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International Standards of Good Scientific Practice

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About the Project "German-Ukrainian Agricultural Policy Dialogue" (APD)

The project German-Ukrainian Agricultural Policy Dialogue (APD) started 2006 and is funded up to 2018 by the Federal Ministry of Food and Agriculture of Germany (BMEL). On behalf of BMEL, the mandatary, GFA Consulting Group GmbH, and a working group consisting of IAK AGRAR CONSULTING GmbH (IAK), Leibniz-Institut für Agrarentwicklung in Transformationsökonomien (IAMO), carry it out and AFC Consultants International GmbH. Project executing organization is the Institute of Economic Research and Policy Consulting in Kyiv. The APD cooperates with the BVVG Bodenverwertungs- und -verwaltungs GmbH on the implementation of key components related to the development of an effective and transparent land administration system in Ukraine. Beneficiary of the project is the Ministry of Agrarian Policy and Food of Ukraine.

In accordance with the principles of market economy and public regulation, taking into account the potentials, arising from the EU-Ukraine Association Agreement, the project aims at supporting Ukraine in the development of sustainable agriculture, efficient processing industries and enhancing its competitiveness on the world market. With regard to the above purpose, mainly German, but also East German and international, especially EU experience are provided by APD when designing the agricultural policy framework and establishing of relevant institutions in the agriculture sector of Ukraine.

APD German-Ukrainian Agricultural Policy Dialogue

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Content

In preparing this document, I received valuable inspiration and ideas from a slide presentation entitled Good Scientific Practice by Andreas von Tiedemann, who is an ombudsman at the Georg-August-University of Göttingen, as well as from a slide presentation entitled Ethical Issues in the Research Environment by Manfred Schüssler and a slide presentation entitled Research Misconduct by Thomas Inzana. Nevertheless, I am responsible for any and all errors and inaccuracies.

1. INTRODUCTION

At some point in his or her career, probably sooner than later, a scientist will be confronted by questions such as the following:

- Is it OK to use a figure from another paper or presentation?
- My supervisor expects to be a co-author on all of the papers that I produce – is this right?
- How long to I need to store the data that I used in my research?
- I let colleagues use my data – shouldn't they include me as a co-author on their paper?
- When can I set aside outliers in my data?
- I have been asked to review a paper, but I am pretty sure that I know who the authors are. Should I decline?
- Can I publish the same results in two or more different papers and journals?
- I suspect that a colleague is falsifying results – what should I do?

These questions are challenging for students and young scientists, but experienced colleagues are also confronted with them, and sometimes stumble over them. Good scientific practice (GSP) provides answers to these questions, or at least guidelines for answering them. GSP is a set of rules derived from fundamental convictions about the nature of science and how it works best.

In the following section I will begin by discussing the importance of GSP and why it matters. Subsequently, in section 3 I will discuss six important dimensions of GSP in greater detail. These dimensions are:

- Data management
- Intellectual property rights
- Authorship
- Publication
- Conflict of interest, and
- Supervision and mentoring.

In section 4 I will describe procedures for dealing with violations of GSP, based on guidelines that have been established by the German Research Foundation (Deutsche Forschungsgemeinschaft – DFG) and their implementation by my University in Göttingen. Section 5 concludes.

2. WHY IS GOOD SCIENTIFIC PRACTICE IMPORTANT?

Science is the search for truth. This search is an incremental process. Research generally begins with an implicit or explicit literature review that compiles and evaluates what previous research has achieved in order to identify open questions and potential contributions. Each research step thus builds on previous steps. This incremental search is not linear; sometimes sciences progress is rapid, sometimes it is slow, and often scientists have to backtrack to correct previous missteps.

As a result, science depends crucially on transparency and trust. To identify the frontier in a field of research, I must know what other scientists in that field have accomplished to date, how they did it, and whose work they were building on. I therefore need to trust that the other scientists in the field have disclosed all relevant information in their publications and presentations, and that they have not withheld any information or falsified their results. This dependence on transparency and trust is mutual because scientists depend on one another. Transparency and trust in science are also important vis-à-vis policy makers and the public in general, who in the long run determine the regulatory and financial conditions under which research takes place.

