Good Scientific Conduct

Ivo F. Sbalzarini

Slides in part based on:
“Grundlagen wissenschaftlichen Arbeitens”, Andreas Kämper, Universität Tübingen.
“Sicherung guter wissenschaftlicher Praxis”, A. Reichenbach, Universität Leipzig.

Outline

- Scientific Misconduct
  - Definition
  - Manipulation and falsification of data
  - Plagiarism
  - Self-Plagiarism
- Good Scientific Practice
- Situation and Offices at TU Dresden

Scientific Misconduct

Definition

US Office of Research Integrity:

“Research misconduct means **fabrication**, **falsification**, or **plagiarism** in proposing, performing, or reviewing research, or in reporting research results.”

Does not include honest error, or differences of opinion!

Definition

- **Fabrication**: recording or reporting data or results that were made up.
- **Falsification**: manipulating research equipment, materials, or processes, or changing or omitting data or results such that the research is not accurately represented in the records.
- **Plagiarism**: (re-)use of another person's ideas, processes, results, words, or data without giving appropriate credit.

Severe cases

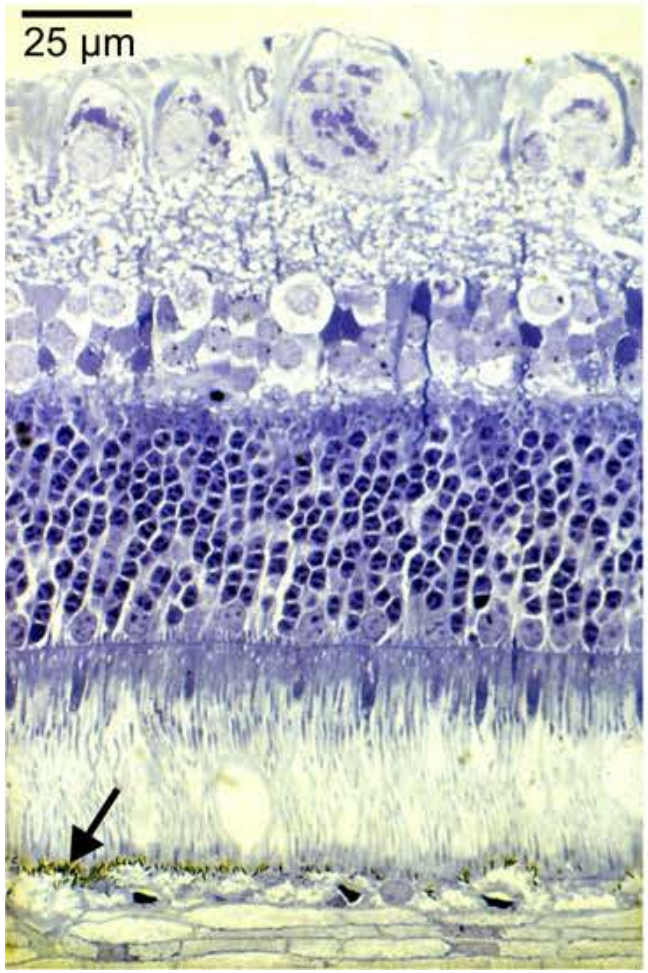
- Deliberately providing wrong information
- Violation of copyright or intellectual property
- Listing of co-authors without their consent
- Sabotage
- Destruction of raw data or codes

