

**ETHICS IN SCIENTIFIC PUBLICATION: HISTORICAL
AND INTERNATIONAL PERSPECTIVES**

A Senior Honors Thesis

by

MELISSA JUNE HENRY

Submitted to the Office of Honors Programs
& Academic Scholarships
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Group: Cultural Studies 2

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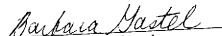
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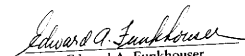
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ABSTRACT

Ethics in Scientific Publication: Historical
and International Perspectives. (April 2003)

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Ethical issues in scientific communication have existed in the scientific community since before the 17th century publication of the first scientific journal.

To understand the historical development of scientific publication ethics as its own field of research, I did a comprehensive review of Internet sites and books and articles published after 1970. To help fill in gaps in the literature, I sent an electronic survey to 26 researchers with experience as editors, authors, and peer reviewers.

I found that five main topics in publication ethics have received the largest amount of attention over the last 25 years: peer review, authorship, conflict of interest, publication bias, and duplicate/redundant publication.

Since the 1970s, when research reports and other articles on these topics were first published with regularity, the number of studies published annually has increased substantially. Conferences, such as the International Peer Review Congresses, have focused on ethical issues, and many scientific organizations have created guidelines for ethical practices in scientific publishing.

Different nations and fields have different codes and guidelines regarding ethical issues in scientific publishing. In national guidelines, it appears that there is an inverse relationship between guideline stringency and the amount of political freedom allowed under that nation's government.

Of the 26 surveys sent, 13 were returned. Of those surveyed, most stated that they were only somewhat aware of guidelines, and responses indicated that few researchers surveyed were aware of many instances of misconduct.

Debate over each issue has increased, but no commonly accepted ethical practices have been developed. Awareness of these issues does not appear to have increased nor does it appear that the rate of occurrence of ethical infractions has decreased. This apparent unchanging rate of occurrence may be because, as publication has increased in most fields, scientists lack time to read articles outside of their own areas of research. A more comprehensive survey, distributed on a much larger scale, would be useful to better understand the causes of continued ethical infractions and to help develop practical solutions to ethical problems.

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CHAPTER I

INTRODUCTION

Scientific publication is not only vital to the dissemination of knowledge and the growth of the scientific community, but also teeming with ethical issues and dilemmas. These issues and dilemmas are often unavoidable and inherent to the process of scientific publication. For example, credit for new discoveries is often assigned based on authorship; thus, issues related to authorship are inevitable. By studying ethical issues, it is possible to develop some solutions to the dilemmas these issues create. These solutions help to preserve public trust in scientists and trust among scholars. Both forms of trust are essential. Public trust allows the implementation of new knowledge and discoveries; trust among scholars allows teamwork to occur and scholars to build upon the work of others without having to reinvent the wheel.

Although many studies of ethics in scientific publication have already been conducted, these studies mainly examine single issues or groups of issues. For example, Lock's book *A Difficult Balance: Editorial Peer Review in Medicine*¹ describes the process of editorial peer review and covers nearly all the ethical issues regarding peer review that had developed at the time it was published. There appear to be few works that consider multiple ethical issues in scientific publication. One exception is *Ethics and Policy in Scientific Publication*,² published in 1990 by the Council of Biology Editors. While this book examines many issues, it does not look at them in a historical context nor does it deal with the development of these issues. It also appears that previous works have not drawn comparisons between accepted ethical practices among nations.

Understanding the main groups of issues in scientific publication ethics and their historical development is critical. Seeing the progress that has been made to date will help determine how effective published articles and guidelines have been in educating scientists and increasing the awareness of ethical issues in the scientific community. This may provide insight into how issues will further develop in the future and may suggest ways to encourage ethical conduct in scientific publication.

This thesis follows the style and format of Science Editor.

Examining differences among nations and fields is a crucial step in the analysis of these issues. By comparing the practices considered acceptable or appropriate in different nations and scientific fields, differences can be acknowledged and perhaps solutions to some ethical problems in scientific publishing can be generated.

To gain an understanding of the main groups of issues in scientific publishing, I conducted a comprehensive review of Internet sites and books and articles published after 1970. I also sent an electronic survey to 26 researchers with experience as editors, authors, and peer reviewers. My methods are detailed in Chapter II.

Basically, the main issues in scientific publication ethics fall into five groups: peer review, authorship, conflict of interest, publication bias, and duplicate/redundant publication. These groups of issues are explained and examined in Chapter III.

Chapter IV is a brief account of the history of ethical issues in scientific publication and their development. The origins of the scientific journal, calls for research and reform, the literature, the International Peer Review Congresses, and ethical codes and guidelines are examined in this chapter in historical perspective.

In Chapter V, the ethical codes of western nations are compared with the codes of other nations, and international differences are discussed. An inverse relationship between the stringency of ethical codes and the level of political freedom allowed by the government is observed. The impossibility of creating a standard ethical code, used by researchers in all nations and fields, is also described.

Chapter VI contains the results from the 13 surveys returned (a response rate of 50%) and provides some analysis of these results. However, 13 surveys are not an adequate sample from which to draw generalizations; another survey conducted on a larger scale is needed to confirm any trends from this survey.

A summary of the first six chapters is in Chapter VII, as well as conclusions and suggestions for future research.

More research on the ethics of scientific publication in a historical and international perspective may provide a clearer view of the important issues in this field. Better solutions to ethical problems may be developed, which may eventually lead to a decrease in the rate of occurrence of ethical infractions and an increase in public trust in scholars and trust among scholars.

CHAPTER II

METHODS

A comprehensive review of Internet and library sources published after 1950 was conducted to allow an understanding of the history of scientific publication ethics. The Internet search was conducted in September and October 2002 and January 2003 at www.google.com with the query parameters "scientific publication ethics." Over 30 relevant websites were returned. Many of the sites found at this stage were actually journal articles and contained references to similar articles. Wherever possible, journal articles found on the Internet were reviewed in paper. Both PubMed and MEDLINE were searched using the search parameters "scientific publication ethics" in October 2002 and again in January 2003. Librarian Jeremy Hawpe from Texas A&M University's Sterling C. Evans Library was consulted in October 2002. He provided assistance in searching numerous library databases, including the National Library of Medicine's (NLM) LOCATORplus database. Information from books written in the field and articles published in a variety of American, British, Canadian, and international journals was gathered and carefully reviewed. The published ethical codes from a number of professional organizations were also examined, in addition to the ethical guidelines prepared by many scientific journals. Several national codes of ethical conduct in science that included policies on publication ethics, from nations as diverse as Turkey and the U.S., were also studied.

Literature was included in the review if it focused on one or more of the following five issues: peer review, authorship, conflict of interest, publication bias, or duplicate/redundant publication. Ethical codes and guidelines included in the review were those which dealt with the aforementioned issues; other guidelines were excluded. These issues were selected because of their prominence in the literature since 1975. Other issues did appear, but with less frequency; these issues were therefore excluded from the review. A start date of 1975 was selected because literature on ethical practices in scientific publishing seems to have first appeared in quantity at that time.

Materials were then grouped by topic for analysis. Ethical codes were analyzed separately. Articles were categorized by issue and then further organized chronologically. The articles were then compared and contrasted within their subgroups to develop a thorough

understanding of each issue, and a timeline of important events was created. The timeline showed how ethical issues had developed.

After analysis of the literature, 26 editors, authors, and peer reviewers were emailed an interview questionnaire. Interview subjects were selected from a variety of nations, including China, Canada, Great Britain, South Africa, Spain, Japan, France, the Netherlands, the U. S., and Finland. The number 26 was chosen as an appropriate number of interviews to provide reasonably accurate information in a limited time period. Interviews were sent on January 27, 2003, and a follow-up email was sent to those who had not responded by February 22, 2003. Thirteen questionnaires were returned. Those interviewed were asked questions regarding their views on the ethical codes and guidelines currently in use. (See Appendix C.) Interviewees were also asked how they believed the ethical climate in scientific publishing had changed over time. Information gathered from the returned questionnaires was examined to identify themes and patterns.

The information gathered in the interviews was then examined along with that uncovered during the literature review. This compilation of literature sources and interview accounts forms the basis for this study.

CHAPTER III

THE ISSUES

Over the past 30 years, five topics seem to have generated the most literature on the ethics of scientific publishing – peer review, authorship, conflict of interest, publication bias, and duplicate/redundant publication. An understanding of these issues is critical to examining both the historical progress of the literature and the ways various groups have dealt with the issues in crafting ethical codes. Authorship and conflict of interest appear to be areas of great cross-cultural difference as well as diversity of opinion among assorted scientific fields and organizations. Peer review and publication bias also seem to be serious issues for scientific journals and researchers in all fields, while duplicate/redundant publication is an issue that, while significant, has not produced much real controversy. Analyzing these issues and studying the viewpoints of different nations, publications, and professional societies is the first step toward a larger understanding of ethical issues in scientific publishing.

Peer Review

With well over 800 books and articles about it in print, peer review is by far the most heavily discussed issue in publishing ethics. Clearly, this is a subject of importance to many researchers.¹ The ethical issue regarding peer review is not simply its effectiveness as a method of ascertaining the value of manuscripts, but rather which type of peer review is most ethical and practical.

Peer review in publishing generally refers to the system used by most scientific journals to evaluate the scientific merit of manuscripts submitted for publication. Generally, editors send the manuscripts to one or more experts in the field that are not members of the journal staff. Unfortunately, it would be nearly impossible for an editor to have such extensive, detailed knowledge of all topics about which s/he publishes to determine the merit of all manuscripts submitted. Historically, scientists discussed the results of their research with colleagues in writing before submitting that research for publication.² However, as it became standard practice to assign credit for new discoveries to the first author to publish those discoveries, pressure to publish rapidly increased, and scientists submitted their research for publication without discussing results with colleagues.³ Since submitted manuscripts were no longer evaluated

before submission and editors were generally not broadly knowledgeable enough to determine research merit unassisted, editors began to send the manuscripts out for evaluation after submission, in much the same way that authors had previously sent their work to peers before publication.²

Over the years from the late 17th century to World War II, this informal system slowly became standardized, and the formal process of peer review developed.² Today's basic process is a system in which each submitted manuscript is not only reviewed by journal editors, but also sent out to one or more prominent researchers in that specific field. These peer reviewers identify strengths and weaknesses of the research and make a recommendation either for or against publication of the manuscript. At nearly all journals, editors make the final publication decision.

In practice, peer review is slightly more complex. There are three main types of peer review: closed, open, and blind. All three have been attempted by various scientific journals; opinions vary on which form of peer review is best. Each system has both positive and negative aspects.

Most scientific journals use a system of closed peer review.⁴ In this system, authors' names accompany the manuscripts sent for review and thus reviewers are aware of authors' identities. However, authors do not receive the names of the reviewers; the review is anonymous. One journal that uses this process is the *New England Journal of Medicine*. Although reviewers are asked to provide an evaluation of the manuscript, the editors stress that the final publication decision rests with the editorial staff.⁵ Little empirical research has been conducted on the closed review process, but it has been strongly supported by tradition since World War II.⁶

Nevertheless, this method of peer review is not without drawbacks. Reviewing articles takes time and is often a thankless job. Closed system reviewers do not usually receive credit for individual reviews. At the same time, reviewers' anonymity shelters them from accountability for review quality.⁴ Likely the strongest argument against a closed review system is that it is prone to abuse.⁷ With reviewer identities unknown, it is relatively easy for misconduct to occur. Such misconduct might include reviewers stealing ideas or attempting to hold up publication for personal gain. Several researchers have, in addition, questioned the ethics of a system in which some identities are known while others are hidden. They argue that closed peer review is inherently unjust.⁸

A growing number of journals, such as the *BMJ* (formerly the *British Medical Journal*), are turning to open peer review.⁹ In this system, authors of submitted manuscripts are provided with reviewer identities and reviewers are provided with author identities. Some researchers consider this to be more fair than closed review.¹⁰ Some even go so far as to deem it "ethically superior."⁴ These individuals contend that the only ethical systems of peer review are those in which either all identities are known (open review) or no identities are known (blind review).⁸ In open review, authors are held accountable for their work, and reviewers are held accountable for the quality of their reviews.⁴ There is even limited evidence to suggest an open system may produce higher quality reviews.¹¹ However, the research producing this evidence compared the reviews received under an open review system to those received in a blind review system. There does not appear to have been any study in which the reviews obtained under open review were found to be of higher quality when compared with those obtained through closed review (the most frequently used system). Also supporting an open review system is some researchers' assumption that authors would prefer it,^{4,9} but empirical research has not supported this. On the contrary, research suggests that authors' level of review satisfaction is based heavily on manuscript acceptance and not review method or quality.¹² More empirical research is needed to determine whether these bonuses truly exist.