Failure to follow GSP reduces transparency and undermines trust. Failure to follow GSP therefore impedes scientific progress and ultimately destroys science. Science can only function if the great majority of scientists are willing to adhere to the principles of GSP voluntarily, and to contribute to the maintenance of institutions that monitor and safeguard GSP by identifying and sanctioning the few who do not adhere voluntarily.

There are many high-profile examples of scientific misconduct, i.e. violations of GSP. For example:

- Some experts suspect that the Austrian 'father' of modern genetics, GREGOR MENDEL, may have manipulated his data because his experimental findings on phenotype ratios are implausibly close to the theoretical expectations. However this contention has been challenged and opinion remains divided.[1]
- HWANG WOO-SUK, a veterinary scientist from South Korea published a series of papers based on fabricated results in high-ranking journals, including two papers published in Science in 2004 and 2005 in which he claimed to have created human embryonic stem cells by cloning. He was dismissed and charged with fraud in 2006.[2]
- ERIC POEHLMAN, a medical researcher in the United States admitted in 2005 to falsifying data in 17 federal grant applications and ten published articles. For this misconduct he was ultimately convicted and sentenced to one year of prison.[3]
- The Swiss economist BRUNO FREY admitted in 2011 to self-plagiarism in five articles all based on the same empirical analysis of factors that affected whether individuals survived the Titanic disaster. He and his co-authors had published these papers in five different journals.[4]
- In Germany, two politicians, KARL-THEODOR ZU GUTTENBERG and ANNETTE SCHAVAN, resigned from their positions as cabinet ministers following allegations that they had plagiarized parts of their PhD dissertations.

These examples highlight a number of different types of scientific misconduct – such as plagiarism, data manipulation and data falsification – that I will discuss in greater detail in section 3 below. However, before moving to this discussion it is perhaps worth considering why some scientists violate GSP. Several, sometimes mutually reinforcing explanations deserve mention.

First, scientific misconduct is sometimes a response to the pressures of 'publish or perish'. Publication in peer-review journals is a crucial evaluation criterion for young scientists who are candidates for tenure or competing for promotion. Under such circumstances, the temptation to e.g. manipulate data and/or results to secure an additional publication might be difficult to

[1] See, for example, http://www.genomicseducation.ca/informationArticles/intro/inheritance_mendel.asp, and http://irapilgrim.mcn.org/men02.html.
[2] See http://www.nature.com/news/specials/hwang/index.html?cookies=accepted.
[3] See http://www.nature.com/nature/journal/v434/n7032/full/434424a.html, and https://www.nrin.nl/archieven/tag/data-manipulation.
[4] See https://en.wikipedia.org/wiki/Bruno_Frey, and http://olafstorbeck.blogstrasse2.de/?p=949.

withstand. Even established, tenured scientists might be driven to misconduct by the pressures of personal ambition, a craving for recognition, or a desire to outperform peers.

Second, financial pressures can also lead to misconduct. In some fields of science, research can lead to patents and commercial gain. In medicine, for example, the success of a new, potentially lucrative prescription medication can hinge on test results. Some countries and research institutions provide individual financial incentives for scientific publication. Jufang and Huiyun (2011), for example, report on financial incentives provided to researchers in China. They reveal that in some instances, payments of as much as RMB 100,000 (roughly equivalent to $ 15,000) have been provided for publications in high-ranking journals such as *Science* and *Nature*.[5] Such incentives prompted the President of the Chinese Academy of Sciences, Lu Yongxiang, to remark in 2006 that "[t]oo many incentives have blurred the reasons for doing science in some people's minds".[6]

Third, some scientific misconduct might result from the increasing complexity and size of many research projects. Large and complex projects are more difficult to coordinate, making it more difficult to keep track of the contributions made by different collaborators, and to trace who carried out exactly which steps (such as data collection, compilation and cleaning, estimation, etc.). This can lead to errors such as a failure to accurately describe how results were produced (e.g. the treatment of outliers in data). It can also lead to conflicts over authorship. Related to this, supervisors might be over-committed and unable to closely monitor all of the researchers and research projects for which they are responsible. As a result, they might not provide sufficient mentorship and guidance on GSP to the young students and researcher whom they supervise.