Bad cases

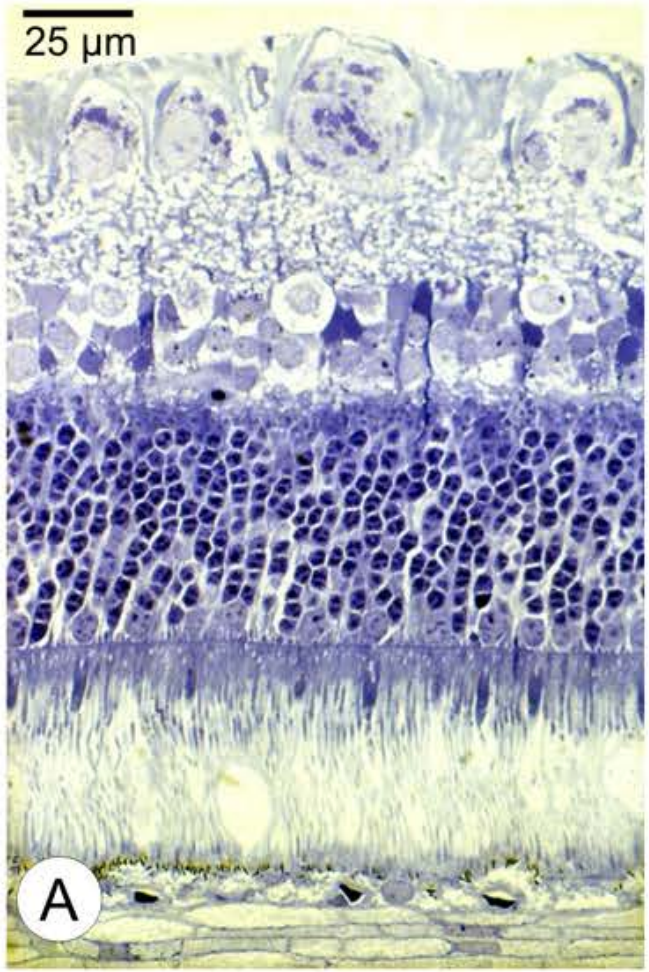
- Leaving out of “unpleasant” observations or data (“outliers have been omitted”)
- obfuscation of significance (“only typical results are shown here”, “the other results were similar and are not shown”, …)
- Leaving out of portions of an image or a plot that does not “fit the story”, or using suggestive legends
- Wrong or missing references and wrong information about own publications, including publication status (“in print”, “submitted”) and publication venue.

Examples

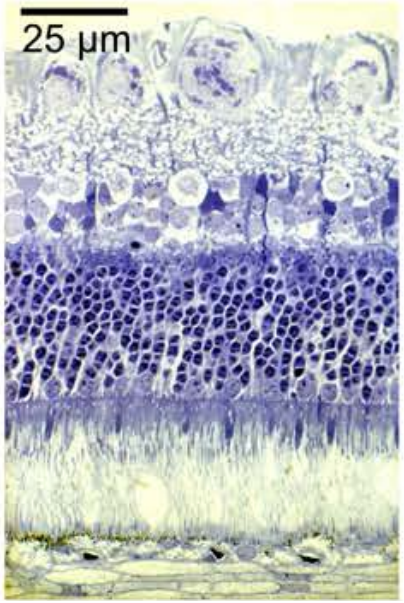
Original (retina)



Questionable



Illegal

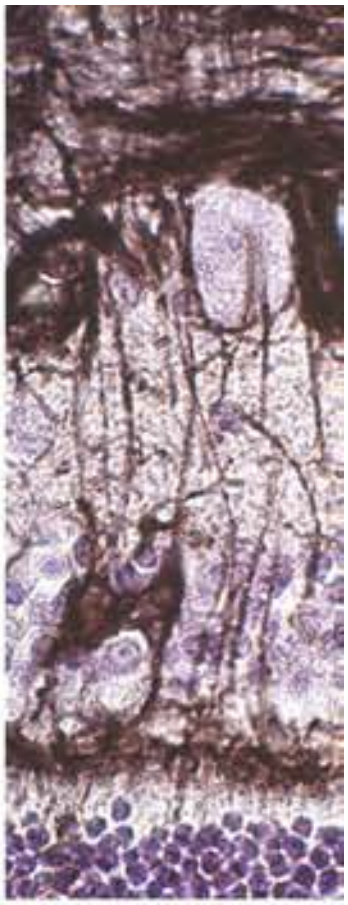


“Sicherung guter wissenschaftlicher Praxis”, A. Reichenbach, Universität Leipzig.