Along with the benefits of open review, there are several disadvantages. If reviewer identities were known, some researchers believe, reviews would be less critical. Reviewers might be leery of offending authors, they say, and relations between authors and reviewers might become strained. Ultimately, journal acceptance rates would rise significantly, and editors would be under greater pressure.¹⁰ However, these negative effects are largely speculative. Studies have found that while there has been no discernible difference in review quality between open and closed systems, open review increases both the number of reviewers who decline to review manuscripts and the number of manuscripts reviewers recommend for acceptance.^{9,11,13} Realistically, the lack of difference in review quality appears to suggest that both methods are capable of producing reviews of equivalent quality.

There is one remaining system of peer review – blind review. In a blind review system, both reviewers' and authors' identities are hidden. In practice, this system of peer review is often not possible. In studies of this system, 23% to 42% of reviewers could correctly identify the authors based on the content and references.^{11,13-16}

Authorship

Like peer review, authorship is the subject of much literature in publication ethics. While it was not uncommon to publish research anonymously in the 19th century,¹⁷ this is certainly no longer the case. Because scientific credit is now often assigned based on first publication³ and scientists are expected to take credit and responsibility for their work, anonymity is almost unheard of today. Authorship has become a major issue in many fields, and as of 1998-1999, authorship problems were the most commonly reported type of research misconduct.^{18,19}

Unlike peer review, authorship is not a single complex issue. Instead, authorship is the collective name for a family of issues, including: authorship credit, order of authors, group authorship, and honorary/ghost authorship.

The most frequently debated of these issues is authorship credit, which in fact is often simply called authorship. There is at this time no single accepted method of determining what level of contribution to a project warrants authorship credit. The Guidelines for Good Publication Practice published in the COPE (Committee on Publication Ethics) Report 1999 state that "as a minimum, authors should take responsibility for a particular section of the study."²⁰ This same set of guidelines recommends that if no specific task can be attributed to a single person, that person should not receive authorship credit. These guidelines also suggest that all authors must take public responsibility for the content of the manuscript.²⁰ The American Chemical Society has less strict authorship requirements. In the January 2000 revision of its Ethical Guidelines to Publication of Chemical Research, the American Chemical Society states that "all persons who have made significant contributions to the work reported and who share responsibility and accountability for the results"²¹ should be listed as authors. Although this may appear to be the same statement, the American Chemical Society does not define "significant contribution" and holds researchers accountable solely for the results of the research and not for the paper as a whole. This type of guideline in some cases enables typists and assistants who performed only technical tasks to be granted authorship credit²² and in other cases allows supervisors who had little to do with the actual research to receive authorship status.²³ Partially in response to this sort of authorship abuse, the International Committee of Medical Journal Editors created the Uniform Requirements for Manuscripts Submitted to Biomedical Journals,²⁴ which is today used by many biomedical journals. (As of 1997, there were just over 600

biomedical journals that followed the Uniform Requirements.)²⁵ The Uniform Requirements make the following statement about authorship:

Each author should have participated sufficiently in the work to take public responsibility for the content. Authorship credit should be based only on substantial contributions to (a) conception and design, or analysis and interpretation of data; and to (b) drafting the article or revising it critically for important intellectual content; and on (c) final approval of the version to be published. Conditions (a), (b), and (c) must all be met.²⁶

Order of authors is also an important issue. When a study has multiple authors listed, this order might be used to determine to whom comments should be directed or which researcher made the largest contribution. However, because of the incredible diversity of convention among various fields and organizations, many journals, such as the *BMJ*, suggest that readers "should infer nothing from the order of authors."²⁷ In some fields, it is common for authors to be listed alphabetically. At other times, authors are listed in order of greatest contribution. In still other circumstances, a group of researchers working on several projects will rotate the order of authors from publication to publication, thus ensuring that each member of the group is listed first on at least one manuscript. Although emphasis is sometimes placed on order of authorship (Often authors listed fourth or later are not included in citations, and sometimes only the first author is listed as in "Smith et al."), these varying practices render order of authorship irrelevant in many cases.

A major difficulty with order of authorship appears to stem from another issue: group authorship. As more and more research is performed by large groups of researchers, lists of authors become longer and longer or are replaced altogether with the name of the research group. This has caused difficulties with indexing and citing such papers,²⁸ and with determining levels of contribution and accountability.²² This problem seems to be growing, and as yet there does not appear to be any solution.

The final issue in the authorship family is honorary/ghost authorship. Honorary authorship is listing as an author an individual who does not meet authorship requirements; ghost authorship is failure to list as an author an individual who does meet authorship requirements. Most recently, a 1998 study by Flanagan, Carey, Fontanarosa, et al. of review articles published in six medical journals found that 26% of the articles likely listed honorary authors and 10%

likely had ghost authors.²⁹ Other studies have found similar results.³⁰⁻³² This suggests that abuse or neglect of authorship guidelines is fairly common.

Conflict of Interest

A third issue of concern in publication ethics is conflict of interest. It is not the existence of conflicts of interest, however, that is the issue; the issue is whether, and if so, when, the conflicts of interest should be disclosed. Broadly, conflicts of interest are any conflicts which may influence (but do not necessarily influence) the judgment of authors, editors, or reviewers. More specifically, conflicts of interest in scientific publication include financial, political, academic or personal conflicts that have the potential to influence a researcher's, editor's, or reviewer's work. Financial conflicts appear to be of greatest concern to most scientists and may include: employment or past employment with a company that will be affected by the outcome of the research, work as a consultant for such a company, or other monetary awards provided by such companies.

Numerous ethical codes and guidelines advise the disclosure of all conflicts of interest, especially financial conflicts.^{20,21,26,33,34} However, there are researchers who believe that disclosing a conflict of interest has a negative effect on readers. These researchers state that disclosure creates a bias against the author, leads readers to believe that researchers may be dishonest, and prevents the research from being fairly evaluated.³⁵ *New England Journal of Medicine* editors Kassirer and Angell refute this argument by stating that disclosure requirements do not necessarily question the honesty of authors, but instead aim to alert readers to possible unconscious bias.³⁶ Critics of disclosure stress that financial conflicts of interest are not the only type of conflict of interest and that disclosure focuses too much on these financial conflicts while ignoring other types.³⁵ On the other hand, supporters state that financial conflicts of interest are of greater concern because financial conflicts are both "voluntary" and "seductive"; they say that other forms of conflict, such as the desire to find positive and influential results, are inherent to the research process.³⁶

Publication Bias

It is widely believed that studies reporting positive results are more likely to be published than studies with negative results. This publication bias is assumed because journals appear to publish more studies with positive results than with negative results.³⁷⁻³⁹ Certainly

appear to have been duplicated.⁴⁷ Although many journals require that researchers submit copies of all related articles previously published or in press, it is clear that this requirement is not always followed. However, computerized medical indexes and databases may be making future duplicate/redundant publication much more difficult.

CHAPTER IV

HISTORICAL HIGHLIGHTS AND TRENDS

When comparing past with present, especially in a fairly subjective field such as ethics, it is easy to think nostalgically about how much better the past was. A hundred years ago, a news article claiming that a researcher failed to declare a conflict of interest would have been scandalous, if it had been printed at all. Today, seeing such an article in the news section of a major scientific journal is common. Conflict of interest is now a major subject of publication, not only in journal articles, but in many different media forms. Articles discussing and debating the ethics of the peer review system or proper authorship practices are also regularly printed. Even 50 years ago, such articles were rare. However, this does not mean that these issues are new. Although it is mainly in the last 30 years that ethical issues in publishing have been studied and appeared in print, it seems likely that many of them existed since shortly after or possibly even before the first scientific journal was published. Tracing the development of these issues over time and examining the key steps that have led to the current understanding of them may facilitate future progress and solutions.

Origin of the Scientific Journal

Before the late 17th century, scientists such as Isaac Newton zealously guarded their research, unwilling to share their work with colleagues for fear that their discoveries would be stolen. Those scientists who did wish to share their research did so at their own risk.¹ Although sharing was a gamble, it was also vital to the growth of scientific knowledge. However, for many scientists, the advancement of science was worth the risk of losing credit for their discoveries.²

With no medium available for publicly disseminating new discoveries, scientists turned to private means. Scientists frequently exchanged correspondence, describing their recent experiments and results in Latin. The use of Latin conquered language barriers and allowed information to be shared among scholars of different nations.²

The practice of scholarly letter-writing was so prevalent that over the course of a lifetime, many scientists wrote and received hundreds of letters. In several cases, researchers

published collections of the letters they had written; one Danish physician, Thomas Bartholin, published five volumes of his own correspondence and had plans to publish three more before the letters were accidentally burned.²

Unfortunately, there was as yet no way to prevent unethical researchers from stealing the work of their more ethical fellows. To provide credit where credit was due, Henry Oldenburg, secretary of England's Royal Society of London, promised to publish scientists' works and defend the claim of the first published author.¹ Thus the first scientific journal, *Philosophical Transactions*, was published in 1665, and the field of scientific publishing was created.²

Although Oldenburg was the secretary of the Royal Society of London and articles written for *Philosophical Transactions* were sometimes reviewed by Society Fellows prior to publication, *Philosophical Transactions* was not officially sponsored by the Royal Society of London until the middle of the 18th century. In fact, scientific journals in the 17th and 18th century were rarely sponsored by scientific societies, unlike modern journals, of which many receive formal sponsorship.²

The first scientific journals differed from modern journals in several other ways as well. Early journal editors often referred to themselves as the journal's author and personally wrote much of the journal's content. These journals rarely lasted more than two or three years, likely because of the strong tie between the journal and its author/editor. Duplicate/redundant publication, a common occurrence in the 17th and 18th centuries, was not viewed negatively until the end of the 19th century. In the early days of the scientific journal, duplication was not a concern because readers rarely had access to more than one journal. Today, with a variety of journals widely available, duplicate publication is seen as a misuse of journal space.²

Calls for Research and Reform

Even though ethical issues likely began to arise shortly after the first scientific journals were created, it appears that these issues were not discussed in the literature, and therefore, there appears to be no record of ethical issues prior to the 20th century. For example, while there is documentation describing a peer review system very similar to today's closed review system from one 17th century French journal,² there does not appear to be any discussion about this system. After World War II, however, peer review became a topic of much debate in the scientific community. This debate took the form of numerous opinion articles, both for and against the peer review process, but no empirical studies had been conducted to ascertain the

value of the process.³ What appears to be the first published call for research on peer review appeared in the *New England Journal of Medicine* in 1985.⁴ The result was an explosion in published material on peer review and the First International Congress on Peer Review in Biomedical Publication. As of 2002, articles on peer review were being published at a rate of 170 to 200 articles per year.⁵

Another ever-present ethical issue in publishing that has been discussed mainly for the last 50 years is authorship. Before the Renaissance, there was no real notion of intellectual property rights in science. Thus, authorship was no real issue. During the Renaissance, the concepts of humanism and individuality were developed and carried into all aspects of life, including science. Researchers began to form ideas about ownership and credit. This led to the concept of authorship.² For some time during the 18th and 19th centuries it was not uncommon for researchers to publish their work anonymously, mainly because there was a common idea that only well-known scientists should link their names with their works. By the 20th century, however, this practice had fallen out of favor in the scientific community as researchers were not only expected to receive credit for their research but also to take public responsibility for it.⁶ As research projects became larger and more expensive following World War II, large groups of scientists became necessary in fields like particle physics and biomedical research to complete experiments. The result of these group experiments is the multi-authored study, which has become more and more prevalent.⁷ As the number of authors has increased, so, it seems, has the number of authorship issues. However, authorship was only rarely discussed in the literature until the 1970s, except for discussion in relation to indexing and cataloguing published works.⁸ In the 1980s, ethical codes published by the American Chemical Society, the American Psychological Association, the Council of Biology Editors, the International Committee of Medical Journal Editors, and other professional societies included sections detailing specific ways to deal with authorship issues.⁹⁻¹² Huth and Relman started writing about authorship in the early 1980s (see Appendix A: Bibliography), and empirical studies of the effects of authorship abuse and possible solutions to authorship problems have been conducted at least since 1990. Today, authorship is a topic of fairly regular publication, with dozens of articles published annually.