Finally, scientific misconduct is sometimes attributed to cultural differences in the standards of GSP. In countries where corruption is more widespread, for example, it might also be the case that scientists feel more pressure or display a greater inclination to manipulate results in return for financial reward. In some more hierarchical scientific communities it might be considered standard practice to offer authorship to professors and group leaders, regardless of whether they have made a substantial contribution to the research in question. Such cultural differences cannot excuse practices that are clearly damaging to science, and they are increasingly giving way to a broad and growing consensus on international standards of GSP. Some observers argue that scientific misconduct reflects ongoing erosion in ethical standards of conduct in society as a whole. However, I am aware of no studies that provide conclusive support for this hypothesis.

3. Key dimensions of GSP

In the following sub-sections I will list six important dimensions of GSP and corresponding typical examples of scientific misconduct.[7] But before I begin, note that differences of opinion and unintentional errors do not constitute violations of GSP. Honest errors can advance science, provided that it is possible to identify and correct them. If I completely and accurately outline all of the research steps that I have followed to reach a conclusion, my peers will be able to reconstruct

[5] Jufang, S. & Huiyun, S. (2011): The outflow of academic papers from China: why is it happening and can it be stemmed? *Learned Publishing*, 24:95–97.

[6] See http://science.sciencemag.org/content/312/5779/1464.full.

[7] One important dimension of GSP that I do not cover in this document concerns the special rules and procedures that must be followed whenever experiments are carried out with animals or human subjects.

those steps and to identify and correct whatever errors I have made. If I omit, hide or distort important information, my peers will be misled.

Note as well that misconduct can be intentional, but that it can also result from carelessness or ignorance of GSP. Sometimes it is difficult to determine whether a violation of GSP is the result of a purposeful attempt to mislead, or whether it represents an oversight or carelessness. For example, you may find that authors have copied verbatim a sentence that appears in another paper, which they correctly cite, but without using quotation marks to clearly identify the copied sentence. Is this a case of deception, carelessness or ignorance? If the authors intended to deceive by plagiarizing someone else's work, then they clearly went about it in a rather amateurish fashion. After all, by citing the source of the sentence that they copied, they also increased the likelihood that their deception would be revealed. So perhaps the authors merely forgot to include the required quotation marks out of carelessness. Perhaps they were not fully aware of the standards of GSP and erroneously thought that citing the source of the sentence would be sufficient.

However, regardless of the underlying intention, or lack thereof, plagiarism is plagiarism and a violation of GSP. Hence, teachers and supervisors have an obligation to alert and inform their students and young scientists about GSP, to ensure that they do not inadvertently commit costly errors.

3.1 Data management

Scientists are required to accurately record how and where the data that they use were collected, compiled, cleaned and otherwise prepared for analysis. They must also carefully archive data in a secure form for a period of time that is often precisely specified by funding agencies.[8] Data in this setting also includes the computer code that was used to process data and to perform estimations and simulations, etc. Scientists must also make data (including computer code) available to peers to permit replication and further study, unless compelling personal or commercial confidentiality considerations justify restricting or limiting access to the data. Finally, scientists must accurately report their own personal data, for example regarding their academic degrees, publications, work experience and affiliations.

What can go wrong? First, it is a violation of GSP to invent or manipulate data or facts – e.g. to simply fill in a response that was, for some reason, left blank in a household survey, or to change an observation so that a regression produces 'better' results. This includes the manipulation of data in tables, graphs, figures and photos.[9] Second, selection or suppression of data or facts without transparent documentation is also a violation of GSP. It might be tempting to omit several outliers to 'improve' estimation results, or to only report results derived using a subset of the data (e.g. for selected regions of a country or types of farm) because the estimated model performs best for this subset. However, any selection/suppression of this nature (including a precise description of the criteria used to identify any outliers), must be clearly documented, and the omitted data must be archived with the rest and made available to peers who wish to replicate results.