Examples

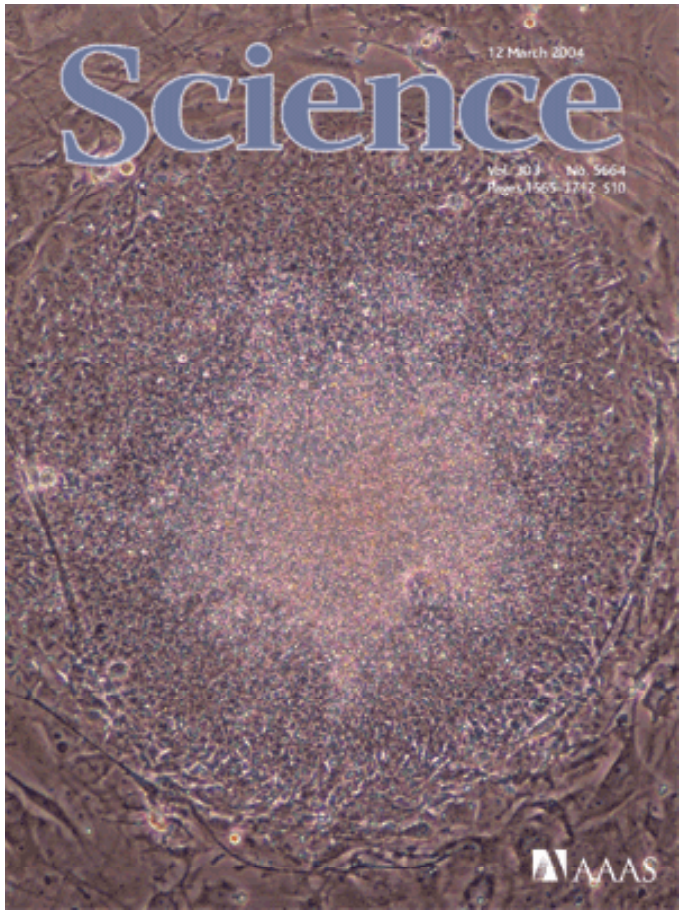
Original

Illegal



“Sicherung guter wissenschaftlicher Praxis”, A. Reichenbach, Universität Leipzig.

Example: Falsification



Hwang Woo-suk

First cloning of a human embryo

Generation of patient-specific stem cells

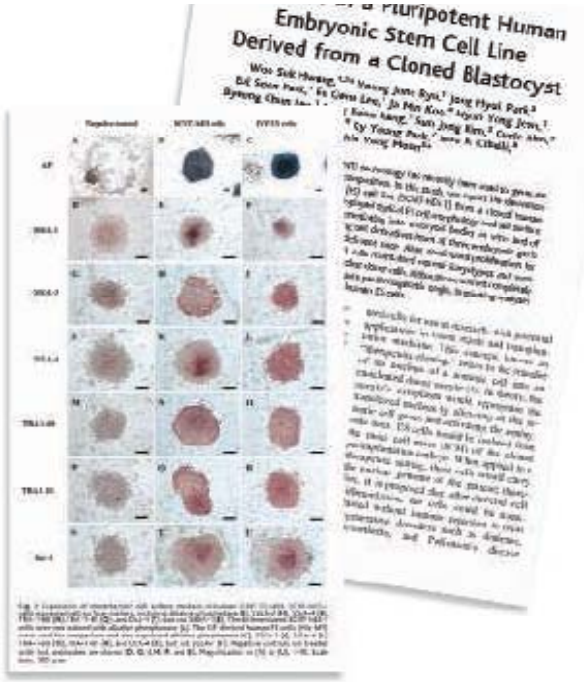
Withdrawn

~~Hwang W. S. *et al.*, *Science* **2004**, *303(5664)*, 1669;~~
~~Hwang W. S. *et al.*, *Science* **2005**, *308(5729)*, 1777.~~

“Grundlagen wissenschaftlichen Arbeitens”, Andreas Kämper, Universität Tübingen.

