

DANTE'S INFERNO: SEVEN DEADLY SINS IN SCIENTIFIC PUBLISHING AND HOW TO AVOID THEM

THOMAS F. BABOR AND THOMAS MCGOVERN

Relinquish all hope, ye who enter here.
Dante Alighieri, *Inferno*, Canto III, 9

More than 700 years ago, Dante Alighieri (1265-1321) wrote an epic poem about a man's journey through the afterworlds of Hell, Purgatory and Heaven. In his *Divine Comedy*, he catalogued the vices and virtues of people who had passed into those spiritual domains, in part to provide a valuable insight to us, the living. Dante described hell as a very unhappy and inhospitable place that had different levels ranging from the blazing inferno of the eternally damned to a rather benign area, called the First Circle, which was reserved for worthy individuals who were born before the world was redeemed and therefore could not enter the gates of heaven.

Within this general metaphor, this chapter will take the reader on an educational journey through the various levels of scientific misconduct. Our purpose is not to scare the fear of God into the gentle hearts of our readers. Rather, like Dante's journey through the netherworld, it is important for us to see the mortal consequences of scientific misconduct so that we can learn how to avoid them. Box 1 shows the seven types of misconduct this chapter explores. In addition to describing these various 'sins' and the people who commit them, we also discuss their relative seriousness, the punishments that can result, and how to prevent these kinds of problems before they arise. In the chapter following this one, we discuss the same issues within a framework of ethical decision-making, using case studies to illustrate each topic.

The first issue is carelessness, exemplified by citation bias, understating the accomplishments or findings of others, and neglecting to reference findings that an informed reader would need to know to interpret the author's conclusions. In its most benign form, this problem consists of a failure to read and understand the articles one cites. A more serious offence is the distortion of others' work so that their ideas or findings support a preconceived point of view that the author is trying to advance. Carelessness can also be manifested in poor management or inaccurate presentation of data.

The second ethical issue is redundant publication, which occurs when two or more papers share any of the same data without full cross-referencing.

The third issue we consider is unfair or irresponsible authorship. According to the Committee on Publication Ethics and similar organizations, all persons named as authors should have made a major contribution to the work, not just a token contribution.

Failure to declare a conflict of interest is the fourth ethical issue considered in this chapter. A conflict of interest is a situation or relationship in which professional, personal, or financial considerations could be seen by a fair-minded person as potentially in conflict with the researcher's or author's independence of judgment.

The fifth ethical violation is the failure to conform to minimum standards of protection for animal subjects or human research participants. The latter includes confidentiality of patient records and other data, informed consent, and proper explanation of the risks of research participation. Abiding by standards set by national and institutional boards for the protection of animal or human subjects is an important aspect of research under this rubric.

BOX 1 THE CIRCLES OF HELL IN RELATION TO THE SINS AND PUNISHMENTS OF THOSE WHO ENGAGE IN PUBLISHING MISCONDUCT
CIRCLE SIN EXAMPLES PUNISHMENTS

CIRCLE	SIN	EXAMPLES	PUNISHMENTS
1	Carelessness	Citation bias, understatement, negligence	Request for correction, letter to editor
2	Redundant publication	Same tables or literature reported without noting prior source	Rejection of manuscript, Copyright infringement
3	Unfair authorship credit	Failure to include eligible authors; honorary authors	Angry colleagues, complaints to editor or employer
4	Undeclared conflict of interest	Failure to cite funding source	Letter to editor, public apology
5	Human/ animal subject violations	No ethical approval	Rejection of manuscript, notification of employer
6	Plagiarism	Reproducing others' work or ideas as one's own	Retraction of manuscript,, notification of employer
7	Scientific fraud	Fabrication or falsification of data; misappropriation of others' ideas or plans given in confidence	Retraction of manuscript, notification of employer, publication ban

Plagiarism is the sixth issue. Plagiarism ranges from the unreferenced use of others' published and unpublished ideas, including research grant applications, to submission under 'new' authorship of a complete paper.

The final level is scientific fraud. This form of misconduct consists of the deliberate fabrication of data or the alteration of findings to make a study more credible and acceptable for publication.

How prevalent are these various ethical problems among scientists? In studying the publication practices of researchers, it has been found not only that negative results are less likely to be published but that even positive findings are withheld if this is perceived as beneficial for the authors. In one study, 20% of researchers reported delaying publication of results for their own advantage (Blumenthal et al., 1997).

It is likely that these and even more serious issues are often hidden from the eyes of busy editors and reviewers. For example, editors and reviewers are unlikely to detect scientific fraud in the normal editorial process because data fabrication can be easily hidden in lab records and computer files that are inaccessible during the review process. Skilled reviewers are more likely to detect plagiarism and citation bias, but there is a general suspicion that the cases of identified and provable misconduct are the tip of an iceberg that needs to be melted rather than remaining submerged.