Third, failure to accurately disclose how data were collected, processed and analyses (e.g. a source of selection bias that is known to the authors, any incentives that were provided to survey subjects

[8] The DFG, for example, specifies that all data collected in projects that it funds must be stored for 10 years.

[9] For an example of data manipulation in figures that led to the retraction of several articles produced by a research group, see http://retractionwatch.com/2011/02/03/three-more-bulfone-paus-retraction-notices-out-in-journal-of-immunology/.

to secure their participation, or the computer code used to estimate a complex model) also represents scientific misconduct. Fourth, failure to archive all data used in research and to make this data available to peers for replication and future study is also scientific misconduct. Supervisors cannot claim exemption from this rule on the grounds that the PhD students or post-docs who carried out some research have moved on to other jobs and institutions; in that case the supervisor nevertheless remains responsible for ensuring access to the data and computer code that was used.

Finally, it is scientific misconduct to invent or misrepresent personal data, for example in a CV. In a prominent case involving my university, several researchers included CVs in a grant renewal application that listed publications as "submitted" that had, in fact, not yet been submitted and in some cases only existed as rough drafts. This had serious repercussions including refusal of the entire grant renewal and reprimands for the researchers involved and their supervisors.

3.2 Intellectual property rights

The essence of intellectual property rights is correct and full attribution – giving credit where credit is due. The most common violation of this principle is plagiarism, to which I will turn in greater detail below. However, accepting an unjustified authorship (and thus claiming to have made a substantial contribution to work when that is not, in fact, the case) also represents scientific misconduct. In addition, it is a violation of intellectual property rights to make use of information that one has obtained as a peer reviewer of someone else's paper or grant application. Note in this connection, however, that it is permitted to make use of the ideas and suggestions provided by anonymous peer reviewers of your own work. Indeed, this is the only situation in science in which it is acceptable to use other people's ideas without giving credit (other than thanking the anonymous referees in the acknowledgements).

The University of Oxford defines plagiarism as follows:

> "Plagiarism is presenting someone else's work or ideas as your own, with or without their consent, by incorporating it into your work without full acknowledgement. All published and unpublished material, whether in manuscript, printed or electronic form, is covered under this definition. Plagiarism may be intentional or reckless, or unintentional. Under the regulations for examinations, intentional or reckless plagiarism is a disciplinary offence."[10]

This definition brings up once more the distinction that was made above between intentional misconduct and misconduct that results from careless behavior or ignorance of the rules. And it reiterates that carelessness or ignorance is no excuse.

The internet and 'cut-and-paste' have made it much easier to plagiarise. But modern information technology also makes it much easier to detect plagiarism. In most university programs, student papers and theses are routinely tested for plagiarism using specially designed software. Plagiarism in the dissertations of the German cabinet ministers mentioned above, GUTTENBERG and SCHAVAN, was detected using technology that was not available and probably quite unimaginable when these dissertations were written (or, with hindsight, at least partially compiled). *Caveat plagiator*! You may be tempted to copy from a paper in a foreign language such Chinese because you cannot imagine that this could never come to light. But who knows what additional facilities for translation and text comparison will be available 15 years from now?

[10] See https://www.ox.ac.uk/students/academic/guidance/skills/plagiarism?wssl=1.

Plagiarism is often a difficult issue for students. A common question and associated complaint is: 'Do I have to cite everything that is not my own? If so, then I will have to mention a source after every second sentence, and put every fourth sentence in quotation marks.' As a first general rule, it is certainly better to cite too many sources than too few. A paper that cites too many sources may appear somewhat clumsy, but it will not get you into serious trouble. Sources should be provided for everything but common knowledge (e.g. Britain is an island; Angela Merkel is the Chancellor of Germany). What constitutes common knowledge depends, of course, on the context. Hence, in an economic paper one might without citing a source write that the income elasticity of demand for aggregate food in middle- and high-income countries is less than one. With experience, students and young researchers become increasingly competent at knowing when it is necessary to provide a citation and when not. But in the meantime, when in doubt, cite.