Example: Falsification

Editorial Retraction


Embryonic Stem Cell Line
Derived from a Cloned Blastocyst

THE FINAL REPORT FROM THE INVESTIGATION COMMITTEE of Seoul National University (SNU) (*1*) has concluded that the authors of two papers published in *Science* (*2*, *3*) have engaged in research misconduct and that the papers contain fabricated data. With regard to Hwang *et al.*, 2004 (*2*), the Investigation Committee reported that the data showing that DNA from human embryonic stem cell line NT-1 is identical to that of the donor are invalid because they are the result of fabrication, as is the evidence that NT-1 is a bona fide stem cell line. Further, the committee found that the claim in Hwang *et al.*, 2005 (*3*) that 11 patient-specific embryonic stem cells line were derived from cloned blastocysts is based on fabricated data. According to the report of the Investigation Committee, the laboratory "does not possess patient-specific stem cell lines or any scientific basis for claiming to have created one." Because the final report of the SNU investigation indicated that a significant amount of the data presented in both papers is fabricated, the editors of *Science* feel that an immediate and unconditional retraction of both papers is needed. We therefore retract these two papers and advise the scientific community that the results reported in them are deemed to be invalid.

As we post this retraction, seven of the 15 authors of Hwang *et al.*, 2004 (*2*) have agreed to retract their paper. All of the authors of Hwang *et al.*, 2005 (*3*) have agreed to retract their paper.

Science regrets the time that the peer reviewers and others spent evaluating these papers as well as the time and resources that the scientific community may have spent trying to replicate these results.

Editor-in-chief
Science Magazine

Withdrawn

~~Hwang W. S. *et al.*, *Science* **2004**, *303*(5664), 1669;~~
~~Hwang W. S. *et al.*, *Science* **2005**, *308*(5729), 1777.~~

Example: Falsification

From national hero to convicted fraud.

Stern.de, 10. Januar 2006 (http://www.stern.de/sonst/578383.html?eid=578306);
Bild: © Reuters, Text: © Stern/DPA.

Withdrawn

~~Hwang W. S. *et al.*, *Science* **2004**, *303(5664)*, 1669;~~
~~Hwang W. S. *et al.*, *Science* **2005**, *308(5729)*, 1777.~~

Example: Plagiarism

K. Muthukkumaran, R. Bokalawela, T. Mathews, S. Selladurai, *J. Mater. Sci.* **2007**, *42*, 7461.

is an almost exact copy of:

D.A. Andersson, S.I. Simak, N.V. Skorodumova, I.A. Abrikosov, B. Johannson, *Proc. Natl. Acad. Sci. USA*, **2006**, *103*, 3518.

Example: Plagiarism

J Mater Sci (2008) 43:422
DOI 10.1007/s10853-007-2183-8

ERRATUM

Corrigendum

C. Barry Carter

Editor-in-chief
J. Mater. Sci.

Published online: 9 October 2007

Corrigendum to: J Mater Sci
DOI 10.1007/s10853-006-1486-5

It has come to our notice that a paper by entitled *Determination of dopant of ceria system by density functional theory* which was 'authored' by Muthukkumaran et al. [1] and was published in the Journal of Materials Science is essentially a reproduction of a paper entitled *Optimization of ionic conductivity in doped ceria* which was authored by Andersson et al. [2] and was published in Proceedings of the National Academy of Science.

There is no doubt that the paper by Andersson is the original work and that the paper by Muthukkumaran et al. does not just plagiarize the results presented in the PNAS paper but actually copies most of it word for word.

The Editors and Publisher of Journal of Materials Science have apologized to the authors and publishers of the PNAS article and are thoroughly investigating the origin of the J Mater Sci article to determine who was complicit in the fabrication. We are in contact with officials at Anna University and the Indira Gandhi Centre for Atomic Research. A report of this investigation will be published in an Editorial when it is completed.

1. Muthukkumaran, K., Bokalawela, R., Mathews, T. and Selladurai, S., J Mater Sci (2007) 42:7461–7466.
2. Andersson, D.A., Simak, S.I., Skorodumova, N.V., Abrikosov, I.A. and Johansson, B., PNAS (2006) 103:3518–3521.