In the following sections of this chapter, each of these ethical improprieties is discussed in terms of its relative importance, possible consequences, and strategies for avoidance. Box 2 provides definitions of the various types of ethical problems discussed in the chapter.

NEGLIGENT CARELESSNESS AND CITATION BIAS

The First Circle of Hell described in Box 1 is reserved for minor forms of negligent

carelessness and citation bias that are likely to mislead readers and distort the value of scientific research. Perhaps the most benign and most prevalent form of ethical impropriety, negligent carelessness, is characterized by such deficiencies as a failure to adequately review the literature on a topic, lack of candour or completeness in describing one's research methods, or presentation of data that are based on faulty statistical analyses. A related problem occurs when an author cites articles taken from other reports or from published abstracts without having read the primary sources. A more serious form of carelessness in scientific writing is citation bias. One variety of this bias is the selective citation of only those articles that support a particular point of view, ignoring or understating the importance of articles that contradict that viewpoint. The intention to deceive others makes this practice especially reprehensible. Another form of citation bias is selective citation to enhance one's reputation, epitomized by self-citation.

Box 2 DEFINITIONS OF TERMS REFERRING TO VARIOUS FORMS OF SCIENTIFIC MISCONDUCT

Citation bias	A form of carelessness that ranges from a rather benign failure to read the articles one is citing to the distortion of the meaning of others' work.
Copyright	The legal right granted to an author, publisher, or distributor to exclusive publication, production, sale, or distribution of a scientific work.
Divided publication	Information from a single research study is divided for publication in two or more papers. Also called "salami science."
Duplicate publication	Re-publication of the same information in two different places
Fabrication	Presenting data in a research report that have not been obtained in the manner or by the methods described in the report.
Fractionally divided publication	Reporting in a single paper only a fraction of the data that have been or will be reported in their entirety in another paper
Misappropriation	Illicitly presenting or using in one's own name an original research idea, plan or finding disclosed in confidence.
Misrepresentation (falsification) of findings	Altering or presenting original findings in a way that distorts the result in a scientifically unjustified way, or by omitting results or data pertinent to conclusions.
Partial repetitive publication	Repeatedly publishing parts of the same information in modified form.
Plagiarism	To present someone else's manuscript, article, text, or idea as one's own.
Repetitive publication	Publishing the same information two or more times (e.g., in journal articles and book chapters).
Self-plagiarism	To copy and present one's own text or article without properly attributing its original source.
Unethical authorship	Authorship which violates the principle that all persons named as authors should

	have made a major contribution to the work reported and be prepared to take public responsibility for it.
--	---

CONSEQUENCES

If the effect of these practices is to mislead or misinform the reader, then they are considered a mild form of scientific misconduct, especially if they only occur at the drafting stage when they are often detected by observant colleagues or reviewers who are likely to request a more balanced literature review, or the correction of obvious mistakes. In some cases an editor may reject an otherwise acceptable manuscript if reviewers raise questions about the author's objectivity or intellectual sloppiness. The consequences could be more serious if carelessness or citation bias is detected only after the article is published. If readers of a published article detect a statistical mistake, a clear bias in the formulation of a research question or the selective reporting of the literature, they may write letters to the editor pointing out the problem. Editors in turn may ask for corrections to the text or the data analyses, which are subsequently published as a special note to readers. Beyond these embarrassing consequences, failure to cite relevant studies and bias in the interpretation of previous research are likely to create a negative impression of the author among his or her colleagues. Another negative consequence may be opprobrium and damage of reputation experienced by the institution with which the author is affiliated.

PREVENTION

The best way to avoid these problems is to follow appropriate citation practices, conduct a thorough review of the literature, read all of the articles you cite, present research findings accurately, and interpret them objectively. Authors who collaborate on multi-authored papers have a special responsibility to read all drafts of a manuscript with extreme care to make sure that these problems are detected during the early stages of the publication process. Even when several authors divide responsibility for writing different sections of a research report, authors should always check each others' work.

REDUNDANT PUBLICATION

Authors wishing to reach the widest possible audience, or a variety of specific audiences, may seek to report a single definable body of research in more than one paper, in repeated reports of the same work, in fractional reports, or in reports in more than one language (Huth 1986). But there are also less noble motives for redundant publication, including the desire for multiple publications to enhance one's reputation. Redundant publication occurs when two or more papers, without full cross-reference, share the same data (Committee on Publication Ethics 2001). According to the Editorial Policy Committee of the Council of Biology Editors, repetitive publication refers to "publication of essentially the same study more than once without clear notification of editors, reviewers, and other appropriate parties" (see Jerrells 2001). In general, journal editors expect authors to ensure that no significant part of the submitted material has been published previously and that the article is not concurrently being considered by another journal. Repetitive publication has become such a serious problem that many journals now require authors to state in writing whether the data have been previously reported in part or in whole.