Other issues of publishing ethics seem to have become topics of concern only in the last 50 years. Historically, scientists conducted research to expand the body of scientific knowledge and were generally funded by universities, scientific societies, and the government, and

occasionally out of their own pockets.² Since World War II, however, many studies have been funded by private corporations. With this movement of science into the business sector, it is not surprising that conflict of interest has become an issue of increasing importance in scientific publishing.¹³ Beginning in the mid 1980s, conflict of interest scandals have been reported not only in specialized scientific journals, but in more widely known scientific publications such as *Science* and *Nature*.^{14,15} By the late 1980s, many journals had adopted conflict of interest policies, and ethical codes published by many professional societies had begun to advise disclosing conflicts of interest, particularly financial conflicts.¹³ Despite some claims made beginning in the early 1990s that disclosure leads to mistrust and is equivalent to censorship,¹⁶ articles and ethical codes published to date appear to call for disclosure more and more often.

Another issue that has appeared in the literature more often in the last 15 years is publication bias. Since the late 1980s, the possibility of bias against negative results has come up repeatedly in journal articles. To date, there appears to be little evidence suggesting that publication bias is a real problem. Many scientists seem to believe that publication bias exists, but studies indicate that high quality experiments with negative results are simply submitted less often than experiments of equivalent quality with positive results.¹⁷⁻²⁰

Unlike peer review and authorship issues, which seem to have existed to some degree since the creation of the scientific journal, duplicate/redundant publication is a relatively new issue. As previously mentioned, duplicate/redundant publication was not considered inappropriate in the first centuries of journal publication.² As the availability of scientific journals and the volume of new knowledge increased, repeated publication eventually became a problem. Until 1980, however, very little was said about this issue.²¹ Since the first recognition of duplicate/redundant publication as an issue, a number of studies have been reported starting in 1989 that address the prevalence of the problem. Estimates of the rate of occurrence of duplicate/redundant publication range from 8.5%²² to about 20%²³ but do not appear to have increased or decreased substantially over time. This suggests that although the problem is not growing, it is not diminishing either.

The Literature

Starting in the 1980s, books and articles on publishing ethics have appeared in the scientific literature with regularity. As the supply of articles focusing on these issues grew, scientific publishing ethics became its own genre. Certain authors became leaders in their

specialized ethical fields. Which publications and authors have had the greatest impact on publishing ethics can be seen most clearly not only by examining the texts themselves, but by observing the frequency with which certain publications and authors are cited by others. The following publications and authors appear to have been the most influential in publishing ethics based on these criteria.

In 1985, the first edition of Lock's book *A Difficult Balance: Editorial Peer Review in Medicine*²⁴ was published. Although this book deals solely with the peer review process in medical publishing, it was apparently the first comprehensive study of peer review in any field. *A Difficult Balance* contains most of the information known about peer review at that time and was one of the first publications about peer review not exclusively based on opinion.

Another book that contributed greatly to the body of knowledge in publishing ethics was *Ethics and Policy in Scientific Publication*,²⁵ published by the Council of Biology Editors in 1990. The first part of this book contains information gathered from two surveys. The surveys were sent to the members of the Council of Biology Editors and contained questions about 19 topics in publishing ethics. The surveys presented 19 scenarios and asked whether similar situations were a problem and how often they occur, as well as what solutions respondents recommended. More than 200 responses to each survey were received. The second part of the book contains transcripts of proceedings and open discussions held at a Council of Biology Editors conference in October 1988. This is one of the largest collections of opinion on ethical issues in publishing available and has provided much valuable information that is difficult to find elsewhere.

In addition to these two books, many articles have been widely cited in the literature on scientific publishing ethics. A relatively small number of authors wrote the majority of these articles. Rennie is one of the most prominent; his numerous articles cover peer review, authorship, conflict of interest, and publication bias. Angell and Kassirer, frequent collaborators, have written several important articles on peer review, authorship, and conflict of interest. Huth's articles on authorship, conflict of interest, and duplicate/redundant publication are also widely cited, as are Relman's articles on the same issues. Flanagin's articles on authorship, conflict of interest, and publication bias are fairly well-known, as are Dickersin's studies of conflict of interest and publication bias. Horton has been particularly important in the areas of authorship and conflict of interest, and Lock has greatly influenced both peer review and authorship. Garfield, another prolific author, has been writing about authorship and conflict of

interest since the late 1970s. Additionally, van Rooyen, Godlee, Smith, and McNutt have published important empirical studies of peer review, and Olson, Weber, Callaham, and Wears have produced empirical data on publication bias. Interestingly, most of these authors are associated with biomedical journals and research. See Appendix A (Bibliography) and Appendix B (Recommended Readings) for examples of works by these authors.

The International Peer Review Congresses

In 1983, Bailar and Patterson called for empirical studies to be conducted on peer review.^{4,5} In response, the editors of the *Journal of the American Medical Association (JAMA)* issued an invitation to readers in 1986, asking researchers to attend a peer review congress. The purpose of the congress would be to present as yet nonexistent empirical studies of peer review.²⁶ The First International Peer Review Congress was held in Chicago in 1989. Since that first congress, the scope of these congresses has expanded to cover any topic of relevance in scientific publishing, including ethics, operations, and legal issues. Hundreds of articles on these issues have been published since 1989, and increases in articles on ethical issues have been seen even in noncongress years.⁵ At that first congress, peer review was the focus; 50 papers were submitted for presentation.²⁷ Peer review was not the only issue discussed at the congress, however. Three studies focusing on publication bias²⁸⁻³⁰ were also presented. Based on the papers presented at the congress, *JAMA* published a theme issue, focusing solely on ethical issues in scientific publishing, especially peer review.²⁷

Based on the success of the first congress, a Second International Peer Review Congress was held in 1993, also in Chicago. One of the more compelling presentations made at this congress was by Kassirer and Campion, who discussed manuscripts presented at the first congress. They stated that most of the work previously presented dealt with the way in which editors manage manuscript and peer review or with the history or philosophy of peer review. They argued that management was not the area in which research was needed, but that research should be conducted to study manuscript assessment, or the process through which reviewers evaluate manuscripts.³¹ At this congress, too, few presentations were based on manuscript assessment. For example, Gilbert, Williams, and Lundberg presented a study of possible gender bias in peer review,³² and Glantz and Bero gave a presentation on selecting appropriate peer reviewers for grant review processes,³³ both management issues.

At the Third International Peer Review Congress, in Prague, Czech Republic, in 1997, publication bias was once more a major theme.³ Dickersin et al. reported on an apparent bias against selecting female editorial staff members.³⁴ Other researchers presented evidence suggesting the possibility of bias in favor of articles from the United States and articles written in English,^{35,36} but one of these studies did not adjust for quality differences,³⁵ and the other was conducted before the journal studied had finished introducing pertinent quality control standards now in place.³⁶ The most thought-provoking reports on publication bias at the 1997 congress were the three presentations which seem to confirm the existence of bias against negative results.³⁷⁻³⁹ Callahan and colleagues examined abstract acceptance to scientific meetings and found that there appeared to be a bias against abstracts showing negative results.³⁷ This was the only study of the three that appeared to truly confirm publication bias. Another of these studies, presented by the same group of researchers, focused on authors' failure to publish manuscripts of studies with negative results after presenting these manuscripts at scientific meetings.³⁸ However, if publication is defined broadly to include any communication of results,²⁵ then these studies had, in a sense, already been published. Misakian and Bero considered failure to publish insignificant results a bias in their study,³⁹ when in fact it is often an editorial decision. Every study cannot be published, and generally studies with significant results should take precedence over those with insignificant results. In all, *JAMA*'s third theme issue on peer review published 33 articles on a variety of subjects, focusing on publishing issues important to clinical researchers.³

Most recently, the Fourth International Congress on Peer Review was held in Barcelona, Spain, in September 2001. This congress was somewhat disrupted by the terrorist attacks on the World Trade Center and the Pentagon in the U.S. a few days before, which made travel difficult or impossible for many congress participants from the Americas. Despite this disruption, the congress was deemed a success as 40 of 43 presentations were given as scheduled, and 58 of 65 posters were displayed.⁵ While most studies presented still focused on management issues,⁵ Horton presented a small study examining the relationship between author opinions and opinions presented in research papers. He found that many papers do not represent the views of all listed authors.⁴⁰ In addition to peer review and authorship issues, the Fourth International Peer Review Congress concentrated on publication bias, postpublication criticism, quality standards, and legal issues. *JAMA*'s fourth theme issue contained 32 papers presented at the congress, including three on Internet publication.⁴¹

Ethical Codes and Guidelines

By the 1980s, peer review, authorship, conflict of interest, publication bias, and duplicate/redundant publication had become prominent issues in publishing ethics. The more literature appeared on these issues, the more solutions were suggested to rectify problems. Authors frequently disagreed about solutions, and as previously discussed (see Chapter 3), issues became more and more complicated. A need was perceived for statements describing how to handle these issues when they arise. In response, several scientific professional societies and groups of editors published ethical guidelines. The professional societies seem to have led the way; their guidelines began appearing in the early 1980s. These guidelines were not complete, however, and provided guidance only in certain areas – exactly which topics were covered varied from society to society. Groups of editors began to publish ethical codes at about the same time, but were more thorough. These codes tend to be much longer and cover the issues in much greater depth. The Uniform Requirements for Manuscripts Submitted to Biomedical Journals, which was first published in 1979, seems to be one of the most influential and widely used of such codes. By 1990, journals began including policy statements on these issues in their guidelines for potential authors. Although this abundance of guidelines may at first appear helpful, this is not necessarily the case. The fact that these issues continue to be problems after published guidelines have been plentiful and readily available for more than 10 years suggests that authors are unaware of these guidelines, confused by the many different methods suggested for handling ethical issues, or blatantly ignoring ethical practices. Assuming that most scientists behave ethically, it seems likely that lack of awareness and confusion are the main causes of continuing ethical problems.

Some of the earliest ethical codes were published by professional societies in the sciences, such as the American Psychological Association in 1983¹⁰ and the American Chemical Society in 1986.⁹ These societies and others created ethical guidelines in publishing at least partially out of a sense of duty to provide guidelines to their members. As stated in the American Chemical Society's 2000 revision of the Ethical Guidelines to Publication of Chemical Research: "An essential feature of a profession is the acceptance by its members of a code that outlines desirable behavior and specifies obligations of its members to each other and to the public."⁴³ Although these early guidelines did provide vital ethical information to scientists within these professions, these guidelines were rather incomplete. The American Psychological Association's 1983 guidelines discussed peer review, authorship, duplicate publication, and

plagiarism, but provided no information on conflict of interest or any other ethical issues in publishing.¹⁰ The American Chemical Society's 1986 guidelines provided codes of conduct regarding all five major issues in publishing ethics, especially duplicate/redundant publication, but are fairly brief and lack details, giving no examples and little elaboration on the issues.⁹ Both of these professional societies have updated and expanded their ethical codes since the 1980s, the American Psychological Association most recently in 2002⁴⁴ and the American Chemical Society in 2000.⁴³

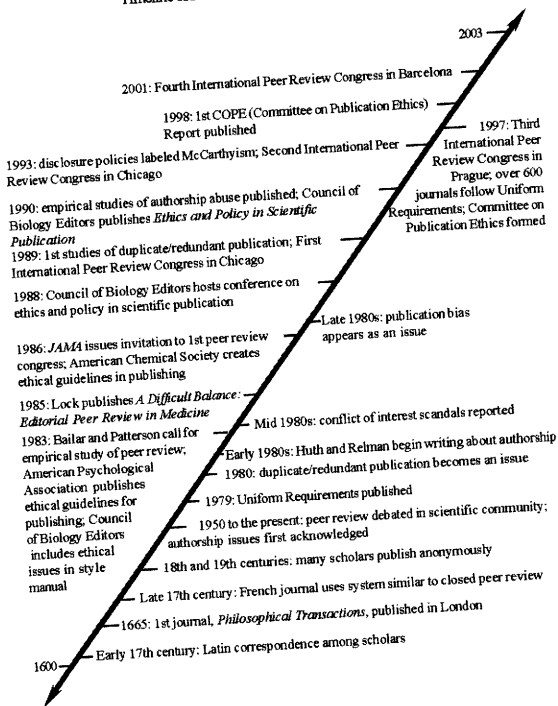
About the same time as professional societies published their first ethical codes, groups of editors created the first comprehensive codes of ethical policy in scientific publication. In 1983, the Council of Biology Editors included in the 5th edition of its style manual a large section on ethical issues, including all five main issues and many other topics.¹¹ In 1979, the International Committee of Medical Journal Editors wrote the Uniform Requirements for Manuscripts Submitted to Biomedical Journals. This document is quite thorough and complete; it contains information on nearly every issue in publishing ethics, including the five main issues. The Uniform Requirements have been well received since publication; more than 600 journals worldwide used these requirements in addition to their own instructions for authors as of 1997.^{12,42} One possible difficulty with such detailed guidelines is that readers may become bogged down in the tremendous amount of information. Another possibility is that scientists simply do not use the guidelines for ethical purposes because ethics is not the main focus of the document; ethical guidelines are buried amongst guidelines for manuscript preparation and are therefore not as easy to access as professional society codes. One group of editors that has produced a more accessible set of guidelines as part of its annual report is the Committee on Publication Ethics (COPE). COPE was first formed in 1997 out of "[concern] about the lack of clear guidelines on how to deal with breeches of research and publication ethics in [an] editorial capacity." The first report, issued in 1998, included relatively brief sections on a variety of issues in publishing ethics, including study design and ethical approval for experiments on human and animal subjects, data analysis, authorship, conflicts of interest, peer review, redundant publication, plagiarism, duties of editors, media relations, and advertising. COPE has since issued a report every year, most recently in 2002.⁴⁵

By 1990, many major scientific journals were publishing their own ethical policies as part of their information for potential authors. *Science*, *Nature*, the *Journal of the American Medical Association*, the *New England Journal of Medicine*, and the *BMJ* all have policy

statements dealing with ethical issues. These and other journals also pass along information on ethical issues to authors through editorials.⁴⁶⁻⁵⁰

Although the wealth of information available on publishing ethics has likely increased awareness of the issues, it remains unclear to what extent this has ameliorated the problems. Looking ahead, it seems that as awareness grows and education increases, occurrences of these problems will decrease. However, it seems unlikely that ethical problems in scientific publication will ever disappear completely.