Example: Plagiarism

It has come to our notice that a paper by entitled *Determination of dopant of ceria system by density functional theory* which was 'authored' by Muthukkumaran et al. [1] and was published in the Journal of Materials Science is essentially a reproduction of a paper entitled *Optimization of ionic conductivity in doped ceria* which was authored by Andersson et al. [2] and was published in Proceedings of the National Academy of Science.

There is no doubt that the paper by Andersson is the original work and that the paper by Muthukkumaran et al. does not just plagiarize the results presented in the PNAS paper but actually copies most of it word for word.

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Editor-in-chief
J. Mater. Sci.

"Grundlagen wissenschaftlichen Arbeitens", Andreas Kämper, Universität Tübingen.

Plagiarism Detection

- **eTBLAST**
- **DejaVu**
- **iThenticate**
- **Grammarly (free)**

Widely Used

- Most universities have anti-plagiarism software in place and some are systematically checking all student theses and exercises (e.g. DTU Copenhagen).

- Journals and editorial offices have plagiarism detectors in place.

Self-Plagiarism

- Self-plagiarism is [...] the verbatim or near-verbatim reuse of significant portions of one's own copyrighted work **without** citing the original source

- Self-plagiarism does not apply to publications based on the author's own previously copyrighted work (e.g., appearing in a conference proceedings) where an explicit reference is made to the prior publication.

- IEEE rule: journal/transactions papers can be extended versions of previously published IEEE conference papers, provided at least 1/3 of the contents is newly added and the original conference paper is mentioned and fully cited.

Example: Self-Plagiarism

R. Vialle, C. Court, I. Harding, J.F. Lepeintre, N. Khouru, M. Tadie, *Clin.* Anatom. **2006**, 19, 51.

is an almost exact copy of:

C. Court, R. Vialle, J.F. Lepeintre, M. Tadie, *Surg. Radiol. Anatom.* **2005**, 27, 8.

Example: Self-Plagiarism

Clinical Anatomy 21:754 (2008)

NOTICE OF RETRACTION

Retraction for "Multiple lumbar plexus neurotizations of the ninth, tenth, and eleventh intercostal nerves," *Clinical Anatomy* 19:51–58, 2006

R. VIALLE,[1,2,3*] C. COURT,[4] IAN HARDING,[5] J.F. LEPEINTRE,[2] N. KHOURI,[3] AND M. TADIÉ[2]

[1]*Ecole de Chirurgie de l'Assistance Publique des Hôpitaux de Paris, Paris, France*
[2]*Department of Experimental Neurosurgery, Kremlin-Bicêtre Hospital, Kremlin-Bicêtre, France*
[3]*Department of Paediatric Orthopaedics, Armand Trousseau Hospital, Paris, France*
[4]*Department of Orthopaedic Surgery, Kremlin-Bicêtre Hospital, Kremlin-Bicêtre, France*
[5]*Department of Orthopaedic Surgery, Nuffield Orthopaedic Centre, Oxford, United Kingdom*

Example: Self-Plagiarism

Although the *Clinical Anatomy* article confirms the results published in a previously published article:

Court C, Vialle R, Lepeintre JF, Tadie M. The thoracoabdominal intercostal nerves: an anatomical study for their use in neurotization. Surg Radiol Anat. 2005;27(1):8–14.

With significantly more subjects, the authors agree that most of the information presented in the *Clinical Anatomy* article is close and similar. Under these circumstances, the impact of new information presented in the *Clinical Anatomy* article is diminished except for the case-wise analysis of the data in the Results section.

Furthermore, the authors also note that the photograph in Figure 6 of the *Clinical Anatomy* article was mis-identified as to the sex of the specimen; the correct gender of the cadaver used was female.

The authors apologize to the readership of *Clinical Anatomy*.

“Grundlagen wissenschaftlichen Arbeitens”, Andreas Kämper, Universität Tübingen.

Also illegal

- Exploitation of ideas received under confidentiality (e.g., as reviewer)
- Presumption or assumption of unfounded (co-)authorship
- Refusal to grant authorship to credit to a contributor
- Citing own work where another citation would be better suited
- Unauthorized dissemination or publication of data or results

Who is guilty?