It is imperative to identify verbatim quotes by placing them in quotation marks. A short quote of a term, phrase or short sentence can simply be included in your running text, while longer quotes might be formatted as a separate paragraph (see the definition of plagiarism above for an example). As a second general rule verbatim quotes should be used as infrequently as possible. If you do not need to use the author's exact words (e.g. a definition by an authority, or to highlight that someone really said it in exactly such and such a way), then re-write them into your own words. This is challenging, especially for students and researchers who must write in a second or third language (typically English), and who might question whether it makes sense to expend energy and time re-writing something that will inevitably end up reading less well than the original.

Researchers, regardless of experience, are well-advised to test their papers for plagiarism with one of the available software tools before they submit to a journal or otherwise publish it (e.g. in a discussion paper series). This will help to catch inadvertent cases of plagiarism that result from carelessness or accident. There are only so many ways to formulate some things (e.g. explaining the specification of a standard stochastic frontier model). Therefore, for want of alternative formulations a section of your writing on such a topic might end up appearing very similar to other, published work. If a plagiarism test turns up an accidental perfect match, a few simple reformulations will keep you out of trouble, together with a reference to seminal or standard sources in the field ("The following presentation closely follows …").

3.3 Authorship

There are three generally accepted conditions for authorship.[11] These are:

1. Each author must have made a substantial contribution to the concept and planning of the research, and to the analysis and interpretation of the data;
2. Each author must have significantly participated in drafting and/or critically reviewing the paper; and
3. Each author must provide full consent on the final version of the paper, which includes agreement on the complete list of authors and their order.

The provision of funding or facilities such as office space or laboratories is not sufficient to justify authorship. Simply collecting data or making it available to others for analysis also does not justify authorship. Finally, merely being the head of chief of the institution in which research took place

[11] See for example the authorship policy of the US Center for Disease Control at http://www.cdc.gov/maso/Policy/Authorship.pdf.

does not justify authorship. In other words, so-called honorary authorship is incompatible with GSP. Authorship means that you are accountable and share responsibility for the entire content of a paper. More limited contributions such as the provision of funding, facilities or data merit mention in a paper's acknowledgements, but not authorship.

The order of authorship on a paper is important, and it can lead to conflict among authors. Conventions differ across fields of science, but in general authors who have made similar contributions to a paper will be listed in alphabetic order. If a particular author is to be highlighted as the first author, then his/her name should be listed first. A footnote can be used to emphasize first authorship or a specific contribution that one of the co-authors has made (or if the first author's family name is, for example, Aaronson).

Conflict can arise when there is disagreement among co-authors about who has made the most important contributions to a paper. For example, co-authors who are PhD students looking to include a paper in their cumulative dissertations, or co-authors who are candidates for tenure, may be particularly keen on recognition as first author. It is important to discuss authorship openly with your co-authors early in the collaboration and at regular intervals to anticipate and avoid conflict. Misunderstanding often arises when colleagues do not discuss authorship until months or even years after a collaborating has begun. The more time has passed, the greater the likelihood that recollections of who had what ideas and made what contributions will differ, sometimes considerably. Under no circumstances is it acceptable to submit a paper for review without the express consent of all co-authors, including agreement on the order of authorship. Finally, while first authorship is undeniably important in science, so are teamwork and cooperation. I advise PhD candidates in particular to relax, to focus on collaboration and contribution, and to let first authorship follow in due course.

3.4 Publication

Publication in peer-review journals is perhaps the most important measure of scientific performance. Several pitfalls must be avoided. First, it is not acceptable to publish identical or substantially similar results in different papers (so-called self-plagiarism). Of course, it is not always clear what constitutes self-plagiarism, i.e. when results are 'too similar'. At the very least, papers that are based on the same research should include references to one another. This will permit referees and editors to compare and determine whether a submission makes a sufficiently distinct contribution. The five papers for which BRUNO FREY and his co-authors were accused of self-plagiarism did not include such cross-references.