Figure 1
Timeline of Events in Scientific Publishing Ethics



CHAPTER V

INTERNATIONAL COMPARISONS AND THE IMPOSSIBILITY OF STANDARDIZATION

Among nations, there are many ways of viewing some of the ethical issues previously discussed. Some practices that would be considered unethical in Britain or the United States, two countries which appear to have similar ideas about scientific publishing ethics, may be acceptable in other nations, and practices acceptable in China may not be appropriate in Canada. Peer review, authorship, and duplicate/redundant publication are all understood differently in different countries. As stated in the introduction to the 1999 COPE (Committee on Publication Ethics) Report, ethical guidelines are meant to be "advisory" rather than "prescriptive."¹ This is because of the nature of ethical issues: Ethical problems are those problems which do not have a simple solution, but involve choosing between competing values. Publication bias, for example, is an ethical dilemma; an editor may prefer to publish studies with positive results because these results will appear more significant to readers, but studies with negative results also need to be published, in part to prevent scientists from repeating studies needlessly. All ethical issues involve such clashes between competing values, and while one society may choose one method of handling an issue, another society may choose another method. Although different, both methods may be equally valid.

Just as different nations have different views on ethical issues in scientific publishing, they also have different means of monitoring ethical publication practices. In many societies, ethical practices are regulated by the government. In these and other societies, scientific and other organizations sometimes also provide guidelines on ethical practices. In some cases, these organizations require their members to follow these guidelines, while in others, the final decision on how to handle ethical dilemmas is left to the individual. Many countries have implemented systems that combine private guidelines with government control, while others appear to have no control whatsoever. In general, it seems that the type of government – democratic, socialist/communist, or authoritarian – determines the manner in which ethical publication practices are regulated. In fact, it seems that the more political freedom a country enjoys, the less likely it is that the government will regulate ethical practices and vice versa. In other words,

an inverse relationship exists between political freedom and government regulation of publishing ethics.

Western Industrialized Nations

Most industrialized nations in the West monitor ethical practices in scientific publishing through a combination of government regulations and guidance from private organizations, with private organizations generally more active. Countries that qualify as western industrialized nations base their economies mainly on industry rather than agriculture, share some basic cultural values with the nations of Western Europe, and often have some form of democratic government. These countries include Australia, Canada, France, Germany, Great Britain, the Netherlands, and the United States.

These countries typically have laws regulating the ethical conduct of research which include sections on ethical publication practices. However, these sections rarely look at the issues in depth, and frequently only cover a few key issues while ignoring other less prominent issues. For example, in the United States, the Office of Research Integrity, part of the U.S. Department of Health and Human Services, has published policies on "instruction in the responsible conduct of research."² These policies deal with the ethical conduct of research and with three ethical issues in scientific publishing: peer review, responsible authorship, and conflict of interest. Each of these issues is defined in a brief paragraph, but no detailed information is given, and the only specific recommendation made is that researchers should be educated on these issues. In Australia, the National Health and Medical Research Council (NHMRC) has created guidelines on research practice which are intended to "guide institutions in developing ... procedures and guidelines by providing a comprehensive framework of minimum acceptable standards."³ The NHMRC requires scientific institutions to have "clearly formulated policies" on publications, authorship, and conflict of interest. It then describes the minimum requirements for guidelines on these issues. Less than a page is written about each issue. Other western industrialized nations have adopted similar policy statements.^{4,5} These policy statements are generally advisory, not prescriptive. Even when the policies "require" that institutions follow their recommendations, the only penalty for not doing so appears to be the dim possibility that the government unit issuing the policy will refuse to fund research conducted by that institution. Although there are a few government agencies in western industrialized nations which offer more comprehensive guidelines, there do not appear to be any western

nations which provide strict regulations for scientific publishing ethics. More detailed guidelines on ethics in scientific publication are found in statements and manuals produced by private organizations. A number of these organizations are discussed in Chapter IV.

This method of monitoring ethical practices in scientific publication may seem fairly loose, but it is closely tied to the democratic tradition under which most of these countries operate. In a democracy, "supreme power is vested in the people and exercised by them."⁶ Therefore, it is logical that private organizations and not the government bear the responsibility for providing comprehensive guidelines on scientific publication ethics.

Other Nations

Many countries outside the West have other methods of monitoring ethical practices in scientific publication. Some of these nations appear to offer almost no guidance whatsoever outside of contract and copyright law. Frequently, private organizations in these nations appear to have limited roles in the creation of policy. These countries are usually either nondemocracies, developing nations, or both. Nondemocracies include communist and authoritarian nations. Developing nations include several recent democracies and are those countries which still depend largely on agriculture for economic survival.

Unlike western industrialized nations, nondemocracies appear to hardly monitor publication ethics at all. Relevant government regulations in countries like China focus almost entirely on patents, trademarks, copyrights, and contracts,⁷ with little or no acknowledgement of ethics aside from international informed consent laws.⁸ Because the Chinese government does not appear to have any policies on ethical issues in scientific publication, individuals, journals, and associations have stepped in to fill this void. In China, the main issues of concern are peer review and authorship. Since 1990, a peer review system for research has been slowly replacing China's previous "planned economy" system (in which researchers are given projects by the government).⁹ Authorship is also becoming an issue of growing concern since the idea of intellectual property rights has taken hold in China largely since 1995.¹⁰

This system of government unconcern toward ethical issues in scientific publication seems at first surprising from a communist government. After all, a communist government is one in which "all economic and social activity is controlled by a totalitarian state."⁶ However, it is unnecessary to regulate publication ethics in a state in which the government maintains

complete control over research. With such intense government scrutiny in such an environment, regulations seem superfluous.

Developing nations, whether they are democracies or not, appear to offer limited guidance on ethical practices in scientific publication. Although India, for example, has a centuries old tradition of ethical practices in medical research, it seems that this tradition is not upheld in India today.¹¹ It also appears that Indian journals are doing little to assist authors in understanding ethical issues in scientific publication. Indian journals print few notices informing authors and others of these issues; publication bias seems to be one issue that is discussed rarely if at all.¹²⁻¹⁴

Like China, India appears to largely ignore ethical issues in scientific publication. It appears that developing nations often do not monitor ethical issues simply because they are lacking in personnel and infrastructure to do so. Many of these countries are quickly moving toward industrialization and have not had time to adjust to such rapid growth. Regulations will likely develop over time as these nations become more industrialized.

International Differences

The variety of methods used to monitor ethical practices is only one difference in how countries view issues in the ethics of scientific publication. Another difference emerges in peer review. In western cultures, there was some type of peer review system in use even before the first scientific journal was published.¹⁵ Peer review in the West has been described as a "crucial democratization of the editorial process ... lessening the impression that editorial decisions are arbitrary."¹⁶ However, in some nonwestern countries, peer review has only recently been adopted. In these countries where peer review processes are relatively new, the peer review system is not viewed in the same way as it is in the West. China, for example, only began to implement a peer review system on a large scale in 1990, and the process is still developing.⁹ Peer review did exist in China as early as 1887, when the first English language Chinese medical journal was published. For about 100 years, though, this system existed primarily in English language journals. Probably because peer review in China is somewhat new compared with peer review in the West, Chinese peer review appears much simpler than western versions. In China, peer review mainly consists of closed review systems (those where reviewer identities are hidden but author identities are not).¹⁷ Unlike in the West, debate over the most ethical type of peer review does not appear common in China.

Authorship is another issue which seems far less developed in countries like China and Russia than in the West. Although authorship is a complex issue with several subcategories in the West, it is far simpler in China, where statements on authorship issues mainly consist of copyright regulations. The idea of intellectual property rights has apparently been developing in China mainly since 1995 and has not yet become as complex as authorship in the West.¹⁰ Copyright laws discuss authorship qualification and coauthorship, but do not acknowledge other authorship issues.¹⁸ In Russia, while scientists who work on international teams and/or publish papers in English language journals seem to view authorship the way it is viewed in western nations, authorship appears to be used outside of strictly international circles simply to refer to the designated author of a manuscript.¹⁹ Although intellectual property rights are “a cornerstone of the Russian program,” authorship issues do not appear to be of concern.²⁰

Other issues that are of concern in the West appear to be ignored in some nonwestern nations. Duplicate/redundant publication is one such issue. Although duplicate/redundant publication seems to be rampant in India, journals and the government both appear unwilling to address this problem.^{1,12,14} In Turkey, some English language journals require authors to submit statements that no duplicate publication has occurred,²⁰ but non-English journals appear to have no such requirements, and government regulations seem to ignore the issue of duplicate/redundant publication altogether.²¹ Table 1 lists some of the differences in views on peer review, authorship, and duplicate/redundant publication among various countries.

The Impossibility of Standardization

In the West alone, there is much variation in ethical standards in scientific publication among scientific fields and among nations. Constructing a standard code of ethical practice for these nations alone would be difficult, if not impossible, simply because there do not appear to be commonly accepted views and practices in relation to any ethical issues. A common code might be helpful to a few scientists, but to scientists in developing countries, such a code would be confusing and might contain much information that would rarely be relevant. Scientists in developing countries are unlikely to need guidelines on issues not yet pertinent in their country, such as ghost authorship, open peer review systems, or the need to disclose past consultancy. Without international consensus, an international code would need to remain vague enough that it could include the accepted methods of handling scientific publication issues in all countries. Scientists in western industrialized nations would likely find an internationally standardized code

Table 1
Examples of International Differences

Nations	Issues		
	Peer review	Authorship	Duplicate/redundant publication
Western industrialized nations	Crucial democratization of science; debate over most ethical and practical form.	Complex group of issues including authorship credit, order of authors, group authorship, and honorary/ghost authorship.	A problem because it wastes valuable journal space; most journals prohibit this except in cases where the two audiences do not overlap.
China	Uses primarily closed review; has only implemented peer review on a large scale in the last 15 years.	Copyright law covers authorship credit and group authorship, but authorship is otherwise not a major issue.	Unknown; not covered in government regulations, but English language journals appear to have acknowledged the issue.
India	Appears to be similar to western nations.	Appears to be similar to western nations.	Although apparently common, not identified as an issue by government or journals in India.
Turkey	Appears similar to western nations.	Addressed mainly in English language journals; government guidelines vague.	Apparently addressed only in English language journals.
Russia	Unknown; appears to be no documentation of peer review outside of English language journals or research conducted by international teams.	Appears to refer only to authorship credit outside of English language journals or research conducted by international teams, which appear to share western values.	Appears similar to western nations.

too vague to be of use, as it could not be as inclusive as guidelines previously developed in their own country. A standard ethical code seems infeasible because of the previously noted factors such as the apparent lack of consensus on issues and the nature of ethics. Although complex, the current system in which ethical practices in scientific publishing are monitored by journals, scientific organizations, and the government may be the best system.

CHAPTER VI

PERSPECTIVES FROM THE INTERVIEWS

To gain insight into the views researchers from various countries and fields have about ethics in scientific publishing, a questionnaire (Appendix C) was sent to 26 researchers with experience as editors, authors, and peer reviewers. Background information on each subject was obtained, including current professional position, experience in scientific publication, and the number of years the individual had been working in his or her field.