- Anyone actively participating in the misconduct
- Anyone knowing of the misconduct without reporting it
- All co-authors of any fraudulent publication or publication resulting from misconduct
- Any supervisor who neglected his supervisory duties

Good Scientific Practice

Basis

The DFG organized an international commission of experts with the task to:

- identify **reasons/incentives** for dishonest behavior in the scientific system
- propose **preventive counter-measures**
- audit the existing mechanisms for **scientific self-monitoring** and provide recommendations for their strengthening

Deutsche Forschungsgemeinschaft, Vorschläge zur Sicherung guter wissenschaftlicher Praxis, Empfehlungen der Kommission „Selbstkontrolle in der Wissenschaft“, Wiley-VCH, Weinheim 1998.

DFG Recommendations

- In the following, the recommendations will be paraphrased, sometimes shortened or with the inclusion of additional explanations.

- They will be formulated for a university, but identically apply to any type of research institution.

- The original recommendation have been published in the source book:

Deutsche Forschungsgemeinschaft, Vorschläge zur Sicherung guter wissenschaftlicher Praxis, Empfehlungen der Kommission „Selbstkontrolle in der Wissenschaft“, Wiley-VCH, Weinheim 1998.

Recommendation 1

Rules for good scientific practice shall specify principles of at least the following:

- general principles of scientific work
- principles of collaboration and leadership in research groups
- supervision and mentoring of junior scientists
- storage and archiving of primary data
- principles of scientific publication

Recommendation 1

What are “general principles of scientific work”?

- respect professional standards and best practices, i.e., work ***lege artis***.
- **document all** results in a traceable manner
- always doubt all your results
- never trust equipment/code without checking it
- be **honest** in acknowledging contributions from partners, competitors, and prior works
- respect ethical standards when executing research

Recommendation 2

- All universities should **formulate organizational rules** of good scientific practice.
- These rules are to be communicated to all members of the university and they are **obliged** to adhere to them.
- These rules should be a **mandatory component** of all teaching and mentoring of junior scientists.

Recommendation 3

- The **leadership** of the university is **responsible** for the organization of good scientific practice and the establishment of the corresponding work ethics/culture at the university.

- The university **ensures** that all tasks of defining, overseeing, securing, and arbitrating these rules are clearly and uniquely **assigned** and that it is guaranteed they are **actually performed**.

Recommendation 4

- Educating and **mentoring of junior scientists** and students must be given particular attention.
- The university shall establish **principles for supervising and mentoring** junior scientists and all research group leaders must be **obliged to adhere** to them.

Recommendation 5

- Universities must provide **independent/impartial persons of contact** or mediators (“Ombudspersons”) where members of the research community can seek **advise**, get **arbitration** in situations of conflict, or can anonymously **report** cases of suspected scientific misconduct.

Recommendation 6

- Universities shall design their performance metrics and evaluation criteria in such a way that **originality and quality** of work always has a higher priority than work/ output quantity.

- This in particular applies to conferring of scientific degrees, promotions, hiring decisions, faculty appointments, and distribution/award of funds.

Recommendation 7

- **Primary data** used as the basis of a scientific work or study (incl. computer program codes and their input files!) must be version-controlled, traceable (data provenance), and stored on durable and secure storage media.

- These storage media are to be **archived** for a duration of at least **10 years** by the university in which they originated.

Recommendation 8

- Universities must define **procedures for dealing with allegations** of scientific misconduct from within and outside the organization.
- These procedures must have been ratified by the responsible decision-making bodies of the university.
- These procedures must adhere to legal regulations, including in particular disciplinary code.

Recommendation 8

Such defined procedures shall include at least:

- **definitions of the elements of an offense** considered scientific misconduct.
- organizational competency and jurisdiction, procedures (e.g., onus of proof), deadlines (respite), procedures of investigation.
- rules of hearing involved and affected parties
- rules of confidentiality and protection of privacy
- rules for the avoidance of partiality or bias
- sanctions possible in response to confirmed misconduct, including levels of severity
- responsibility for imposition and monitoring of sanctions.