As indicated in Box 2, a number of different terms have been used to describe this phenomenon. Although there are some important differences among prior, duplicate, repetitive, fragmented, and redundant publication, they are all part of a common problem. Redundant publication and its variants consume valuable resources that otherwise might be devoted to other authors who are publishing original data or ideas. Because of limited journal space, the publication of one person's paper means that

another's paper will be rejected. If there are questions about the extent of the overlap between two articles, editors and reviewers need to take extra time to review several publications to determine the extent of redundancy and whether it violates any copyright agreements.

Regardless of whether the repetition occurs with data or ideas (e.g., repetitive review articles), the information from duplicated sources is sometimes inadvertently cited in a way that implies that the findings or conclusions are independent of each other, when in fact they are based on the same source. Without proper identification, meta-analyses and review papers may come to biased conclusions because the effect of a given finding is multiplied or distorted.

As Huth (1986) has noted, some types of repetitive publication are legitimate and should not be considered scientific misconduct. This is particularly the case in the publications associated with large datasets that involve multiple investigators across many sites. Often, the collaborating investigators have included measures related to a particular hypothesis or methodology, which could and should be reported in separate articles even though the article presents the same subjects, methods, procedures and even some of the same data as other articles. Such publications may be intended to highlight the relevance of particular clinical findings for a particular audience, especially if they have been first published in a technical journal that did not permit the reporting of particular findings or the discussion of clinical implications. Another acceptable variant is publication of the same article, often in its entirety, in two different languages. It is also acceptable to re-publish ideas, data, or review findings when journal editors or book editors request that a popular author write a topical review or commentary for their publication. As long as the author tells the editor about previously published material and cites all relevant reports in the commissioned paper, it is generally acceptable to re-publish or update such material.

A special case of redundant publication is 'self-plagiarism'. According to Griffin (1991), this occurs when an author re-uses text from a previously published paper in a way that fails to give proper acknowledgement to its source and its owner. By 'owner' is meant the person or organization that owns the copyright (see Box 2 for definition), which is often the publisher of the previous version of the borrowed text, not the original author. This problem typically occurs when authors re-use text from a literature review or the Methods section of an article either without changing the wording or by quoting the original text. Unlike the re-use or re-publication of original data, self-plagiarism is something that is more the result of laziness than dishonesty. It can also be a form of self-aggrandizement.

CONSEQUENCES

If a duplicate publication constitutes a copyright infringement, it may result in a reprimand for the author, a retraction of the article, or an apology to the journal editors and the publishers involved. If editors are embarrassed by the need to publish a retraction, they may adopt policies and regulations that place an added burden on honest authors who follow the rules. And when instances of scientific misconduct like this are reported to the public, they diminish the reputation of scientists and their work. In general, an author is not allowed to re-use previously published material when the rights have been assigned to the publisher, which occurs in most instances of scientific journal publications. Reprinting more than one or two sentences verbatim without proper attribution may constitute a violation of copyright and could result in legal sanctions, although this rarely occurs in cases of minor copyright violations. Editors are unlikely to consider small amounts of 'borrowing' to be a major problem, but if an observant reviewer detects widespread self-plagiarism, the editor may reject the article. Nevertheless, the more that authors re-use text without proper quotation or attribution, the more they risk adverse consequences from editors and publishers, ranging from a

reprimand to legal action for copyright violation.

PREVENTION

Authors of overlapping papers would be seriously remiss in failing to cite their previously published work (see Jerrells 2001 for a discussion of this problem). When there is any possibility of repetitive publication, authors must notify editors to explain the connection between the current paper and its predecessors. Ideally, the author should submit all related publications to the editor along with an explanation of the potential overlap and the reasons for the new report. Second, all versions of related papers must contain appropriate citations and complete references to the related papers so that readers and editors can evaluate the implications of the repetition and overlap. This includes citing illustrations or tables reprinted or adapted from other journals. The publication of the same paper in two different languages is acceptable when the editors of both journals agree to it and when the second version cites the previous version as the primary publication.

Regarding self-plagiarism, set off short quotations from a previously published article in quotation marks and cite the original version. Permission must be requested from the publisher or other copyright holder when large sections are reproduced. When there is a need to repeat the information contained in a previously published literature review or a Methods section, the best solution is to change some of the wording in each sentence and to refer the reader to relevant sources for previously published material (e.g., 'As discussed in our previous report [Bloggins 1899]').

UNFAIR AUTHORSHIP

Authorship of a scientific report refers not only to the writing of a manuscript, but also to the origin of a writing project, any experimentation or other research connected with it, and the substantive kinds of work that led up to it.

According to the Committee on Publication Ethics (2001) and other practice codes, all persons named as authors should have made a major contribution to the work reported and be prepared to take public responsibility for its contents (in proportion to the credit they claim on the author list). An editorial (Editor, 1982, p. 613) in the *Annals of Internal Medicine* defines relevant terms as follows: *Responsibility* means the ability and willingness to defend the content of the paper if it is challenged by readers. *Public* means that authors are willing to carry out this responsibility in a published defense, such as a signed letter to the editor; private defense in private correspondence would not reach the scientific public. *Content* means not simply packages of data but also the conceptual framework on which they are hung: the justification for a study or clinical observations; the basis for the study design; methods for collection of valid data; the analysis and interpretation of the data; and the logic that led to the conclusions.

