee of Medical Journal Editors: Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals. Updated December 2014. http://icmje.org/

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Macrina F L (2005) Scientific Integrity. Third Edition. ASM Press, Washington D.C.

Martinson BA, Anderson MS, de Vries R (2005) Scientists behaving badly. Nature 435: 737-738

Nature Publishing Group. Publikationskriterien:
http://www.nature.com/authors/editorial_policies/peer_review.html

Office of Research Integrity: http://ori.dhhs.gov/

Ombudsman für die Wissenschaft http://www.ombudsman-fuer-die-wissenschaft.de

PhD Comics: http://phdcomics.com/comics.php

Retraction Watch: http://retractionwatch.com/

SCIENCE Information for Authors: http://www.sciencemag.org/about/authors/

https://en.wikipedia.org/wiki/Scientific_misconduct

Singapore Statement. http://www.singaporestatement.org/

Sponholz G, Baitsch H (2005) Zum wissenschaftlichen Fehlverhalten – man hat es geahnt. Arzt und Krankenhaus 10: 310-317

Stegemann-Boehl S (1994) Fehlverhalten von Forschern, Enke Verlag, Medizin in Recht und Ethik

The Danish Committees on Scientific Dishonesty Guidelines for Good Scientific Practice, January 2009: http://en.fi.dk/publications/2009/the-danish-committees-on-scientific-guidelines-for-good-scientific-practice/UVVU%20GVP%20ENG%2015052009.pdf

## Journals of “Negative” Results

Journal of Negative Results
http://www.jnr-eeb.org/index.php/jnr/index

Journal of Negative Results in Biomedicine
http://www.jnrbm.com/

Journal of Unsolved Questions
http://www.junq.info

Journal of Pharmaceutical Negative Results
http://www.pnrjournal.com/

The All Results Journals
http://www.arjournals.com/ojs/

Journal of Articles in Support of the Null Hypothesis
http://www.jasnh.com/