WRITING AND SCIENTIFIC MISCONDUCT: ETHICAL AND LEGAL ASPECTS[1]

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ABSTRACT To maintain a minimum standard of quality in science, it is an imperative in scientific writing that one avoids committing scientific misconduct. What is important in this context is that scientific misconduct doesn't have to be intentional: one can *unintentionally* end up being found guilty of scientific misconduct. That being said, the main aim of this chapter is to give guidelines for how to avoid committing scientific misconduct. A distinction is made between *type one* and *type two* scientific misconduct – the former serves a self-interest, while the latter serves to discredit others – and first guidelines are given for how to apply widely accepted principles of good scientific practice avoid forms of type one scientific misconduct like (self-)plagiarism and meddling with data. Second, guidelines are given for how to avoid forms of type two scientific misconduct, in particular putting forward falsely negative conclusions about the scientific quality of someone else's work in an emotional outburst. To illustrate this with an example: what has to be avoided is that one, after typographically not having recognized some formulas in someone else's work as known mathematics, angrily reports without any further argumentation that the scientific quality of the work is substandard qua mathematics – this is type two scientific misconduct if it concerns correct mathematics that were simply unknown to the reader. A second aim of this chapter is to list the consequences if scientific misconduct is nevertheless committed: the above guidelines will not prevent *intentional* misconduct, but fear for the consequences might be an effective deterrent.

INTRODUCTION

When writing a contribution of any type to the enterprise called 'science', one has to keep in mind that this contribution has to meet criteria of scientific quality. Although Hemlin and Montgomery (1990) reported that there will perhaps never be consensus on what scientific quality means up to the last detail, there are some quality standards of reporting that are widely agreed upon in all branches of science: gross violations thereof are forms of *scientific misconduct*. This does not necessarily have to be *intentional*: such is merely a severe degree of scientific misconduct. The following two questions then arise:

(1) How can we avoid scientific misconduct?

(2) What are the consequences if we nevertheless do commit scientific misconduct?

These questions touch on the ethical and legal aspects of the relation between scientific writing and scientific misconduct. This chapter deals with these two aspects.

ETHICAL ASPECTS

A written contribution is guaranteed to meet the required basic quality standards of reporting by adhering to widely accepted ethical norms. These are the *basic principles of good scientific practice*, which Van der Heijden *et al.* have nicely formulated (2012); see table 1. We can thus *avoid* scientific misconduct in writing by making a decent effort to adhere to these principles. The treatment of the basic principles of good scientific practice below will be split into two parts: *avoiding type one scientific misconduct* and *avoiding type two scientific misconduct*—type one leads to falsely positive conclusions about one's own work, while type two leads to falsely negative conclusions about someone else's work (Cabbolet 2014).

[1] This is an invited chapter for a book, but the book never went to print.

principle	description
scrupulousness (or: carefulness)	Scientific activities are performed scrupulously, unaffected by mounting pressure to achieve
reliability	… A scientific practitioner is reliable in the performance of his research and in the reporting, and equally in the transfer of knowledge through teaching and publication
verifiability	… Whenever research results are publicized, it is made clear what the data and the conclusions are based on, where they were derived from and how they can be verified
impartiality	In his scientific activities, the scientific practitioner heeds no other interest than the scientific interest. …
independence	Scientists do their work in academic freedom and independence. It is made clear when limits to that freedom are unavoidable.

Table 1: principles of good scientific practice and their descriptions, taken from (Van der Heijden *et al*. 2012). Dots in the descriptions indicate omissions from the original text.

Avoiding type one scientific misconduct

In the first place we have the *principle of carefulness* (or *scrupulousness*):

> "*Scientific activities are performed scrupulously, unaffected by mounting pressure to achieve*" (Van der Heijden *et al.* 2012).

For scientific writing this means first and foremost that sources of the material should be properly identified, to avoid someone else's work being passed off as one's own. This form of misconduct ranges "from gross intentional plagiarism to 'inaccurate referencing' and from deliberately stealing other people's ideas to the careless 'use' of other people's thoughts" (Drenth 1999). Of course, one can use ideas and results of others, but the golden rule as formulated by Drenth (1999) is this: "when the final result of scientific endeavor is presented … there should be a clear distinction between that which is a product of personal reflection, analysis, data gathering and interpretation, and that which should be attributed to others. And the latter should be clearly indicated by means of proper references."

This principle further means that authorship has to be properly acknowledged, to avoid on the one hand someone who has significantly contributed to the work being excluded as an author, and on the other hand someone who hasn't contributed being mentioned as an author. In the first case one is passing off someone else's work as one's own, and in the second case we speak of 'gifted authorship': both cases are explicitly mentioned as examples of scientific misconduct by KNAW[2], NWO[3] and VSNU[4] (2001). However, given a proper list of co-authors, there is still the question of the *order* of authorship. The rule here is as follows: if all authors have contributed equally, then the order is alphabetically; if not, the order is by magnitude of

[2] Koninklijke Nederlandse Academie der Wetenschappen (Royal Dutch Academy of Sciences).
[3] Nederlandse Organisatie voor Wetenschappelijk Onderzoek (Dutch Organization for Scientific Research).
[4] Vereniging van Samenwerkende Nederlandse Universiteiten (Association of Cooperating Dutch Universities).

the contribution, with the group leader last (Heilbron 2005). So if there are multiple co-leaders in the latter case, these should be mentioned last in alphabetical order.