There are a number of ways in which authorship decisions can result in ethical improprieties. First, some persons who have made significant contributions to an article may not receive sufficient credit, or may receive no credit at all. This occurs when an article is drafted without the knowledge or consent of someone who made a substantive contribution earlier in the process. It also occurs when a decision to list the order of contributions is not made fairly with the full agreement of the co-authors, as when a major contributor is listed after a minor contributor to enhance the ego or career of the minor contributor. Another instance of inappropriate credit occurs when a coauthor, such as a science writer, is not listed because the research group might be embarrassed to admit that someone else wrote the paper, such as a science writer hired by a drug company to expedite the publication of favorable findings. This is called 'ghost' authorship because the author's identity is unknown to those who read the

article.

A second type of authorship problem arises when some persons are listed as co-authors even though they made no substantive contribution to the article or the research. A common example is the practice of listing the head of a department or a research centre director, often at the end of the authors' list, a custom known as gratuitous, honorary or gift authorship. Again, in the light of this practice, one must question the ethical climate in research settings that allow such behaviour to occur. Ethical guidelines, appropriately crafted and implemented, might deter such transgressions.

Between these two extremes, there are a number of related infractions, such as the failure to give proper recognition to a person's contribution by listing him or her inappropriately low in the author list, or the tendency to award co-authorship for minor contributions based on personal or political considerations. Our purpose here is to discuss the seriousness and consequences of this type of misconduct, and to summarize the steps that can be taken to prevent its occurrence.

CONSEQUENCES

Authorship credits may be one of the most contentious issues in scientific publishing. At the level of collaborating research groups, the consequences range from hurt feelings to formal complaints made to a scientist's unit director or institutional authority. In between these extremes there are likely to be recriminations, perceptions of unfairness, and poisoned working relationships, which could damage the reputations of some of the parties involved. When instances of unfair authorship credit are detected, the editor's response could range from the rejection of a pending manuscript to the call for a correction to a published paper. But these matters rarely come to the attention of editors unless there is a case of scientific fraud, where co-authors might claim that they were not sufficiently involved in the writing of the paper to detect the fabrication in the first place.

PREVENTION

How can authors best deal with ethical issues related to authorship? Early agreement on the precise roles of the contributors and collaborators, and on matters of authorship and publication, is advised. The lead author should periodically review the status of authorship credits within a designated working group by having open discussions of substantive contributions with all prospective collaborators. In order to avoid disputes, distribute and discuss authorship guidelines with all potential collaborators on a manuscript. An open discussion, related to authorship, should be on the academic agenda of research centres. Involving an institutional ethics committee in drawing up institutional guidelines might also be helpful. Open and ongoing conversation about these issues, combined with institutional policies, is the best way to avoid problems.

UNDECLARED CONFLICT OF INTEREST

A conflict of interest is a situation or relationship in which professional, personal, or financial considerations could be seen by a fair-minded person as potentially in conflict with independence of judgment (ISAJE 1997). One way to determine whether a conflict of interest exists is to ask the question: If the situation or relationship were revealed to the editor or the reader only after the paper was published, would it make a reasonable person feel misled or deceived? Conflict of interest is not in itself wrongdoing. It is the failure to declare real or potential conflicts to an editor, one's coauthors, and the readers of a paper that constitutes scientific misconduct, to the extent that potential conflicts are very important in the evaluation of any piece of scientific work.

There are three levels of conflict of interest: real, apparent, and potential. A *real* conflict of interest means that the author, or the administrative unit with which the author has an employment relationship, has a financial or other interest that could unduly influence the author's position with respect to the subject matter being considered. An *apparent* conflict of interest exists when an interest would not necessarily influence the author but could prompt others to question the author's objectivity. A *potential* conflict of interest exists when there is an interest or relationship that would make a reasonable person uncertain or suspicious whether or not it should be reported.

Conflicts of interest can be financial, personal, political, or academic. Financial interests include employment, research funding, stock or share ownership, payment for lectures or travel, consultancies, and company support for staff (Committee on Publication Ethics 2001). These kinds of conflict are most often discussed in ethics codes and reports on research integrity because they are easier to document and quantify. In addition to financial and commercial conflicts of interest, a conflict may be personal, political, or academic. Personal conflicts might include a vendetta against another researcher who is disliked by the author of an article. Political conflicts exist when researchers distort their findings or interpretation to conform to 'politically correct' ideas or ideology. Academic conflicts include the attempt to validate 'pet' theories supporting one's own ideas. These kinds of conflict are difficult to detect, but they should nevertheless be considered by authors when evaluating their own work. Authors in the past have been provided with little guidance in evaluating and responding appropriately to issues of conflict of interest. The existence of compliance offices in research settings is helpful, but these institutions of themselves will not solve the problem. Researchers need appropriate training about the ethical dimensions involved as well as opportunities for ongoing dialogue and conversation, in order to develop informed individuals and groups (Institute of Medicine 2002).