Second, self-plagiarism is related to what is sometimes referred to as 'salami slicing', which is dividing work that could be reported in a single publication into two or more smaller publications. The advantage of salami slicing is obvious; a longer list of publications for the slicer. However, this can backfire when your publications are reviewed, for example by a hiring committee or tenure board. They might find that your individual publications are not sufficiently substantial, and conclude that you are more concerned with the volume than with the value of your scientific output. Furthermore, salami slicing causes damage to science. Readers who only read one 'slice' or your output from a research project may not be able to interpret your results in context. Salami slicing clogs journals and obliges readers to read more to acquire a given amount of knowledge.

As a rule, each paper that you write should address a distinct question. If you compare two treatment groups with the same control group, then the analysis of both treatments should probably be included in one paper rather than being divided into two papers. At the very least, you should inform the editors of a journal if there are possible overlaps between your papers, such as the use of a common control group; as with cases of possible self-plagiarism, it is best to let others decide whether you are slicing your results too thinly.

Finally, beware of and avoid predatory journals. These are journals that claim to conduct peer review, and charge authors often substantial amounts of money for quick publication in reputable-sounding, but ultimately bogus journals. The internet has provided many benefits to scientific publishing. It has made it possible to shorten turn-around times for the review and publication of scientific papers, and it has led to the creation of open access journals that are freely available to anyone online. However, the internet has also led to the creation of predatory journals that pose as reputable open access journals but in fact provide no scientific quality control. These journals take advantage of authors who are eager (and in some cases perhaps desperate) to publish, and ultimately only serve to generate profits for unscrupulous so-called editors and publishers.[12]

Because predatory journals do not provide meaningful peer review, publication in such a journal will provide little or no benefit for your scientific career. Citing a paper that has been published in a predatory journal is dangerous, because you cannot assume that the quality of that paper has been evaluated by peers. Some editors or conference organisers will even reject a paper on the grounds that it cites papers that have been published in predatory journals. BEALL's list of "potential, possible and probably predatory" publishers is an important reference that can help you identify and avoid such journals.[13]

3.5 Conflict of interest

Conflict of interest occurs when you have more than a purely scientific interest in the results of your research. For example, you are carrying out research that might lead to a product or procedure that could be patented and generate financial gains for you or your institution. In such a case, your scientific interest in the research might conflict with your financial interest, and you might consciously or unconsciously carry out your research or report your results in a way that favours the latter to detriment of the former. Similarly, if you are carrying out research for a funding agency that has a financial or political interest in certain results, your interest in securing funding from that agency might affect the way you work and the results that you produce.

Other examples of conflict of interest can arise when you are asked to review papers or grant applications written by other researchers. In some cases a paper or a grant application might have implications for your own work. For example, you might conclude that if a paper that you have been asked to review is published, it will affect the likelihood of your own ongoing work being published later on. Or perhaps you are asked to review a grant application submitted by individuals to whom you feel loyalty (e.g. colleagues, collaborators or friends) or against whom you bear a grudge (e.g. a peer who once criticised one of your conference presentations).

It is not possible to completely avoid conflict of interest. With the exception, perhaps, of millionaire hobby scientists, all salaried scientists have a financial as well as a scientific interest in their work. The tenure system is an institution designed to provide scientists with academic freedom so that they can carry out research on controversial topics without fear of dismissal and, thus, to eliminate

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[12] See http://science.sciencemag.org/content/342/6154/60.full for a report on an interesting experiment that BOHANNON carried out to expose the practices of predatory journals.

[13] See BEALL's list at https://scholarlyoa.com/2016/01/05/bealls-list-of-predatory-publishers-2016/.

one potential conflict of interest. In Germany, academic freedom is even anchored in the constitution.[14]

Such institutions notwithstanding, conflict of interest inevitably crops up. It is important to be aware of such conflict. When in doubt about a potential conflict of interest that you face, ask yourself how you would consider a peer's work if you knew that he/she was in the same position as you. If you worry that his/her work might be affected by the conflict, then you can conclude that your work might be affected as well. If possible, remove yourself from situations of conflict of interest. If you know that a funding agency expects you to come to certain research conclusions, even at the cost of suppressing or manipulating results, then do not accept funding from that agency.