Last but not least, this principle means that material from one's own previous publications also has to be identified, to avoid that one's own work is passed off more than once as original research (self-plagiarism). However, while multiple publication of one and the same result is an obvious example, self-plagiarism is not as clear-cut as plagiarism. For example, in a large project which results in several publications, it is unavoidable that some text will be have to be reused (Nijkamp 2014). The general rule is to "adhere to the spirit of ethical writing and avoid reusing … previously published text, unless it is done in a manner consistent with standard scholarly conventions" (Roig 2006, 24).

In the second place we have the *principle of reliability*:

> "*… A scientific practitioner is reliable in the performance of his research and in the reporting, and equally in the transfer of knowledge through teaching and publication*" (Van der Heijden *et al.* 2012).

For scientific writing this means that the presented empirical data must have been really experimentally obtained, and not made up or tampered with: a violation of this principle is the most severe form of misconduct in scientific writing. There are no nuances involved here, and there is no need to waste many words on a matter that is so abundantly clear.

Furthermore, this principle means that *all* experimental data must be presented. One might be tempted to leave out negative results and report only those data that support the desired outcome, but the selective omission of experimental results is another serious form of misconduct. Of course, it can be interesting to show what the outcome would have been if certain results are left out of the analysis. But the rule is then that all results that were obtained according to the initial plan should be reported, and that any manipulations of these results afterwards should be clearly described and motivated (Roig 2006, 35).

Finally, we have the *principle of verifiability*:

> "*… Whenever research results are publicized, it is made clear what the data and the conclusions are based on, where they were derived from and how they can be verified*" (Van der Heijden *et al.* 2012).

This means that the experimental section of a scientific publication must contain enough detail for an independent research group to reproduce the results, and the rationale for the conclusions must be sufficiently detailed to be understandable for a third party. This avoids the pitfall of enthusiasm illustrated by the cold-fusion case[5]: the researchers were so eager to publish their findings that they didn't want to await publication in a peer-reviewed journal, and so their enthusiasm *unintentionally* led to a violation of the above principle.

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[5] On March 23, 1989, Martin Fleischman and Stanley Pons announced in a press release of the University of Utah that they "successfully created a sustained nuclear fusion at room temperature" in a "surprisingly simple experiment that is equivalent to one in a freshman-level, college chemistry course" (University of Utah 1989). This announcement was shocking, because at the time nuclear fusion was thought to require a temperature of millions of degrees on the Kelvin scale. However, hundreds of other researchers could not reproduce the results reported by Fleischman and Pons, which soon casted doubt on their main claim. Eventually, the idea that one can produce cold nuclear fusion with the experimental set up of Fleischman and Pons was rejected. For further details, see e.g. (Taubes 1993).

Avoiding type two scientific misconduct.

Of particular importance in this context is the *principle of impartiality*:

> *"In his scientific activities, the scientific practitioner heeds no other interest than the scientific interest. ...* " (Van der Heijden *et al.* 2012).

Among other things, that means that critical comments on someone else's work have to be written with the scientific interest in mind, leaving room for a different intellectual stance: one has to avoid that one publishes venomous, false allegations that came up in an emotional reaction on a new development that dissents from one's own view. This is about understanding the difference between *skepticism* and *pseudoskepticism*, a term originally introduced by Truzzi (1987). There is nothing wrong with a healthy skepticism towards a new idea: it can be in the interest of science to rigorously point out why a new theory is not convincing or even wrong. Pseudoskepticism, on the other hand, has nothing to do with a scientific discussion: it is gravely discrediting somebody else's work without even trying to prove the allegations, e.g. bluntly alleging "all his formulas are syntactically ill-formed" without that actually being the case. Thus speaking, when writing a critical comment about someone else's work, one should avoid being on the wrong side of the border between skepticism and pseudoskepticism. Falsely accusing someone else of bad research belongs to the greatest impudencies a scientist can commit (Cabbolet and De Swart 2013). Official measures against pseudoskepticism are currently still in their infancy, but this making up of negative conclusions about someone else's work ought to be treated the same way as the fabrication of data in one's own work (Cabbolet 2014).

This pertains in the first place to scientific writings that are not subject to peer-review, such as:

* monographs;
* preprints;
* the peer-review reports themselves, which too fall under the realm of scientific writing.

The point is that not only arguments must be given when one puts forward negative conclusions about someone else's work, but also these arguments must be *of scientific substance*: the rule is here that "clear reasons with appropriate references [must] be provided to justify any claims that impugn either the methods, data or conclusions of the work under consideration" (Cabbolet 2014). Gross violations of this rule are a form of type two scientific misconduct (Cabbolet 2014).