The potential for conflict of interest is enhanced by any relationship or funding connected with commercial or industrial sources like the tobacco industry, the food industry, for-profit health care systems, private hospitals, the pharmaceutical industry, and 'social aspect organizations' that receive their primary support from these sources. For example, in the search for drugs that may be used to treat chronic diseases like diabetes, scientists involved in research on a particular pharmaceutical product may have financial ties with companies that have a business interest in that product. Some industries like the tobacco companies have funded researchers to conduct studies of the health consequences of their products. Sometimes the industry funds studies directly; at other times it funds studies indirectly through 'social aspect' organizations legal firms that receive their support from industry sources. In addition to research funding, industry ties can include paid consultancies, conference presentations, stockholding, advisory board membership, and patent holding.

Two major questions regarding the need for conflict of interest policies and precautions are whether industry funding affects the quality and eventual publication of research, and whether the effect is deleterious. Bias toward 'positive' results may exist even among articles where financial ties to industry are disclosed (Cho 1998). For example, pharmaceutical industry-supported drug studies are significantly more likely to report 'positive' findings (i.e., the manufacturer-associated drug better than placebo) than nonindustry funded studies (Stelfox et al. 1998). Another risk is publication bias, in which industry-favourable studies are more likely to get published than unfavourable ones.

There are several possible mechanisms to explain how conflicts, especially those connected with industry ties, may lead to publication bias (see Cho 1998). One is suppression of publication, whereby negative findings are not published because either the author fears loss of funding from industry sponsors or the industry itself imposes

restrictions on publication. Another mechanism is self-selection or industry selection of researchers who are more likely to get positive results.

CONSEQUENCES

One consequence of competing financial interests is the possible limitation of publication options. Although most journals do not ban publication of articles because of their authors' financial interests, some journals have now begun to prohibit authors of editorials and review articles from publishing if the author has a substantial financial interest in the product discussed in the editorial or review (Relman 1990). This policy does not apply to authors of scientific reports that present original data. Undeclared conflicts of interest, when detected, may have serious consequences, such as the rejection of a pending article, the retraction of a published article or the author's need to publish an apology. A more subtle effect of real or apparent conflict of interest is the perception by one's scientific colleagues that one's scientific work is biased because of a personal or financial interest.

PREVENTION

According to Loue (2000), the best way to avoid problems associated with potential conflict of interest is self-elimination from participation in potentially conflicting activities.. Arrangements with industry can be particularly problematic when the researcher is asked to sign a restrictive contract regarding the ownership of data, the sponsor's control of the data, and the investigator's right to publish it. Many academic institutions have rules governing financial support for faculty activities. These rules describe when faculty must disclose particular interests, and when they must divest themselves of particular financial interests. Conflict of Interest Committees, when they operate as part of Ethical Review Committees, are a part of institutional compliance oversight, and hold promise in this respect. In addition, many professional societies and associations, such as the Association of American Medical Colleges (AAMC), the American Association of Universities (AAU), and the Council of Government Relations (COGR), have developed policies on conflicts of interest. Authors should pay close attention to the guidelines issued by these committees and associations. The scientific community has issued warnings about the advisability of accepting any funding from several industries, and has suggested rigorous adherence to voluntary ethical codes when such funding is accepted. Even when these guidelines have been followed appropriately, however, each author should declare to the editor any real, potential or apparent conflict of interest with respect to his involvement in a particular publication. Each author should declare conflicts between (a) commercial entities and the participant personally; and (b) commercial entities and the administrative unit with which the participant has an employment relationship.

Authors should also declare sources of funding for a study, review, or other publication in a way that can be clearly understood by the reader. A footnote or an acknowledgement is the most appropriate mechanism. Describe funding sources in sufficient detail so that an average reader can recognize potential conflicts of interest. If a funding source is a social aspect organization with an ambiguous name such as 'The Tobacco and Health Fund', the reader should be informed that, for example, the organization is supported by a group of tobacco companies.

Disclosure alone will not necessarily eliminate publication bias. Researchers who are serious about avoiding even the appearance of conflict of interest are advised to dilute the conflicting relationship by getting funding from both industry and non-industry sources, and by refusing to sign industry agreements that do not guarantee the researcher's right to publish the results regardless of the study's outcome. Other management strategies include avoiding additional financial ties that are not absolutely necessary to the pursuit of the research, such as the acceptance of advisory board memberships, stock options, or consulting fees from companies sponsoring research

(Cho et al. 2001).