If you cannot remove yourself from a possible conflict of interest, then at least ensure that you fully disclose that conflict. Mention the sources of funding that made your research possible in the acknowledgements of your paper. If you are asked to review a paper by a friend, honestly evaluate whether you feel capable of producing an objective review, or whether your judgement might be affected by your friendship. In the latter case, tell the editor that you would rather not review the paper. In the former case, inform the editor of the potential conflict of interest; indicate that you feel that you can nevertheless provide a fair review; and let the editor make the final decision.

3.6 Supervision and mentoring

Supervisors and mentors are responsible for ensuring that all of their students (undergraduates, graduates, PhD candidates and post-docs) and research staff are aware of the principles of GSP. It goes without saying that they should lead by example and maintain the highest standards of GSP themselves. They should discuss GSP with their students and staff, and explain the procedures for dealing with conflicts and suspected scientific misconduct.

The importance of supervision and mentoring has been mentioned above in connection with the distinction between intentional, careless and ignorant violation of GSP. A supervisor can be deceived when a student or research staff member intentionally or accidentally breaks the rules. But a supervisor bears responsibility for scientific misconduct by one of his/her students or staff if that individual committed the misconduct out of ignorance. And supervisors are responsible for installing checks and balances to reduce the likelihood of careless or accidental misconduct. For example, a supervisor can require that any paper submitted to a journal or conference by a member of his/her group must first be read critically by at least one other member.

4. DEALING WITH VIOLATIONS OF GSP

To be eligible to receive public research funding, universities and other research institution in many countries, including Germany, must establish policies and procedures for investigating and reporting instances of alleged research misconduct. In the following I will outline the procedures

[14] Article 5 §3 of the Basic Law for the Federal Republic of Germany stipulates that „Arts and sciences, research and teaching shall be free." See https://www.btg-bestellservice.de/pdf/80201000.pdf.

that are in place in Germany and briefly describe their implementation at my university in Göttingen.

The DFG has adopted 17 recommendations for safeguarding GSP. The eighth recommendations states:

> "Recommendation 8: Procedure when Scientific Misconduct is Suspected
>
> Universities and research institutes shall establish procedures for dealing with allegations of scientific misconduct. They must be approved by the responsible corporate body. Taking account of relevant legal regulations including the law on disciplinary actions, they should include the following elements:
>
> - a definition of categories of action which seriously deviate from good scientific practice (Recommendation 1) and are held to be scientific misconduct, for instance the fabrication and falsification of data, plagiarism, or breach of confidence as a reviewer or superior,
> - jurisdiction, rules of procedure (including rules for the burden of proof), and time limits for inquiries and investigations conducted to ascertain the facts,
> - the rights of the involved parties to be heard and to discretion, and rules for the exclusion of conflicts of interest,
> - sanctions depending on the seriousness of proven misconduct,
> - the jurisdiction for determining sanctions." [15]

To implement this recommendation, the Georg-August-University of Göttingen has adopted a set of Guidelines for GSP that include, under "Procedures to handle cases of suspected scientific misconduct" the following four paragraphs:[16]

§6 Duty of disclosure, consequences
§7 Ombudsmen and -women
§8 Pre-investigation by the university ombuds committee
§9 Formal investigations by the investigation committee.

Paragraph 6 on the duty of disclosure and consequences establishes that any reported suspicion of misconduct will be pursued and that proven cases of misconduct will have disciplinary and/or legal consequences. It also stipulates that the identity of any informer who registers a suspicion of misconduct (the so-called whistleblower) will only be disclosed if he/she agrees. Finally, it stipulates that any and all investigation procedures will be thoroughly documented in writing.