The researchers were then asked questions in two subject areas: their views on the multiple sets of standards and guidelines in scientific publication ethics and on the ethical climate in scientific publishing. The questions on the first subject area asked how familiar respondents were with applicable guidelines; how many sets they believed that they were expected to follow; how to handle a conflict between two sets of guidelines; how useful a single, standard ethical code would be; whether there were any legal guidelines that applied to scientific publication in their country; what penalties for noncompliance with these guidelines were; and how rigorously these guidelines were enforced. Questions about the ethical climate in scientific publishing asked whether the current climate was positive or negative, whether that climate had changed over time, and if so, how. Most of the questions were open ended.

Thirteen responses were received. Three respondents were from Great Britain, three were from the continental United States, two were from Canada, and there was one respondent each from Austria, Germany, Japan, New Zealand, and Puerto Rico. Respondents' scientific fields were biology, biomedical science, computer science, geology, nuclear policy, psychology, sociology, science ethics, and zoology. Years of experience ranged from 12 to more than 40.

Dealing with Multiple Standards and Guidelines

Respondents were asked a series of questions to help determine how effective the almost innumerable sets of standards and guidelines in scientific publication ethics are at promoting ethical practices. First, they were asked about their familiarity with applicable ethical guidelines for publications in their fields. Choices were "unaware," "somewhat familiar," "very familiar," and "I wrote them." Ten respondents chose "somewhat familiar," two chose "very familiar,"

and one respondent chose both "very familiar" and "I wrote them." The respondents who were most familiar with ethical guidelines were from biomedical backgrounds. Asked how many sets of guidelines they believed they were expected to follow, answers ranged from four or five to "many." The question of how to handle a conflict between different sets of guidelines produced more varied responses. Eleven respondents said that this question was not relevant. Some stated that it seemed unlikely that guidelines in similar fields would differ significantly, others said that the only difference between guidelines in similar fields was in the stringency of guidelines, and five said that they had never experienced any conflict. In cases where guidelines differed only in stringency, or one set of guidelines did not include something that another included, respondents said that the stricter guidelines should be followed. One respondent said that if a conflict arose, scientists should act in the manner that would be of greatest social benefit because this was of greater importance than any guidelines. The final respondent made the ambiguous statement that the most applicable of the guidelines should be followed.

The next question asked whether a single, standard ethical code for scientific publication would be more or less useful than the many codes currently available. Ten respondents said that it would make no difference to them, one said that it would be less useful because it would be too open ended, one said that creating a single, standard ethical code would be impossible, and one respondent stated that it would be less useful "because it could not address some of the very specific areas of importance in some areas without being too detailed for practical use."

When asked about legal guidelines in their countries, eight respondents (from Austria, Canada, Great Britain, New Zealand, Puerto Rico, and the United States) said they were not aware of any. The other five respondents (from Germany, Great Britain, Japan, and the United States) referred to copyright laws, intellectual property laws, and libel. No one mentioned laws, regulations, or even government recommendations that deal with the ethical issues examined in the previous chapters. In addition, no one appeared to have any clear idea about penalties or enforcement; answers to the question about this subject were "variable," "unknown," and "it depends."

It appears that respondents in biomedical fields were most familiar with guidelines on publication ethics. While several respondents were aware that many sets of guidelines exist, overall the responses suggest that the guidelines were not important to most respondents. One respondent stated that there are many types of guidelines, some that are advisory and others that

are disciplinary; he said that the disciplinary codes were the important ones. This suggests that some researchers believe following ethical guidelines is necessary only to avoid punishment.

In general, it seems that the respondents did not think that ethical issues in scientific publication were a major concern. Although many of the responses were lengthy, no one mentioned any concrete examples of ethical misconduct. Several respondents gave vague answers to questions, suggesting that scientific publishing ethics was not a subject of concern. Five respondents stated that they had never experienced any problems with ethical infractions, and one said that the few problems he had seen had been minor and quickly resolved. This implies either that the group surveyed has encountered a lower rate of ethical problems than the 8 to 20% reported in the literature (see Chapter 4), that problems with ethical misconduct in publishing are less widespread than the literature suggests, or that respondents encountered ethical problems but did not perceive them as such.

It is somewhat surprising that no one seemed aware of any government agency guidelines on ethical practices in scientific publication. Because respondents showed little knowledge of enforcement, it seems that enforcement must not be common.

The Ethical Climate in Scientific Publishing

When asked about the current climate in scientific publishing and whether this climate had changed during their careers, eight respondents said that the current climate was mostly positive but that there are a few problems, mainly related to authorship. Another respondent also said that the current ethical climate was both positive and negative. She also said that in the current ethical climate some researchers tend to think the worst of their fellows, labeling minor mistakes as misconduct. Four respondents did not identify the current ethical climate in scientific publishing as positive or negative. Instead, two respondents listed a few ethical problems such as authorship and two others asked questions of their own, such as: "What makes an environment positive or negative?" "Does this mean publication is encouraged?"

Respondents posed several explanations for the changes they had perceived in the ethical climate. Six respondents said that the ethical climate in scientific publishing has improved over time because of increased awareness of ethical issues. Six other respondents mentioned similar explanations for changes they perceived and also mentioned apparent increases in the rate of occurrence of misconduct; however, these respondents gave no indication of whether the ethical climate had improved or deteriorated over time. The remaining respondent stated that ethical

debates concerning scientific publication have been increasingly influenced by nonscientific factors, such as legal proceedings and the agendas of religious groups.

Although some researchers find the current ethical climate in scientific publishing to be mostly positive, it seems that others perceive problems. One respondent suggested that the increasing focus on ethics has created this perception by making researchers suspicious of each other. She also stated that the existence of more regulations prevents free discussion of issues. This may be true, although it seems somewhat unlikely considering that debate over ethical issues has increased in the literature over the past decades (see Chapter 4).

Closing Comments

Overall, this survey appears to show that most researchers do not find the many available ethical guidelines for scientific publishing to be particularly useful. Although issues of peer review, authorship, conflict of interest, publication bias, and duplicate/redundant publication have become prominent in the literature in the last 15 years, it seems that researchers are still largely unaware of the issues or their significance. It appears that greater education for researchers outside of the field of publication ethics may be needed in addition to more empirical studies to decrease the occurrence of ethical infractions in scientific publications.

CHAPTER VII

SUMMARY AND CONCLUSIONS

Scientific publication is vital to the dissemination of knowledge and the growth of science, and is also an area full of ethical issues. Although many studies of these issues have been conducted, this is one of the first studies to consider ethical issues in scientific publication in historical and international perspectives. Understanding the historical development and international differences in the main ethical issues in publishing is an essential step in providing insight into future ethical developments in scientific publication.

In this study, I performed a comprehensive review of Internet sites and books and articles published after 1970. I also sent surveys to 26 researchers with experience as editors, authors, and peer reviewers to help fill gaps in the literature.

In the last 25 years, scientific publication ethics has become its own field of research, with hundreds of articles published annually. Although there are many topics in publication ethics, five appear the most often: peer review, authorship, conflict of interest, publication bias, and duplicate/redundant publication.

Ethical issues are those issues that involve choosing between two or more competing values. It is not surprising, then, that each of the five main groups of ethical issues is the subject of much debate. Peer review debate focuses on which type of peer review is both most ethical and most practical. Debates over authorship issues cover authorship credit, order of authors, and group authorship. The conflict of interest debate is essentially about when conflicts should be disclosed. The existence and extent of publication bias are frequently debated, as is the rate of occurrence of duplicate/redundant publication.

By tracing the development of issues in scientific publication ethics, an understanding of ethical progress thus far can be gained, and the path to future progress may be illuminated. Although several of the issues in publication ethics have existed since before the first scientific journal was published, these issues were rarely acknowledged in the literature until the latter part of the 20th century. Not until after World War II, when scientists began to focus more on all aspects of ethical conduct, were long-time issues like peer review and authorship brought to the attention of the scientific community and the public at large.

At this time, ethical issues in scientific publication were addressed in a handful of opinion articles, mainly appearing in biomedical journals, presenting the authors' views on peer review, authorship, conflict of interest, publication bias, and duplicate/redundant publication. In the 1970s and early 1980s, researchers called for empirical studies to be conducted on these and other issues in publication ethics. In the last 20 years, much research has been conducted on these issues, and the scientific literature has expanded.

As yet, there are no commonly accepted right or wrong ways of dealing with these issues. Among different fields and nations, these five groups of issues are handled in a variety of ways. Ethical codes and guidelines are available to help guide scientists in the direction of accepted conduct in their fields. Government agencies in some countries provide similar guidelines, although some are prescriptive rather than advisory. In general, the more limited political freedom is in a nation, the more prescriptive guidelines tend to be. Many of these guidelines are posted on the Internet and readily available to scientists.

Based on responses to the questionnaire (Appendix C), scientists appear to be largely unaware of ethical issues in scientific publication. Few seemed aware that problems exist; in fact, two respondents said that they found the climate in scientific publication overly suspicious. However, the questionnaire was only sent to 26 researchers, and only 13 responses were received. Certainly this is not an adequate sample from which to draw accurate generalizations. Another survey, distributed on a much larger scale with questions that are more clearly explained, might show more exactly how effective articles and guidelines have been in increasing awareness of ethical issues. It might also give a better understanding of how widespread ethical problems in scientific publishing are.

With easily accessible guidelines available and more and more articles on issues in publication ethics published each year, it seems reasonable that the rate of occurrence of ethical infractions should be decreasing. However, this does not appear to be the case. Despite increasing chances for scientists to become aware of ethical issues, recent studies that gave rates of occurrence of infractions in areas where such rates had been previously calculated show that ethical infractions occur at about the same rate as 25 years ago. The extremely limited survey data also appears to support this. (See Chapter VI.)

Scientists appear to be mostly unaware of ethical issues in publication. Continued lack of awareness may be because as the volume of articles published on publication ethics has

increased, so has the volume of articles in nearly every other scientific field. It may be too time consuming for researchers to read many articles outside of their own fields.

As more ethical codes and guidelines have been created, finding the appropriate action in each situation may be more difficult. Many scientists appear to believe that there is little difference between sets of guidelines in similar fields; they may be using codes that do not include guidelines on all pertinent issues or that are out of date. Also, it seems likely that scientists turn to standards and guidelines only when they perceive a problem; however, problems may exist unnoticed.

It is also possible that occurrences of misconduct are not staying the same, but rather that misconduct is more likely to be noticed because of the increase in awareness of ethical issues. It seems that because greater discussion of ethical issues in scientific publishing has led to greater awareness, it has also led to increased scrutiny and possibly to a more suspicious environment. If discussion of ethical issues in the literature continues to increase, perhaps misconduct will occur less and less as it grows more difficult not to be caught by well-informed peers.

More research reports and other articles may not be enough to increase awareness of ethical problems in publication in the scientific community. Increased education, including more continuing education programs similar to some already in place, may also be needed. Publishing handbooks and making guidelines available does not appear to be enough, since many scientists seem largely indifferent to such publications.

Ensuring that scientists are aware of ethical standards seems to be a task that journal editors and scientific professional societies have taken upon themselves. These groups have published many codes of ethical conduct. They have sponsored conferences and published articles discussing the current situation in publication ethics. But education stemming from these individuals and organizations does not appear to be adequate.

Like proper research techniques, publication ethics may be best taught through mentoring, where young scientists have the opportunity to work one-on-one with more experienced researchers. The mentoring system already in place may need to be strengthened and reinforced. When mentors are alert to poor publication practices exhibited by students, the proper ethical solution can be explained and the student can develop awareness of ethical issues in scientific publishing. Some researchers already focus on publication with their students, but others spend less time on this subject. Students can learn by example when scientific publication is made a more formal part of the mentoring process. Working closely with an experienced

researcher, young scientists can learn to understand the importance of proper ethical practices in scientific publication.

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Appendix B

Recommended Readings

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Appendix C

Interview Questionnaire

Instructions: Please answer the following questions. You do not have to answer all of the questions if you are uncomfortable doing so. Thank you for your time.

1. Background information:

- a. What is your name and current professional position?
- b. What experience have you had in scientific publishing (as an author, editor, referee, etc.)?
- c. How long have you been working in your current field?

2. Many professional organizations in the scientific community have their own sets of guidelines for good publication practices. Journals also provide such guidelines. In addition, several other organizations such as the Committee on Publication Ethics provide still more guidelines.

- a. How familiar are you with applicable guidelines in your field?