HUMAN/ANIMAL SUBJECTS VIOLATIONS

Research involving human and animal subjects has been conducted for over a century. During this period regulations governing human and animal experimentation have developed into a very complex set of procedures that are typically governed by appointed committees located at institutions involved in biomedical research. These procedures include ethical review of research protocols, safety monitoring of animals and human research participants, and informed consent requirements for human participants. These procedures were developed out of concern for the rights of research participants following a series of well-publicized medical experiments in which human subjects were exposed to harmful agents or had effective treatments withheld without their knowledge or consent (Loue 2000). It has now become customary, if not mandatory, to submit proposed research for independent review by an Ethical Research Committee to determine its ethical acceptability from the perspective of the local community and the researcher's institution (Institute of Medicine 2003). Such boards focus primarily on the protection of research participants by assuring that the study's procedures minimize risks of unwarranted harm to participants.

It is becoming increasingly recognized that scientific journals have an important role to play in the protection of human and animal research subjects. Journals are responsible for the dissemination of research findings. They "are obligated to publish research that meets high ethical standards [...] for which the authors have attested to their compliance with regulatory ethical standards" (Institute of Medicine 2003, p. 205). Most journals that publish research dealing with human research participants have implemented policies requiring authors to certify compliance with ethical informed consent procedures.

CONSEQUENCES

Failure to follow recommended or required journal procedures regarding protection of human and animal research subjects could have several important consequences.

Although most journals do not ban publication of articles because they have not been submitted for ethical review, some journals now require authors to state whether their research conforms to the minimum standards outlined in the Helsinki Declaration. In particular, social and behavioural research such as survey studies and research involving archival records may not require stringent informed consent procedures. However, it would be an error to rely on this perception: surveys, on occasion, have resulted in significant harm to individuals and to institutions. It is safer to submit all research for institutional review, letting the committee decide whether the researcher is exempt or not. Failure to obtain ethical approvals or informed consent from research participants may lead an editor to question the purpose and value of the research, and could result in a decision not to send the manuscript out for review or, when the failure is detected during peer review, to decline the manuscript. Another consequence could be the notification of an official from the author's institution.

PREVENTION

It is always wise to mention both in the cover letter to the editor and in the text of a submitted manuscript that the researchers have followed appropriate ethical review procedures. If there are any questions regarding the applicability of human subjects requirements, these should be raised with the editor in the cover letter or in a telephone call or email message prior to submission of a manuscript. Often these questions can be resolved by consulting the journal's instructions to authors or website. The International Committee of Medical Journal Editors has provided the following guidance regarding ethical issues:

When reporting experiments on human subjects, indicate whether the procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 1983.

Do not use patients' names, initials, or hospital numbers, especially in illustrative material. When reporting experiments on animals, indicate whether the institution's or a national research council's guide, or any national law on the care and use of laboratory animals was followed. (Source: www.icmje.org/index.html#top)

The Helsinki Declaration refers to the formal international standards developed to guide experimentation involving human participants. In particular, the 1975 and 1983 revisions emphasized the importance of voluntary informed consent to participate in research (Loue 2000).

PLAGIARISM

Plagiarism includes both the theft of intellectual property and the copying of unattributed textual material. Plagiarism ranges from the unreferenced use of others' published and unpublished ideas, including research grant applications, to submission under 'new' authorship of a complete paper, sometimes in a different language. It can also include copying of another's work verbatim or nearly verbatim in a way that misleads the ordinary reader about the author's own contribution. It may occur at any stage of planning, research, writing, or publication. It applies to both print and electronic versions of a publication.

The Office of Research Integrity (ORI), an office within the US Department of Health and Human Services that monitors investigation of research misconduct, considers plagiarism to include both the theft or misappropriation of intellectual property and the substantial unattributed textual copying of another's work, such as sentences, paragraphs or even entire manuscripts, in a way that misleads the ordinary reader regarding the contribution of the author.

CONSEQUENCES

The consequences of plagiarism can be serious, ranging from a reprimand from an editor to a formal hearing and loss of employment after an allegation is reported to the author's institutional officials. ORI generally does not pursue the limited use of identical or nearly-identical phrases that, for example, describe a commonly-used methodology or previous research because these are not considered to be substantially misleading to the reader or of great significance. Journal editors can be unrelenting and at times unforgiving if they detect instances of plagiarism. The typical approach is first to request a written explanation from the author soon after the plagiarism has been discovered. Most often these instances are discovered by knowledgeable and vigilant reviewers, or by readers who sometimes report that their own words, sentences, paragraphs or articles have been misappropriated. If the author's explanation is credible and the amount of copying is small, the consequences may be nothing more than a letter of reprimand and possibly the rejection of the manuscript. More extensive types of plagiarism may result not only in the rejection of the manuscript, but also in the publication of a correction if the material has already been published. More importantly, such matters may then be referred to the author's institutional employer, who typically will have responsibility for dealing with allegations of scientific misconduct. This is discussed in more detail in the next section. Although failure to attribute the original source of a sentence or paragraph may constitute a copyright infringement and could result in civil proceedings, such cases are rarely prosecuted.