Recommendation 9

- Institutions that are not part of a superordinate roof organization are recommended to act in larger groups and in a coordinated fashion when dealing with or responding to allegations of scientific misconduct.

Recommendation 10

Professional organizations shall for their respective discipline:

- define **guidelines for good scientific practice**
- bind membership to adherence to these guidelines
- make these guidelines public

Recommendation 11

- Authors of any scientific publication are always **jointly responsible** for the entire contents of the publication.
- **“honorary authorship” is not permitted.** (authors are only persons without whose contribution the publication would not exist in its final form).
- author affiliations shall correctly reflect the place where the original research leading to the publication has been performed.
- Provision of funds does not warrant authorship.

Recommendation 12

- **Scientific journals** shall make it evident from their guidelines for authors that they will evaluate the originality of a contribution and the criteria of authorship according to accepted international standards.

- Reviewers of unpublished manuscripts must be obliged to **confidentiality** and to disclose any bias or conflict of interest.

- Scientists should not submit their work to journals not adhering to the above.

Recommendation 13

The grant guidelines of **research funding bodies**/ agencies shall define clear criteria for the **correctness** of information provided about:

- own and other's relevant **prior work**
- proposed research program
- **collaborations** and expected contributions from others
- all facts and circumstances relevant to the project

as well as information about **sanctions** and consequences of providing incorrect or misleading information.

Recommendation 14

- Grant contracts and/or guidelines for the use of granted funds should oblige the grantee or responsible project leader to comply with defined rules of good scientific practice.

- Institutional grants should only be awarded to universities where rules of good scientific practice are defined and established.

- Universities and individuals who are not following recommendations 1 though 8 shall be excluded from funding.

Recommendation 15

- Reviewers of grants shall be obliged to treat all application materials confidentially and to disclose any bias or conflict of interest without being asked.
- Funding organizations should specify and publish the criteria according to which grant applications will be reviewed and decided upon.
- Quantitative indicators of scientific output (e.g., impact factors, h-index, …) should not be used as the (sole) basis for a funding decision.

Recommendation 16

Funding agencies, scientific publishers, and universities should install Ombudspersons and endow them with sufficient resources and competencies (i.e., power) to advise and support scientists in matters of good scientific practice, help those who are victims of scientific misconduct, and investigate allegations of misconduct. They shall publish annual reports on their activities.

”**Science and the humanities are founded on integrity.** It is one of the key principles of good scientific practice and therefore of every aspect of research. Only science performed with integrity can ultimately be productive science and lead to new knowledge. On the other hand, a lack of integrity can represent a threat to science, destroying the confidence of researchers in each other and that of the public in science; research is unthinkable without this confidence.. ”

DFG memorandum on „ Safeguarding Good Scientific Practice” (2013), S. 64

Possible conflicts

- Data handling
- Publication process
- Organizational culture
- Research using human specimen or dangerous substances
- Animal experimentation
- Management of research funds
- Competition / Scooping
- Contract research (paid)
- Military research

Situation at TU Dresden

TU Dresden Guidelines

**Guidelines for Safeguarding Good Scientific Practice,
Avoiding Scientific Misconduct and Dealing with Violations**

- English Version -

From 5 March 2014

adopted by a decision of the Rectorate from 25 February 2014 after consultation with the Senate

You sign them with your matriculation, GA membership, or work contract.

https://tu-dresden.de/tu-dresden/qualitaetsmanagement/ressourcen/dateien/wisprax/guidelines?lang=en

TU Dresden Guidelines

> All members and employees of TU Dresden shall be bound to make these guidelines to safeguard good scientific practice the basis of their scientific work and to contribute actively to avoiding scientific misconduct in their sphere of responsibility.