Paragraph 7 outlines the roles of the university ombudsmen and -women. The University of Göttingen selects three professors to act as ombudsmen and –women, one each from the research areas of i) Humanities and Theology, ii) Law, Social Sciences and Economic Sciences, and iii) Natural Sciences, Mathematics and Informatics. The ombudsmen and –women are independent individuals who have experience in conducting research projects and who are charged with receiving allegations of scientific misconduct and carrying out preliminary investigations. Initially, one ombudsman or –woman is responsible for an allegation of misconduct, typically for those allegations that emerge from his/her research area. Where possible, the ombudsman/woman will mediate a solution between the parties involved in a dispute (e.g. colleagues who cannot agree on authorship), thus making further investigation and action unnecessary. Otherwise the

[15] The entire set of DFG recommendations is available, in German and English, at http://www.dfg.de/download/pdf/dfg_im_profil/reden_stellungnahmen/download/empfehlung_wiss_praxis_1310.pdf.

[16] These paragraphs are part of the *Statute of the Georg-August-University Göttingen for ensuring good scientific practice*, which can be found under https://www.uni-goettingen.de/en/223832.html.

ombudsman/woman will investigate the plausibility of the allegation. If a mediated solution cannot be reached and the ombudsman/woman concludes that the suspicion of misconduct is genuine, then he/she will refer the case to the ombudscommittee for preliminary investigation.

The ombudscommittee referred to under paragraph 8 is composed of the three ombudsmen and –women. This committee informs the person suspected of scientific misconduct of the evidence against him/her, and gives him/her the opportunity to respond to this evidence. It may also hear the whistleblower and other witnesses or experts. Based on this evidence, the ombudscommittee can decide to end the case (for lack of evidence; because it has succeeded in mediating a solution between the conflicting parties; or because the misconduct is deemed to be of a less serious nature and the perpetrator agrees to fulfil certain conditions). Otherwise, the ombudscommittee passes the case, together with a statement of its findings and all relevant documentation, to the investigating committee.

The investigating committee is described in paragraph 9. It is composed of five members, at least two of whom are not members of the university. One of the external members, who must be qualified for judgeship, acts as chairperson. The investigating committee hears the individual suspected of misconduct as well as the whistleblower, both of whom may wish to be accompanied by legal counsel or other supporting persons. The investigating committee also hears any other witnesses or experts it deems necessary. The investigating committee can then decide to end the case for the same three reasons listed above with respect to the ombudscommittee (lack of evidence, successful mediation, etc.). If the investigating committee decides that the suspicion of misconduct has been proven, it passes the results of its investigation on to the university President along with a recommendation for appropriate sanctions.

The sanctions for proven scientific misconduct range from a formal written reprimand to dismissal. Intermediate sanctions include temporary restriction or suspension of a scientist's right to apply for research grants, and temporary exclusion from university committees and/or national research committees. The university can also decide to cut a scientist's university budget allocations for research, or his/her salary. Regardless of the exact sanction that is applied, the result is a lasting stain on the scientific reputation of the scientist who is found to have committed scientific misconduct.

Throughout these procedures, the whistleblower plays a crucial role. Indeed, most known cases of scientific misconduct would never have come to light without a whistleblower. Note that failure to report misconduct is itself a violation of the principles of GSP. Sometimes a whistleblower is depicted as someone who is disloyal and who denigrates his/her peers and collaborators. However, it must be stressed that the whistleblower is not the cause of the problem; those who engage in scientific misconduct are. That said, frivolous or malicious accusations of scientific misconduct are a serious problem that can undermine a system of safeguards for GSP, and unfairly and perhaps irreparably damage an individual's reputation.

If you suspect scientific misconduct, first seek the advice of a trusted colleague, perhaps a former supervisor, a senior scientist such as your Department Head or Dean, or the ombudsman or –woman at your institution. All are obliged to treat your request confidentially.

5. CONCLUSIONS

Science is a great and inspiring occupation. It is a privilege to be given the freedom and the resources to think critically and to nurture and indulge your curiosity about the world around you and the people, things and forces that interact in it. It is also a privilege to be a member of the scientific community, which has included and includes so many illustrious and inspiring individuals (even if most of us never get beyond junior membership). The price of this freedom, and the price of admission into the scientific community, is upholding the rules of Good Scientific Practice. This, all things considered, is a small price to pay.