- unaware
- somewhat familiar
- very familiar
- I wrote them

b. How many sets of ethical guidelines do you believe you are expected to follow? For example, someone who is a member of two professional organizations and regularly submits his/her research to one of two journals might follow two sets of professional guidelines and two sets of journal guidelines.

c. If you experienced a conflict between the guidelines set forth by your professional society and those recommended by a journal in which you wished to publish research (for example, regarding authorship or disclosure of a conflict of interest), how would you try to resolve the conflict? If you are a journal editor, how would you respond to a query from a potential author about such a conflict?

3. Would a single, standard ethical code for scientific publication be more or less useful than the numerous sets of guidelines currently available?

- It would be more useful, and I think one should be developed.
- It would be more useful, but I don't think it would be possible to develop one.
- It would not make any difference for me.
- It would be less useful because it would have to be so open ended.
- A single, standard ethical code is an impossibility.
- Other.

Please explain your answer choice.

4. Do you know of any legal guidelines that researchers in your country are required to observe in relation to the publication of research (or, if relevant, the publication of a scientific journal)?

Please do not include laws regarding conduct of research.

If yes:

- a. What are the penalties for noncompliance?
- b. To your knowledge, how rigorously are these laws enforced?

5. Do you think the current ethical climate with regard to scientific publishing is positive or negative? Why?

6. Do you feel the ethical climate regarding the publication of scientific research has changed over the course of your career? If so, how?

Appendix D

Selected Guidelines for Scientific Publication Ethics

Excerpts from: Committee on Publication Ethics (COPE)

Guidelines on Good Publication Practice 2002

Available online at: <http://www.publicationethics.org.uk/cope2002/pdf2002/>.

These guidelines are intended to be advisory rather than prescriptive, and to evolve over time. We hope that they will be disseminated widely, endorsed by editors, and refined by those who use them.

3. Authorship

Definition

There is no universally agreed definition of authorship, although attempts have been made (see Appendix). As a minimum, authors should take responsibility for a particular section of the study.

Action

- (1) The award of authorship should balance intellectual contributions to the conception, design, analysis and writing of the study against the collection of data and other routine work. If there is no task that can reasonably be attributed to a particular individual, then that individual should not be credited with authorship.
- (2) To avoid disputes over attribution of academic credit, it is helpful to decide early on in the planning of a research project who will be credited as authors, as contributors, and who will be acknowledged.
- (3) If professional writers employed by pharmaceutical companies, medical agencies, or other parties have written the paper, then their names should be included, and any conflicts of interest declared.
- (4) All authors must take public responsibility for the content of their paper. The multidisciplinary nature of much research can make this difficult, but this can be resolved by the disclosure of individual contributions.

(5) Careful reading of the target journal's "Advice to Authors" is advised, in the light of current uncertainties.

(6) Authors should be vigilant about allowing their name to be used on a piece of work to add credibility to the content.

4. Conflicts of interest

Definition

Conflicts of interest arise when authors, reviewers, or editors have interests that are not fully apparent and that may influence their judgments on what is published. They have been described as those which, when revealed later, would make a reasonable reader feel misled or deceived. They may be personal, commercial, political, academic, or financial. "Financial" interests may include employment, research funding, stock or share ownership, payment for lectures or travel, consultancies and company support for staff.

Action

- (1) Such interests, where relevant, must be declared to editors by researchers, authors, and reviewers.
- (2) Editors should also disclose relevant conflicts of interest to their readers. If in doubt, disclose.
- (3) Editors should also consider disclosing to readers their own conflicts of interest and those of their teams, editorial boards, managers, and owners.
- (4) Sometimes conflicts of interest may be so extreme that publication will not be possible or people (for example, reviewers or editors) may have to be excluded from decisions on publication.

5. Peer review

Definition

Peer reviewers are external experts chosen by editors to provide written opinions, with the aim of improving the study. Working methods vary from journal to journal, but some use open procedures in which the name of the reviewer is disclosed, together with the full or "edited" report.

Action

- (1) Suggestions from authors as to who might act as reviewers are often useful, but there should be no obligation on editors to use those suggested.

- (2) The duty of confidentiality in the assessment of a manuscript must be maintained by expert reviewers, and this extends to reviewers' colleagues who may be asked (with the editor's permission) to give opinions on specific sections.
- (3) The submitted manuscript should not be retained or copied.
- (4) Reviewers and editors should not make any use of the data, arguments, or interpretations, unless they have the authors' permission.
- (5) Reviewers should provide speedy, accurate, courteous, unbiased and justifiable reports.
- (6) If reviewers suspect misconduct, they should write in confidence to the editor.
- (7) Journals should publish accurate descriptions of their peer review, selection, and appeals processes.
- (8) Journals should also provide regular audits of their acceptance rates and publication times.

6. Redundant publication

Definition

Redundant publication occurs when two or more papers, without full cross reference, share the same hypothesis, data, discussion points, or conclusions.

Action

- (1) Published studies do not need to be repeated unless further confirmation is required.
- (2) Previous publication of an abstract during the proceedings of meetings does not preclude subsequent submission for publication, but full disclosure should be made at the time of submission.
- (3) Re-publication of a paper in another language is acceptable, provided that there is full and prominent disclosure of its original source at the time of submission.
- (4) At the time of submission, authors should disclose details of related papers, even if in a different language, and similar papers in press.
- (5) All original studies should be peer reviewed before publication, taking into full account possible bias due to related or conflicting interests.
- (6) Editors must treat all submitted papers as confidential.
- (7) When a published paper is subsequently found to contain major flaws, editors must accept responsibility for correcting the record prominently and promptly.
- (8) Where misconduct is suspected, the editor must write to the authors first before contacting the head of the institution concerned.

(9) Editors should ensure that the Instructions to Authors specify the need for authors to obtain informed consent from patients included in their research.

Excerpts from: American Chemical Society

Ethical Guidelines to Publication of Chemical Research, January 2000.

Available online at: <http://pubs.acs.org/instruct/ethic2000.pdf>.

Preface

The American Chemical Society serves the chemistry profession and society at large in many ways, among them by publishing journals which present the results of scientific and engineering research. Every editor of a Society journal has the responsibility to establish and maintain guidelines for selecting and accepting papers submitted to that journal. In the main, these guidelines derive from the Society's definition of the scope of the journal and from the editor's perception of standards of quality for scientific work and its presentation. An essential feature of a profession is the acceptance by its members of a code that outlines desirable behavior and specifies obligations of members to each other and to the public. Such a code derives from a desire to maximize perceived benefits to society and to the profession as a whole and to limit actions that might serve the narrow selfinterests of individuals. The advancement of science requires the sharing of knowledge between individuals, even though doing so may sometimes entail foregoing some immediate personal advantage. With these thoughts in mind, the editors of journals published by the American Chemical Society now present a set of ethical guidelines for persons engaged in the publication of chemical research, specifically, for editors, authors, and manuscript reviewers. These guidelines are offered not in the sense that there is any immediate crisis in ethical behavior, but rather from a conviction that the observance of high ethical standards is so vital to the whole scientific enterprise that a definition of those standards should be brought to the attention of all concerned.

We believe that most of the guidelines now offered are already understood and subscribed to by the majority of experienced research chemists. They may, however, be of substantial help to those who are relatively new to research. Even well-established scientists may appreciate an opportunity to review matters so significant to the practice of science.

Guidelines

A. Ethical Obligations of Editors of Scientific Journals

1. An editor should give unbiased consideration to all manuscripts offered for publication, judging each on its merits without regard to race, religion, nationality, sex, seniority, or institutional affiliation of the author(s). An editor may, however, take into account relationships of a manuscript immediately under consideration to others previously or concurrently offered by the same author(s).
2. An editor should consider manuscripts submitted for publication with all reasonable speed.
3. The sole responsibility for acceptance or rejection of a manuscript rests with the editor. Responsible and prudent exercise of this duty normally requires that the editor seek advice from reviewers, chosen for their expertise and good judgment, as to the quality and reliability of manuscripts submitted for publication. However, manuscripts may be rejected without review if considered inappropriate for the journal.
4. The editor and members of the editor's staff should not disclose any information about a manuscript under consideration to anyone other than those from whom professional advice is sought. (However, an editor who solicits, or otherwise arranges beforehand, the submission of manuscripts may need to disclose to a prospective author the fact that a relevant manuscript by another author has been received or is in preparation.) After a decision has been made about a manuscript, the editor and members of the editor's staff may disclose or publish manuscript titles and authors' names of papers that have been accepted for publication, but no more than that unless the author's permission has been obtained.
5. An editor should respect the intellectual independence of authors.
6. Editorial responsibility and authority for any manuscript authored by an editor and submitted to the editor's journal should be delegated to some other qualified person, such as another editor of that journal or a member of its Editorial Advisory Board. Editorial consideration of the manuscript in any way or form by the author-editor would constitute a conflict of interest, and is therefore improper.
7. Unpublished information, arguments, or interpretations disclosed in a submitted manuscript should not be used in an editor's own research except with the consent of the author. However, if such information indicates that some of the editor's own research is unlikely to be profitable, the editor could ethically discontinue the work. When a manuscript is so closely related to the current or past research of an editor as to create a conflict of interest, the editor should arrange

for some other qualified person to take editorial responsibility for that manuscript. In some cases, it may be appropriate to tell an author about the editor's research and plans in that area.

8. If an editor is presented with convincing evidence that the main substance or conclusions of a report published in an editor's journal are erroneous, the editor should facilitate publication of an appropriate report pointing out the error and, if possible, correcting it. The report may be written by the person who discovered the error or by an original author.

9. An author may request that the editor not use certain reviewers in consideration of a manuscript. However, the editor may decide to use one or more of these reviewers, if the editor feels their opinions are important in the fair consideration of a manuscript. This might be the case, for example, when a manuscript seriously disagrees with the previous work of a potential reviewer.

B. Ethical Obligations of Authors

1. An author's central obligation is to present an accurate account of the research performed as well as an objective discussion of its significance.
2. An author should recognize that journal space is a precious resource created at considerable cost. An author therefore has an obligation to use it wisely and economically.
3. A primary research report should contain sufficient detail and reference to public sources of information to permit the author's peers to repeat the work. When requested, the authors should make a reasonable effort to provide samples of unusual materials unavailable elsewhere, such as clones, microorganism strains, antibodies, etc., to other researchers, with appropriate material transfer agreements to restrict the field of use of the materials so as to protect the legitimate interests of the authors.
4. An author should cite those publications that have been influential in determining the nature of the reported work and that will guide the reader quickly to the earlier work that is essential for understanding the present investigation. Except in a review, citation of work that will not be referred to in the reported research should be minimized. An author is obligated to perform a literature search to find, and then cite, the original publications that describe closely related work. For critical materials used in the work, proper citation to sources should also be made when these were supplied by a nonauthor.
5. Any unusual hazards inherent in the chemicals, equipment, or procedures used in an investigation should be clearly identified in a manuscript reporting the work.

6. Fragmentation of research reports should be avoided. A scientist who has done extensive work on a system or group of related systems should organize publication so that each report gives a wellrounded account of a particular aspect of the general study. Fragmentation consumes journal space excessively and unduly complicates literature searches. The convenience of readers is served if reports on related studies are published in the same journal, or in a small number of journals.

7. In submitting a manuscript for publication, an author should inform the editor of related manuscripts that the author has under editorial consideration or in press. Copies of those manuscripts should be supplied to the editor, and the relationships of such manuscripts to the one submitted should be indicated.

8. It is improper for an author to submit manuscripts describing essentially the same research to more than one journal of primary publication, unless it is a resubmission of a manuscript rejected for or withdrawn from publication. It is generally permissible to submit a manuscript for a full paper expanding on a previously published brief preliminary account (a "communication" or "letter") of the same work. However, at the time of submission, the editor should be made aware of the earlier communication, and the preliminary communication should be cited in the manuscript.

9. An author should identify the source of all information quoted or offered, except that which is common knowledge. Information obtained privately, as in conversation, correspondence, or discussion with third parties, should not be used or reported in the author's work without explicit permission from the investigator with whom the information originated.

Information obtained in the course of confidential services, such as refereeing manuscripts or grant applications, should be treated similarly.

10. An experimental or theoretical study may sometimes justify criticism, even severe criticism, of the work of another scientist. When appropriate, such criticism may be offered in published papers. However, in no case is personal criticism considered to be appropriate.

11. The co-authors of a paper should be all those persons who have made significant scientific contributions to the work reported and who share responsibility and accountability for the results. Other contributions should be indicated in a footnote or an "Acknowledgments" section. An administrative relationship to the investigation does not of itself qualify a person for co-authorship (but occasionally it may be appropriate to acknowledge major administrative assistance). Deceased persons who meet the criterion for inclusion as co-authors should be so

included, with a footnote reporting date of death. No fictitious name should be listed as an author or coauthor.