Guidelines for Safeguarding Good Scientific Practice, Avoiding Scientific Misconduct and Dealing with Violations of TUD (2014), p. 2

https://tu-dresden.de/tu-dresden/qualitaetsmanagement/ressourcen/dateien/wisprax/guidelines?lang=en

TU Dresden Codex

„The Technische Universität Dresden is a community of teachers, researchers, and students that are aware of their scientific and societal responsibility. All members of the university are characterized by the combination of professional expertise, inventive curiosity, and motivation to perform. The members pledge to:

- respect the intellectual property of others
- never manipulate data
- always perform honestly and fair in all exams according to the rules.

As a new member of the Technische Universität Dresden, I avow myself to these principles of good scientific practice."

You signed this together with your matriculation documents (point 12, page 4).

CMS Core Values

https://tu-dresden.de/ing/informatik/studium/studienangebot/master-studiengaenge/computational-modeling-and-simulation/core-values

Safeguarding Good Scientific Practice

- Science is based on honesty and trust. Scientists must be truthful and honest in their research and follow generally accepted research practices. Misuse, manipulation, falsification, and partial reporting of data to influence the outcome of a work are not allowed and may constitute a criminal offense.
- All cases of scientific misconduct will be investigated and prosecuted both disciplinarily and - if applicable - legally. Confirmed scientific misconduct can lead to measures ranging from exmatriculation to fines to criminal punishment.
- Science is a collective effort of a community. Research methods and findings must be accurately and extensively documented so that others can reproduce them.
- Acknowledging other researchers' work and ideas is essential to create an environment where ideas can be freely exchanged fostering open discussions. Plagiarism (including self-plagiarism) is not accepted and will be prosecuted.
- Scientists must be open to discussions and criticism about their work. Researchers

Definition of Scientific Work

A scientific work (project, doctorate, master thesis, …) consists of an original contribution to a research question and has to follow the established rules of good scientific practice.

- How to formulate hypotheses and research questions?
- How to collect and curate data?
- How to work and document in a way that is comprehensive and reproducible for others?
- How to archive, present, and publish results?
- What may be subject to copyright protection?
- How to cite and quote correctly (also yourself)?
- How to acknowledge other’s contributions and help? How to justify authorship?

Ombudspersons

- Faculty of Computer Science: Prof. Christine Baier
- Faculty of Mathematics: Prof. Rolf Kühne
- Faculty of Mechanical Engineering: Prof. Karl-Heinz Modler

Every department and unit of TU Dresden has an Ombudsperson. See online…

Ombudspersons

- General (university-wide): - can also name contact persons outside of the university.

Arbiter (Ombudsperson)
Prof. Dr. Achim Mehlhorn

achim.mehlhorn@tu-dresden.de

+49 351 463-39980

Deputy
Prof. Dr. Ursula Schaefer

ursula.schaefer@tu-dresden.de

+49 351 463-39936

Consequences

> ”As every case of scientific misconduct is different, and the seriousness of the scientific misconduct also plays a central role in each decision, there are no uniform guidelines for adequate individual consequences. The decision concerning measures to be taken for scientific misconduct is determined by the circumstances of the individual case.“
>
> *Guidelines for Safeguarding Good Scientific Practice, Avoiding Scientific Misconduct and Dealing with Violations at TUD (2014), § 20, p. 16*

- Responsibility: TU Dresden Investigation Body for Scientific Misconduct (§14)

Consequences

- **in academic terms**
  i.e. ban on grant applications, withdrawal of the academic degree or of the teaching license, retraction of publications

- **in terms of employment**
  i.e. warning, notice, termination of the work contract

- **prosecution by penal law**
  i.e. in case of fraud or forgery of documents

- **prosecution by civil law**
  i.e. compensation, ban, claim for the return of funding (third party funding, scholarships, etc.)

How to play fair

- Respect others
- Grant equal rights to all
- Listen to others
- Ask questions any time
- Never dismiss a question as “stupid”
- Never disclose confidential information
- Do not moralize or morally judge
- Do not bully or threaten others

Researcher Values

- Self-government and self-determination
- Do good, do not do damage
- Justice
- Responsibility
- Freedom and independence
- Trust
- Honesty
- Collegiality and helpfulness
- Integrity
- Loyalty
- Considerateness