In the second place, this pertains to opinion pieces in the mass media: one has to realize that writing an opinion piece on someone else's work is also a scientific activity, as one does it in one's capacity as a scientist. There is nothing wrong with explaining a scientific controversy in understandable language for the general public: this too can be in the interest of science. But it is something else when one falsely discredits a dissenting view in the mass media: *even if* the allegations are false, the general public will accept such smear as true when the article is written by a university scientist. This is a form of type two scientific misconduct, and those that engage in it ought to be eliminated from academic circles (Cabbolet 2014).

To avoid pseudoskepticism, it is important to understand that it arises from an automatic, negative emotional reaction on a piece that implies that one's own beliefs are false (Cabbolet 2014); this simply has to be seen as a part of human nature. To not let one's actions be guided by this emotional reaction, the following two imperatives might be helpful. The first is based on More's Utopia: don't give a written reaction to a piece on the same day that one has read it for the first time. The second applies Fuller's exercise in self-reflection (1981): before submitting a comment, take a distance from it intellectually and emotionally, look at it as if one is an outsider, and reflect on the question "isn't this pseudoskepticism?" This way at least *unintentional* cases of pseudoskepticism could be avoided.

As a future measure against reviewer misconduct (pseudoskepticism) in peer review, it has been suggested that the journal editor reveals the identity of the otherwise anonymous referee to the author(s) (Cabbolet 2014).

LEGAL ASPECTS

Nowadays employment contracts for scientists at accredited universities usually contain a clause that the undersigned has to comply with an ethical code of conduct, a kind of Hippocratic oath. That means that even *unintentional* scientific misconduct already implies breach of contract. Furthermore, like any other person, scientists too can be prosecuted for criminal acts: if the scientific misconduct is so severe that it falls under criminal law, the legal consequences can be severe as well. In the overview below, known consequences of scientific misconduct are divided in three groups: *breach of contract*, *criminal law violations*, and *additional consequences*.

Breach of contract

A scientist can receive a reprimand, which can take the form of a written remark in the personnel file. This is nothing but a metaphorical slap on the wrists meant to get the scientist to reflect on his own behavior, in the hope that he/she comes to a change of heart and never repeats that behavior in the future. From published cases, e.g. ANP[6] (2011) and DFG[7] (2012), it is known that both type one and type two scientific misconduct have led to reprimands for scientists.

PhD students—often employees of the university—can be blocked from graduation when the dissertation shows evidence of writing misconduct.[8]

A scientist can be dismissed. There are many highly publicized cases, although thus far no cases are known involving type two scientific misconduct.[9]

When submitting a grant proposal, one often has to agree explicitly with the terms and conditions of the funding agency. Consequently, scientists who have been caught faking data in grant proposals can be banned from submitting further proposals by the funding organization.[10]

Likewise, when submitting a paper to a journal, one also has to agree to the terms and conditions of the journal. Consequently, when an automated test for plagiarism turns out a positive result, authors can get banned from submitting further papers to that journal.

Criminal law violations

Fabrication of data has given rise to several criminal prosecutions resulting in a conviction of the scientist.[11] Scientists who falsely discredits another scientist in the mass media can be sued for

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[6] Algemeen Nederlands Persbureau (General Dutch Press Agency).
[7] Deutsche Forschungsgemeinschaft (German Research Union).
[8] See Van Kolfschooten 2006 and 2014 for some examples.
[9] For some examples, see Bartlett 2008 and Reich 2011.
[10] See e.g. Interlandi 2006; DFG 2012; Swiss National Science Foundation (SNSF) 2013.

libel. Although nowadays courts are *likely* to rule in favor of vested interests (Martin 1998), this probability should not be interpreted as a *guarantee* that this form of type two scientific misconduct is free of legal consequences.

Grants may have to be repaid. Cases are known were it came out that grants had been obtained with a proposal that contained faked data: the institutions that had received the grants subsequently had to pay these back.[12]

Additional consequences

In some high-profile cases the PhD degree of the scientist in question has been withdrawn.[13] Especially in the medical sciences, a scientist can be banned permanently or temporarily from the profession after being found guilty of serious misconduct.[14] Students can be expelled from the university for plagiarism in essays.[15]

Last but not least, any scientist who commits scientific misconduct, regardless whether it concerns type one or type two, has to reckon with a *loss of reputation* once the misconduct surfaces. Although not exactly a legal consequence, it nevertheless is *justice after all*.

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[11] See e.g. Reich 2011; Parrish and Mercurio 2011; Stroebe *et al*. 2012.
[12] For some examples, see Parrish and Mercurio 2011.
[13] For some examples, see Löwenstein and Müller 2011 and Stroebe *et al*. 2012.
[14] For examples involving the fabrication of data, see Meikle and Bosely 2010; Stroebe *et al*. 2012.
[15] See Ross 2012 for an example.

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