The author who submits a manuscript for publication accepts the responsibility of having included as co-authors all persons appropriate and none inappropriate. The submitting author should have sent each living co-author a draft copy of the manuscript and have obtained the co-author's assent to co-authorship of it.

12. The authors should reveal to the editor any potential conflict of interest, e.g., a consulting or financial interest in a company, that might be affected by publication of the results contained in a manuscript. The authors should ensure that no contractual relations or proprietary considerations exist that would affect the publication of information in a submitted manuscript.

C. Ethical Obligations of Reviewers of Manuscripts

1. Inasmuch as the reviewing of manuscripts is an essential step in the publication process, and therefore in the operation of the scientific method, every scientist has an obligation to do a fair share of reviewing.

2. A chosen reviewer who feels inadequately qualified to judge the research reported in a manuscript should return it promptly to the editor.

3. A reviewer (or referee) of a manuscript should judge objectively the quality of the manuscript, of its experimental and theoretical work, of its interpretations and its exposition, with due regard to the maintenance of high scientific and literary standards. A reviewer should respect the intellectual independence of the authors.

4. A reviewer should be sensitive to the appearance of a conflict of interest when the manuscript under review is closely related to the reviewer's work in progress or published. If in doubt, the reviewer should return the manuscript promptly without review, advising the editor of the conflict of interest or bias. Alternatively, the reviewer may wish to furnish a signed review stating the reviewer's interest in the work, with the understanding that it may, at the editor's discretion, be transmitted to the author.

5. A reviewer should not evaluate a manuscript authored or co-authored by a person with whom the reviewer has a personal or professional connection if the relationship would bias judgment of the manuscript.

6. A reviewer should treat a manuscript sent for review as a confidential document. It should neither be shown to nor discussed with others except, in special cases, to persons from whom

specific advice may be sought; in that event, the identities of those consulted should be disclosed to the editor.

7. Reviewers should explain and support their judgments adequately so that editors and authors may understand the basis of their comments. Any statement that an observation, derivation, or argument had been previously reported should be accompanied by the relevant citation.

Unsupported assertions by reviewers (or by authors in rebuttal) are of little value and should be avoided.

8. A reviewer should be alert to failure of authors to cite relevant work by other scientists, bearing in mind that complaints that the reviewer's own research was insufficiently cited may seem self-serving. A reviewer should call to the editor's attention any substantial similarity between the manuscript under consideration and any published paper or any manuscript submitted concurrently to another journal.

9. A reviewer should act promptly, submitting a report in a timely manner. Should a reviewer receive a manuscript at a time when circumstances preclude prompt attention to it, the unreviewed manuscript should be returned immediately to the editor. Alternatively, the reviewer might notify the editor of probable delays and propose a revised review date.

10. Reviewers should not use or disclose unpublished information, arguments, or interpretations contained in a manuscript under consideration, except with the consent of the author. If this information indicates that some of the reviewer's work is unlikely to be profitable, the reviewer, however, could ethically discontinue the work. In some cases, it may be appropriate for the reviewer to write the author, with copy to the editor, about the reviewer's research and plans in that area.

11. The review of a submitted manuscript may sometimes justify criticism, even severe criticism, from a reviewer. When appropriate, such criticism may be offered in published papers. However, in no case is personal criticism of the author considered to be appropriate.

Excerpts from: International Committee of Medical Journal Editors**Uniform Requirements for Manuscripts Submitted to Biomedical Journals, January 1997.**

Available online at: www.icmje.org.

Redundant or Duplicate Publication

Redundant or duplicate publication is publication of a paper that overlaps substantially with one already published.

Readers of primary source periodicals deserve to be able to trust that what they are reading is original unless there is a clear statement that the article is being republished by the choice of the author and editor. The bases of this position are international copyright laws, ethical conduct, and cost-effective use of resources.

Most journals do not wish to receive papers on work that has already been reported in large part in a published article or is contained in another paper that has been submitted or accepted for publication elsewhere, in print or in electronic media. This policy does not preclude the journal considering a paper that has been rejected by another journal, or a complete report that follows publication of a preliminary report, such as an abstract or poster displayed for colleagues at a professional meeting. Nor does it prevent journals considering a paper that has been presented at a scientific meeting but not published in full or that is being considered for publication in a proceedings or similar format. Press reports of scheduled meetings will not usually be regarded as breaches of this rule, but such reports should not be amplified by additional data or copies of tables and illustrations.

When submitting a paper, the author should always make a full statement to the editor about all submissions and previous reports that might be regarded as redundant or duplicate publication of the same or very similar work. The author should alert the editor if the work includes subjects about which a previous report has been published. Any such work should be referred to and referenced in the new paper. Copies of such material should be included with the submitted paper to help the editor decide how to handle the matter.

If redundant or duplicate publication is attempted or occurs without such notification, authors should expect editorial action to be taken. At the least, prompt rejection of the submitted manuscript should be expected. If the editor was not aware of the violations and the article has already been published, then a notice of redundant or duplicate publication will probably be published with or without the author's explanation or approval.

Preliminary reporting to public media, governmental agencies, or manufacturers, of scientific information described in a paper or a letter to the editor that has been accepted but not yet published violates the policies of many journals. Such reporting may be warranted when the paper or letter describes major therapeutic advances or public health hazards such as serious adverse effects of drugs, vaccines, other biological products, or medicinal devices, or reportable diseases. This reporting should not jeopardize publication, but should be discussed with and agreed upon by the editor in advance.

Authorship

All persons designated as authors should qualify for authorship, and all those who qualify should be listed. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content. One or more authors should take responsibility for the integrity of the work as a whole, from inception to published article.

Authorship credit should be based only on 1) substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; and 3) final approval of the version to be published. Conditions 1, 2, and 3 must all be met. Acquisition of funding, the collection of data, or general supervision of the research group, by themselves, do not justify authorship.

Authors should provide a description of what each contributed, and editors should publish that information. All others who contributed to the work who are not authors should be named in the Acknowledgments, and what they did should be described.

Increasingly, authorship of multicenter trials is attributed to a group. All members of the group who are named as authors should fully meet the above criteria for authorship. Group members who do not meet these criteria should be listed, with their permission, in the Acknowledgments or in an appendix.

The order of authorship on the byline should be a joint decision of the coauthors. Authors should be prepared to explain the order in which authors are listed.

Conflict of Interest

Conflict of interest for a given manuscript exists when a participant in the peer review and publication process-author, reviewer, and editor-has ties to activities that could inappropriately influence his or her judgment, whether or not judgment is in fact affected.

Financial relationships with industry (for example, through employment, consultancies, stock ownership, honoraria, expert testimony), either directly or through immediate family, are usually considered to be the most important conflicts of interest. However, conflicts can occur for other reasons, such as personal relationships, academic competition, and intellectual passion.

Public trust in the peer review process and the credibility of published articles depend in part on how well conflict of interest is handled during writing, peer review, and editorial decision making. Bias can often be identified and eliminated by careful attention to the scientific methods and conclusions of the work. Financial relationships and their effects are less easily detected than other conflicts of interest. Participants in peer review and publication should disclose their conflicting interests, and the information should be made available so that others can judge their effects for themselves. Because readers may be less able to detect bias in review articles and editorials than in reports of original research, some journals do not accept reviews and editorials from authors with a conflict of interest.

Excerpts from: Council of Science Editors

Editorial Policy Statements Approved by the CSE Board of Directors.

Available online at: http://www.councilscienceeditors.org/services_EditorialPolicies.shtml.

Conflicts of Interest and the Peer Review Process

Objective

To offer guidelines useful to biomedical journals as they develop policies and procedures relating to conflict of interest in peer review.

Definition

A widely used American dictionary (Webster's 9th New Collegiate Dictionary) defines conflict of interest as a "conflict between the private interests and the official responsibilities of a person in a position of trust." In scientific publishing, the author of a manuscript, the reviewer, and the editor are all persons "in a position of trust."

Conflicts of interest in the publishing can be defined as sets of conditions in which an author, editor, or reviewer holds conflicting or competing interests that could result in bias or

improper decisions. The conflicts of interest may only be potential conflicts of interest or only perceived, and not necessarily even potential, conflicts.

The determination of whether a conflict of interest actually exists can be extraordinarily difficult and often contentious. Recognizing the potential for conflicts of interest is usually easier; they are common and it is not their existence, but rather their potential to cause bias and failure to acknowledge or recognize conflicts, that causes concern. Such failure, which reflects an insensitivity to the potential for conflict of interest, is troubling, whether it is observed in an author, a reviewer, or an editor.

Ideally, authors are completely objective in presenting their findings, and editors and reviewers are entirely objective in evaluating them. These processes are all prey to biases. Personal, political, financial, academic, or religious considerations can affect objectivity in innumerable ways. The challenge for authors, editors, and reviewers is to recognize the potential for biases arising from conflicts of interest and to respond appropriately.

Financial Conflicts

The most evident type of potential conflict of financial interest is the situation in which a commercial product is under study and the author, reviewer, or editor stands to benefit financially if the assessment of the product goes one way or another. For example, an author reporting investigation of a specific product, at the same time he or she holds equity positions or stock options in the company that makes the products, clearly has the potential to realize direct financial gain if the assessment is favorable. A researcher in the employ of a for-profit enterprise has a slightly less direct relationship to product-related research, but still can reasonably expect to benefit financially if a product does well. In these examples, an individual's "private interests" (i.e., his or her financial interests) are potentially in conflict with his or her "official responsibilities" (i.e., the responsibility of a scientist to seek the truth).

The situation in which an investigator studies a product of a for-profit enterprise from which the investigator has received monies previously (e.g., as a consultant or in the form of an honorarium or speaking fee) is slightly different. There is now no direct relationship between the evaluation and any personal gain the investigator may anticipate. Nevertheless, the existence of payments even in the past could conceivably influence research and must therefore be regarded as having the potential to present conflicting interest.

The examples given above involve authors reporting the results of their research, non-research articles, reviews, and opinion pieces, but they could just as well involve reviewers evaluating a manuscript or editors deciding whether or not to accept a manuscript. There are some subtle differences among authors, reviewers, and editors with respect to conflict of financial interest, but the basic principles apply to all.

Some journals refuse to consider manuscripts describing research involving a commercial product when the research was supported financially by a commercial organization involved in the manufacture or sale of the product. A few journals will not permit editorials or review articles to be authored by individuals with potential conflicts of financial interest, feeling that these pieces rely especially heavily on interpretation and judgment, and thereby make conflict of interest and the potential for bias especially problematic.

Non-Financial Conflicts

Many considerations - intellectual, political, academic, and religious, to mention just a few - can represent "private interests." The challenge for authors, reviewers, and editors is to recognize the potential for these types of conflicts as well as those involving finances, and respond appropriately. Complete objectivity is not often possible, but fairness and even-handedness can reasonably be expected. For example, a reviewer strongly opposed to abortion, on religious or other moral grounds, might have difficulty evaluating a manuscript describing the use of fetal tissue in research in an objective matter. Or an editor who is also chair of a department might have difficulty in reaching objective decisions about manuscripts submitted by his or her faculty because the editor has a "private interest" as a chair in helping the academic advancement of his faculty.

Disclosure

The key to recognizing and dealing with conflicts of interest - financial or non-financial - is disclosure: disclosure to the editor when a manuscript is submitted, and disclosure to the reader when a paper is published. The former provides a means for the manuscript to be evaluated by the editor with full knowledge of all its circumstances, and the latter assures that the reader will have sufficient information to interpret the work appropriately.

Disclosure of potential financial conflicts of interest is meant to maintain the integrity of professional judgment and to maintain the public's confidence in professional judgment. A

disclosure does not infer that scientists are unduly influenced by financial gain. Rather, disclosure in such cases gives readers the information to allow them to make an informed decision because it is often difficult to determine when research has been inappropriately influenced by financial gain. Informing readers is the responsibility of the journal. Some, however, would argue that mandatory financial disclosure actually does not allow a manuscript to be judged solely on its merits. They believe that such disclosure is based on the faulty assumption that only financial considerations influence authors and that all authors are influenced. They further believe that such disclosure unfairly prejudices the reader against the author. See Rothman J.J. Conflict of Interest: the New McCarthyism in Science. *JAMA* 1993; 269:2782-2784.