PREVENTION

All sources should be disclosed through appropriate citation or quotation conventions,

and if a large amount of other people's written or illustrative material is to be used, the author must seek permission to reprint the material (Committee on Publication Ethics 2001). Legal definitions may vary from country to country regarding plagiarism, copyright, and intellectual property rights.

The author should review these with the editor when there is any question. A more common problem that may result in an embarrassing revelation is the unintentional copying of small amounts of textual material or the borrowing of others' ideas or concepts without appropriate attribution. These cases are usually the result of negligence, sloppiness, or laziness, as when an author fails to use quotation marks or paraphrases someone else's ideas without stating the source. In these instances the best prevention method is the careful documentation of all source documents in the course of note-taking, and the development of writing habits that allow ample time to prepare a manuscript.

OTHER TYPES OF SCIENTIFIC FRAUD

According to the Finnish National Advisory Board on Research Ethics (2004), scientific fraud is manifested in the following forms:

- fabrication i.e., presenting data in a research report that have not been obtained in the manner or by the methods described in the report;
- misrepresentation (falsification) of findings, i.e., altering or presenting original findings in a way that distorts the result in a scientifically unjustified way, or by omitting results or data pertinent to conclusions;
- plagiarism, i.e., to present someone else's manuscript, article, or text as one's own;
- misappropriation, i.e., illicitly presenting or using in one's own name an original research idea, plan or finding disclosed in confidence.

Fraud can occur in the course of proposing, conducting or reporting research. It is most often detected at the time of publication, primarily because reviewers, editors and readers of scientific articles are very critical and skeptical by nature and profession. In the course of this chapter, we have described several of the less serious instances of scientific misconduct, such as the selective interpretation of others' findings, inappropriate citation practices, unfair authorship practices, selective reporting of data, or use of inappropriate statistics. The problem with these and the more serious forms of misconduct (such as data fabrication) is the damage it does to the scientific enterprise, to the extent that it misleads other scientists and establishes a false record that may be misinterpreted by the public, policymakers, or clinicians. Definitions of scientific misconduct vary from country to country and sometimes involve the need to prove the intention of the author (Loue 2000). Box 3 provides an example of scientific misconduct from the field of nicotine and tobacco research.

Box 3 AN EXAMPLE OF SCIENTIFIC FRAUD FROM THE TOBACCO FIELD

In December 2003, the Court of Justice of the Canton of Geneva gave its sentence in an (in)famous case of scientific fraud. A Swedish professor at The University of Geneva and formerly of Gothenburg University had charged two tobacco activists with libel after they accused him of 'unprecedented scientific fraud' concerning the risks of passive smoking.

The court dismissed the case, stating that "Geneva has indeed been the platform of a scientific fraud without precedent in the sense that. Professor Ragnar Rylander has acted in his capacity of associate professor at the University, taking advantage of its influence and reputation and not hesitating to put science at the service of money, in disregard of the mission entrusted to this public institution." According

to the court, for thirty years the professor had had a close but secret relationship with Philip Morris, which included substantial financial rewards. Thus he lied when he stated to The European Journal of Public Health that he had never had contact with Philip Morris. In his research on passive smoking and in several conferences on the topic he questioned the risks connected with passive smoking. According to the Court, the professor "did not hesitate to deceive the general public in order to show himself favourable to the tobacco company." In particular, the Court reported as apparently fraudulent a study on respiratory diseases in children in which he altered the database so that no link could be made between passive smoking and the frequency of respiratory infections.

Sources: Domstol i Geneve slår fast svenskt vetenskapsfusk (Court in Geneva gives sentence on Swedish scientific fraud). *Svenska Dagbladet*, 16.12.2003 www.prevention.ch/rypr151203.htm, accessed 11 June 2004.

CONSEQUENCES

Journal editors, funding agencies, and academic institutions take allegations of scientific misconduct seriously, especially those institutions that depend on government support for their research. Typically, an editor who receives information about possible misconduct or who suspects it during the course of a manuscript review has a limited number of options, starting with the notification of the author. Many scientific and academic institutions have procedures to deal with allegations of misconduct, so an editor can begin by passing the allegation and the author's response to an appropriate institutional official or review committee for further action if the allegation seems credible. Generally, the process begins with a preliminary investigation, followed by a more formal inquiry if the allegation has sufficient substance or importance. In such cases, the withdrawal or rejection of the manuscript, or the publication of a correction in the case of an already published paper, is the least of the author's worries.

PREVENTION

There can be no substitute for careful mentoring and training of scientists in the prevention of scientific misconduct. Most scientists have such high respect for the values of science that they would never deliberately fabricate data or mislead their colleagues about the data they have collected or its interpretation. Milder forms of scientific misconduct may result from ignorance, so that deliberate exposure to ethical training may help individual scientists avoid these kinds of problems.

Because scientists typically work in groups along with research support staff, the best way to prevent fraud is to carefully check the data as well as colleagues' work at every stage in the process of conducting a research project and preparing a scientific report.

CONCLUSION

At various times in its short history, scientific research has had its credibility damaged because of ethical breaches in its research and publication practices. Today the field is experiencing an even greater crisis in values, caused by increasing pressure to publish, conflicts of interest, and ethical committee restrictions on research (Babor, in press). This situation has been exacerbated by the fact that researchers and organizational entities such as journals and professional societies do not have a consistent framework of ethical standards and ethical decision-making that can protect authors, the scientific community and the public from the ethical problems that arise in research and scientific writing. Even when ethical issues are considered professionally, they are more likely to be addressed in an abstract or prescriptive way ('Thou Shalt Not ') rather than as part

of an ethical problem-solving process based on generally accepted ethical values.

In most countries, the general public rates biomedical and social scientists highly in terms of their occupational prestige and credibility. When scientific misconduct is detected and publicized, scientists violate this trust and science loses public support. By following the preventive measures described in this chapter, researchers can avoid most of the major and minor ethical dilemmas associated with scientific misconduct. But the obligation of ethical conduct in reporting research in journal publications does not rest with the authors alone. The US Institute of Medicine (2002) report affirms what this chapter espouses in terms of the integrity of individual authors (researchers) by advocating "above all a commitment to intellectual honesty and personal responsibility for one's actions and to a range of practices which characterize the responsible conduct of research" (p. 5). This report also notes that individuals can only flourish in institutions that "establish and continuously monitor structures, processes, policies and procedures [that support] integrity in the context of research and use this knowledge in continuous quality improvement" (Institute of Medicine 2002, p. 5).

REFERENCES

- Alighieri, D. *The Divine Comedy*. Translated by Laurence Binyon (1947) in *The Portable Dante*, New York: The Viking Press.
- Babor T.F. Alcohol research and the alcoholic beverage industry issues, concerns and conflicts of interest. *Addiction* 2009; 104: 34-47.
- Blumenthal D, Campbell E, Anderson M, Causino N, Louis K. (1997). Withholding Research Results in Academic Life Science. Evidence from a National Survey of Faculty [Comment]. *JAMA*; 277(15): 1224-1228.
- Cho, M.K. (1998) FUNDamental conflicts of interest. The shift toward industry funding biomedical research. *HMS Beagle Home*, Op-Ed., 24, 1-8.
- Cho, M.K., Shohara, R., and Rennie, D. (2001) What is driving policies on faculty conflict of interest? Considerations for policy development. Conference Proceedings:
- Investigating Research Integrity. Committee on Publication Ethics (2001) Guidelines on good publication practice. *BMJ International*, 85, 2-7. URL <http://www.publicationethics.org.uk>
- Griffin G. C. (1991) Don't plagiarize - even yourself. *Post Graduate Medicine*, 89, 15-16.
- Editor (1982) Authorship from the reader's side. *Annals of Internal Medicine*, 97, 613-614.
- Huth E.J. (1986) Irresponsible authorship and wasteful publication. *Annals of Internal Medicine*, 104, 257-259
- Institute of Medicine (2002) *Integrity of Scientific Research: Creating an Environment that Promotes Responsible Conduct*. Washington, DC: National Academy of Sciences Press.
- Institute of Medicine (2003) *Responsible Research: A Systems Approach to Protecting Research Participants*. Washington, DC: National Academies Press.
- International Society of Addiction Journal Editors (1997) The Farmington Consensus. *Addiction*, 92, 1617-1618.
- Jerrells, T.R. (2001) Duplicative publication of data and other ethical issues in publishing of scientific findings. *Journal of Substance Abuse Treatment*, 20, 111-113.
- Lambe, M., Hallhagne, E. and Boethius, G. (2002) Cyniskt spel inom tobaksindustrin. Tvångspublicerade interna dokument avslöjar mångåriga ansträngningar att förneka eller tona ner tobakens negativa hälsoeffekter. [The cynical policies of the tobacco companies -- internal documents reveal deliberate cover-up of the health hazards of smoking]. *Läkartidningen*, 99: 2756-2762.
- Loue, S. (2000) *Textbook of Research Ethics: Research and Practice*. New York: Kluwer.

National Advisory Board on Research Ethics (2004) Academy of Finland guidelines on research ethics. Helsinki, Finland: Ministry of Education, www.aka.fi/modules

Relman, A.S. (1990) New 'Information for Authors' - and readers. *New England Journal of Medicine*, 321, 56.

Stelfox, H.T., Chua, G., O'Rourke, K. and Detsky, A.S. (1998) Conflict of interest in the debate over calcium-channel antagonists. *New England Journal of Medicine*, 338, 101-106.

Stenius, K. and Babor, T.F. (2003) Ethical problems and ethical guidelines of addiction journals: A report to the ISAJE membership. International Society of Addiction Journal Editors. Unpublished manuscript.