Authors

Many journals require that financial support of the work reported be identified with the submitted manuscript. Some examples, taken from the "Information for Authors" section of different journals follow: The checklist for submission to *Science* includes an item requiring inclusion of "any information about the authors' professional or financial affiliations that may be perceived to have biased the presentation." *The Journal of the American Medical Association (JAMA)* requires all authors to sign a statement disclosing "any affiliations with or financial involvement in any organization or entity with a direct financial interest in the subject matter or material discussed in the manuscript (e.g., employment, consultancies, stock ownership, honoraria, expert testimony, current or pending patents.)" *Obstetrics and Gynecology* uses similar wording and a time limit of three years is specified. Most journal policies ask authors to disclose their relevant financial interests when they submit their manuscripts. It is then the editor's responsibility to interpret this information and, if the paper is ultimately accepted, decide how (if at all) it is to be relayed to the reader.

How should authors' disclosure of financial interests be handled during the peer review process? Journals seem to have differing policies on this point. Some make the information about financial disclosure available to reviewers and ask them to evaluate this, along with the scientific merit of the paper. The reviewers' opinion about the authors' financial interest may then weigh heavily in the editor's decision and may result in a form of publication bias. Other journals keep as recommended by *ICMJE* (International Committee of Medical Journal Editors) such information confidential during the review process, and have it considered by the editor (perhaps

with outside evaluation on this point as well) only after scientific merit is assessed. This latter approach has the advantage of dividing the question into clearly identifiable portions.

Readers have the right to know any potential conflicts of interest. The considerations that interest journals the most are financial, which are usually the easiest to disclose. However, financial conflicts may not be easily detected without disclosure. Financial conflicts include salary, consulting fees and honoraria, stock or equity interests, and intellectual property rights (patents, royalties, and copyrights). Most journals require authors to declare any potential financial conflicts of interest they may have with the subject matter of their manuscripts. Some journals ask authors to disclose any financial interests they may have with any entity that could affect their work.

The authors are responsible for declaring these potential conflicts of interests. Journals don't research possible conflicts of interest and are not expected to "police" authors. However, journal editors must be alert to the possibility of conflicts of interest because the authors may not declare them. An author's failure to declare a financial interest conflicts with the reader's entitlement to know this potential source of bias. Such information can help readers decide whether a particular sponsorship unduly influenced the investigator and whether the research findings are different than what they would otherwise have been.

Examples of disclosure statements

The Journal of the American Medical Association requires financial disclosure, in "Authorship criteria and responsibility, financial disclosure, assignment of copyright, and acknowledgement:"

"Financial disclosure - I certify that any affiliations with or financial involvement in any organization or entity with a direct financial interest in the subject matter or materials discussed in the manuscript (e.g., employment, consultancies, stock ownership, honoraria, expert testimony) are disclosed below. Any financial project support of this research is identified in an acknowledgment in the manuscript."

Obstetrics and Gynecology requires each author to sign an agreement form that must accompany the manuscript submission with a section on financial disclosure: "I affirm that I have no financial affiliation (e.g., employment, stock holdings, consultantships, or honoraria) within the last 3 years with any organization with direct financial interest in the subject or materials discussed in this manuscript, except as disclosed in an attachment."

Science includes on its checklist for submission: "Also include with your manuscript...any information about the authors' professional and financial affiliations that may be perceived to have biased the presentation."

Some journals (e.g., *New England Journal of Medicine* and *Obstetrics and Gynecology*) do not allow any financial conflict of interest for authors who write editorials or review articles, because analysis pieces rely heavily on interpretation and judgment. It is considered difficult for readers to discern conflicts of interest in opinion pieces.

At least one journal (*Obstetrics and Gynecology*) discloses financial matters in a "call-out" box, which is displayed on the front page of the published manuscript. When the editor feels that financial conflicts should be disclosed, he or she advises the corresponding author and indicates how the "financial disclosure" statement should be worded. This situation may occur if any of the authors have financial connections to a particular product or company and the article could be interpreted as favorable to that product or company. Acceptance of the manuscript is contingent upon the author's accepting the disclosure.

Reviewers

Conflicts of interest regarding reviewers concern not only financial issues, but also rivalry, academic scientific and technological competition, and philosophical values and beliefs. Reviewers, when asked to review a manuscript, should be instructed specifically with respect to conflicts of interest. Precisely because they are experts in the field under consideration (i.e., they are peers), reviewers are apt to have conflicts of interest, financial or otherwise. Thus the existence of a conflict is not really the issue, but rather whether the conflict is sufficient to limit the reviewer's ability to evaluate the manuscript fairly and objectively. Journals should instruct their reviewers to disqualify themselves if they feel they cannot render fair and objective assessments. If reviewers have any questions in this regard, they should be urged to consult with the editor.

Most journals approach this issue with fairly general and open-ended advice. However, *JAMA* requires reviewers to complete a specific section of the review form disclosing any potential conflicts of interest. This assures that the reviewer consider the issue and make a direct statement that he or she has or does not have any such conflicts.

Some reviewers believe that a conflict exists if they have reviewed a manuscript before for another journal. If a reviewer still believes the manuscript can be reviewed objectively, many

editors prefer to send the manuscript to the same reviewer again. That reviewer is in a good position to judge whether the manuscript has been improved.

Editors

The journal editor is responsible for establishing and maintaining the highest possible standards in the contributions that fill the pages of the journal as well as for maintaining the integrity of the journal itself. Editors are primarily responsible for ensuring a fair review process of manuscripts submitted to a journal and should give unbiased consideration to all submitted manuscripts. Editors should not have personal financial involvement in manuscripts they consider for publication. An editor should disqualify him- or herself from any decision-making role on a manuscript addressing a subject on which he or she has a potential conflict of interest. Some journals stipulate that editors may have no financial interests in any business that might influence the publication of a manuscript. Other journals request editors to sign financial disclosure forms annually.

Editors may also disqualify themselves from evaluating submissions by local colleagues or friends or submissions that clash with their religious convictions. For example, an editor may preclude him or herself from being involved in the review process of a manuscript written by a close colleague. In these instances, the editor, who is usually blinded to the reviewers of the manuscript, generally asks a guest editor or associate editor to oversee the review process. The guest editor makes the final decision on the manuscript. Some editors consider reviewing manuscripts submitted by members of the journal's editorial board a conflict and will ask a guest editor to oversee those manuscripts. Editors are, after all, human and subject to many of the same biases and conflicts as reviewers and authors.

Recommendations

The Editorial Policy Committee recommends that:

- Journals require authors to explicitly state all sources of funding for research and to include this information in the acknowledgement section of the published paper.
- Journals require authors to state other potential conflicts of interest in the cover letter of the manuscript submission.
- Journals publish financial interests or support with an article. The editor should decide whether to include a description with the published article or letter of all financial support

or any conflicts of interest the editor feels the readers should know. This should be published as a footnote on the first page of the manuscript.

- Journals should have a policy about how to handle undisclosed conflicts after they are identified by a third party and some explanation to the readers.
- Journals should have a policy and plan of action regarding undisclosed financial interests that are identified after publication. Editors may choose to publish a notice of "Failure to Disclose Financial Interest."
- All authors, editors, and reviewers should disclose potential conflicts of interest. Authors and reviewers should disclose to the editor; the editor should disclose potential conflicts of interest to the publications committee, or its equivalent.

In our view, declaring more is better than declaring less. With the input of the authors, the editors can choose what information the readers need to know regarding potential conflicts.

Ask the question: "If these facts were undeclared and emerged later by some other route, would they give cause for embarrassment or recrimination?" The readers and the editorial staff should be made aware of any conflicts of interest so that they have the necessary information to make informed judgments about the potential effects of those conflicts on the manuscript.

Responsibilities and Rights of Peer Reviewers

Definition

Peer reviewers are the linchpin in the process by which research becomes knowledge. The process is publication – usually print, but increasingly Internet-based or other electronic publication.

As described by F. Peter Woodford in *Scientific Writing for Graduate Students*, peer reviewers are "responsible scientists anxious only to further science." Accordingly, they volunteer to assess the strengths and weaknesses of the work of one or a group of researchers for the editors of a publication to which that work has been submitted. The purpose of the peer review process is to assure the accuracy and rigor of any work prior to its being widely disseminated.

Peer review is a gift of uncompensated time by people to whom time is a precious commodity. It is important, therefore, to define the rights and responsibilities of this group of people to whom the scientific community owes so much.

Responsibilities

Responsibility to the Scientific Community

Peer reviewers first and foremost must fulfill their responsibility simultaneously to the scientific community and to the journal that has requested their assistance. By rigorously assessing a given research manuscript within time limits specified by the journal, they meet their responsibility to the scientific community in full.

Responsibility to Authors

Reviewers who agree to examine the work of a peer and comment upon its accuracy, its clarity, its importance, and its usefulness to the scientific world have a weighty responsibility. First and foremost is their obligation to treat the author and the manuscript with respect. When reviewers have a bias against either the researchers or the research, they must excuse themselves. When reviewers have a conflict of interest with the research or the sponsors of the research, they must make it known to the editors or excuse themselves. When reviewers are not truly knowledgeable about the area of research in the manuscript they have been asked to review, they must decline to review it.

Second, reviewers must provide an honest assessment of the value of the research. An appropriate assessment includes an analysis of the strengths and weaknesses of the study, suggestions for avenues to pursue to make the study more complete or relevant, specific questions for the authors to address to make their study acceptable and useful to the audience for which it is intended.

Third, reviewers must maintain confidentiality about the manuscripts they review. Using the data from such manuscripts before they are published is inappropriate. Sharing the data with colleagues is equally inappropriate, as is reproducing the manuscript for any purpose.

Fourth, reviewers must not use the peer review process as a means to further their own research aims, specifically by requiring authors to respond to questions that are of interest to the reviewer but are not questions their study was designed to answer.

Fifth, reviewers should resist the temptation to use their reviews as an opportunity to suggest that their own published work be referenced.

Responsibility to Journals

Reviewers' responsibilities to journals fall into several categories: quality and timing of reviews and avoidance of conflicts of interest.

When reviewers receive invitations to review manuscripts and it is unlikely that the reviews can be finished within the time frame specified by the journal, they should decline the opportunity and explain the reason. This accomplishes two objectives: keeping the manuscript on an appropriate schedule and informing the editorial office that the reviewers should not be sent additional manuscripts in the near future.

Once reviewers agree to review manuscripts, it is incumbent upon them to return their reviews to the editorial office within the specified time frame. If it becomes impossible to complete the review on time, reviewers should so inform the editorial office and ask for guidance about whether to return the manuscripts unreviewed or take the additional time needed to finish them.

When reviewers receive invitations to review manuscripts with which they have a clear conflict of interest, it is their responsibility to turn down the invitation or divulge the conflict of interest. Conflicts of interest can be of several sorts, the most common being a relationship between the reviewers with either the company that sponsored the research or with a company that competes with the sponsor of the research to be reviewed. It is fairest for reviewers with such conflicts of interest to decline the reviews.

On the other hand, when reviewers receive invitations to review manuscripts that advocate positions against which they have a bias, the situation is more complex and the decision more personal. Should, for example, clinicians who advocate aggressive treatment for patients with a specific disease review manuscripts that advocate a nonaggressive approach to therapy for patients with that disease? In general, such reviewers should make that determination personally. The fact that a journal editorial office requested their input into such manuscripts suggests that the editor is looking for balanced reviews and has likely chosen another reviewer or reviewers who support the nonaggressive approach to such patients to provide perspective. With that in mind, reviewers should respond positively if they believe they can review within the specified time frame.

Rights

Reviewers have the right to expect to be informed of the outcome of the review process for the manuscripts they refereed for journals. Whether that information is forthcoming while a manuscript remains active -- as, for instance, when one is returned to its authors for a revision -- or whether it is imparted only once a definitive decision is reached is up to the journal.

Regardless of the timing of notification, however, reviewers should ultimately be informed. As an educational service and in the hope of helping the reviewers with future reviews, it is a nicety to send each reviewer the comments of the other reviewer(s) for their edification.

Reviewers should also expect to be thanked for the time they take to review manuscripts. A journal's thank you to its reviewers can take several forms, any one of which is acceptable. Some journals give reviewers who are not subscribers a brief subscription to the journal. Many journals publish a list of their reviewers for a given year in the journal early in the subsequent year. Some journals arrange a social or educational event, generally at a large specialty meeting, to which their reviewers are invited.

VITA

Melissa June Henry, a resident of San Antonio, Texas, is a member of Texas A&M University's class of 2003. She has been the Editor-in-Chief of the Texas A&M University Undergraduate Journal of Science since August 2001 and has been responsible for the publication of two journals. She will graduate from Texas A&M University with both University and Foundation Honors in May 2003.