Ethics in Science and Engineering
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Publication and Communication

8.1 Introduction

Publication plays a critical role in the advancement of science and engineering by communicating knowledge from the researcher(s) to the larger scientific community (Davis, 1997). One might say that science and engineering communication does not truly exist until the data are published, at which time the publication becomes a public commodity. The exchange of information through publication is an essential part of doing science and engineering, a public good, and, for some, a moral imperative. It is important, then, that scientific societies, as major publishers of science and engineering, take initiatives to preserve the integrity of the process that certifies and communicates research (Beckett, 2003).

Publication of papers in peer-reviewed journals is the predominant form of publication for scientists and engineers, and usually such journals have the highest readership.

However, journals vary enormously in their prestige and importance, and the value of a published article often depends on the journal.

Peer review is a general term that is used to describe a process of self-regulation by scientists and engineers (as well as for many other professions) as a means of evaluation of paper before publication; this involves review qualified individuals in the relevant scientific or engineering field. Peer review methods are employed to maintain standards, improve performance, to verify whether the work satisfies the specifications for review, to identify any deviations from the standards, and to provide suggestions for improvements.

In general, the professionals who are biased towards theory tend to produce data that are often abstract and the intellectual contribution is expressed in the form of theories with proof. As a result, publication on the proceedings of a conference may be the only outlet for their efforts after which publication in a *reputable* journal may be possible but only with considerable efforts or, for various reasons, may not be possible at all. For the non-academic scientist and engineer, there is the medium of publication of the material as a *company report*. This can be a worthwhile method for circulating one's work throughout the company. But, the importance of the work to the young scientist and engineer can, again, be diminished while the names of a supervisor, and any other persons higher up the food chain, are included as co-authors.

Publication of data in the proceedings from a conference often results in a shorter time to print. This follows from the opportunity to describe completed or partly completed work before peer scientistsor engineers receive a more complete review than the type of review that is typical for a journal. At a conference, the audience asks general and specific questions to the presenter that often provides recommendations for further work or a new line of investigation. Overall, this will help the presenter to finalize the document for publication in the proceedings (where the proceedings

are published post-conference), using any lame excuse that comes to mind. This, surely is a breach of ethics, which may involve untruths or merely laziness.

In addition, the young Assistant Professor also has to acquire research funding and may even have to pass his reports/papers through a review committee prior to publication. This review committee will be made up of senior members of staff who, for many reasons that are often difficult to follow, can give the young professor a flowing performance report or a report that is somewhat less than glowing. It is at this time, if the latter is the case, that the young professor can feel that he is suffering rejection by one's colleagues.

The educated young professional scientist and engineer wonders if he is merely a pair of hands (for a overbearing supervisor, an overbearing department head or jealous colleagues) and not supposed to be given credit for the ability to think and solve a problem. Performance suffers and, with repeated negativism towards publication, the young professional starts to lose interest in the organization.

Lack of recognition for hard and intelligent work is a killer and getting the best out of any such scientists and engineer becomes an impossible dream.

There is an extremely important role for the scientific societies in developing authorship policies for their members. The societies must also make sure that their members know of the existence of their policies and how to interpret them. Regular continuing educational efforts are imperative. There is also the possibility that scientific societies could work together to establish a uniform policy that would hold across disciplines. This would be advantageous to those engaged in interdisciplinary research collaborations.

While the general definition of scientific misconduct includes fabrication, falsification, and plagiarism, the scientific community is charged with considering standards for other practices. In publication practices, that encompasses

such matters as authorship credit, duplicate publication, accurate representations of the data presented, and peer review.

Generally, the following criteria need to be observed when compiling data for publication:

1. all persons designated as authors should legally qualify for authorship, and
2. each author should have participated sufficiently in the work to take public responsibility for the content.

Furthermore, authorship credit should be based only on substantial contributions to:

1. either the conception and design or the 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. Other contributors should be listed in an appendix or footnote. Editors may ask authors to describe their contribution(s).

However, publishing is undergoing redefinition as electronic publications and there are both opportunities and pitfalls associated with electronic publishing. The immediacy, impermanence and global reach of electronic publishing mean that new, expanded audiences can be reached. In addition, digital technology may make it easier to misrepresent data or alter graphic representations. Societies could make a valuable contribution by encouraging cross-disciplinary discussion of these matters among researchers and those involved in publishing. Guidelines for responsible conduct in the electronic communication and electronic publication of scientific research must be developed and implemented,

and the societies can play a pivotal role in their promulgation and implementation.

Generally, publications are variable but, in general, constitute:

1. They constitute a report and a record of the activity of researchers.
2. They constitute the references research builds upon.
3. They constitute the data governments, organizations, or society can refer to when facing issues that have a major scientific component.
4. They constitute a way of evaluating the scientific and engineering activities of individual researchers.

The quality of publications, in terms of scientific integrity, is therefore essential for research to be conducted in an efficient and responsible way and for a transparent communication between researchers and society.

Science and engineering disciplines are flourishing because of communication, a much broader concept than publishing. Hopefully, before the article will be published, researchers will have had extensive discussions with their peers to share their views, ideas and opinions in order to check the validity of their claims. Unfortunately, in recent times the advancement of knowledge has not appeared to be a top priority for many scientists and engineers. Fame and fortune have become the focus of the researchers and publication of data that have not been confirmed or data that have been made up have seen the light of day in scientific and engineering journals.

Many opportunities and concerns are at play in scholarly publication and communication. These result from capabilities afforded by new technologies, pressures associated with the publish-or-die message that is forced on many scientist

and engineers in academia or the invent-or-die message that is forced on many industrial scientist and engineers.

While the unethical behavior of scientists and engineers cannot be blamed on, the publish or die message, or on the, invent or die message, the pressure placed on the shoulders of many individuals by either of these messages may be a contributing factor. Not that anyone found guilty of unethical behavior should be excused because of such a message but it may be time to change the message – if that is at all possible.

The young assistant professor, who is excused from being reprimanded for unethical behavior because he is a young professor seeking funding for a research project, is also not a valid excuse for lack of disciplinary action. In fact, one might ask if those exalted academics promoting and accepting such an excuse are not also guilty of unethical behavior because they have condoned the professor's actions.

In fact, the lack of willingness of the (academic or industrial) faculty to change is a key barrier to reducing and perhaps eliminating unethical behavior in science and engineering and engineering.

While there are claims that gross scientific misconduct are assumed to be rare (however, please see Chapter 9), subtler forms of unethical behavior are becoming more common (Ritter, 2001). Misappropriated credit in publications, for example, can lead to some of the most contentious conflicts in the academic world. Currently, in academia, publication of research data has become more competitive because universities and organizations are more focused on intellectual property and rights of ownership. In addition, research that is sponsored by commercial entities is usually controlled; it is the commercial organization which determines whether and how results are published is no longer an academic issue.

Guidelines for responsible conduct in the communication and publication of scientific research must be developed

and implemented, and the societies can play a pivotal role in their promulgation and implementation.

8.2 The Scientific and Engineering Literature

The *scientific and engineering literature* comprises scientific and engineering publications (journals) that report original empirical and theoretical work in scientific and engineering disciplines. University researchers favor publication in such journals while their industrial counterparts may have to focus on patents.

Currently, peer-reviewed journal articles remain the predominant publication type, and have the highest prestige. However, journals vary enormously in their prestige and importance, and the value of a published article depends on the journal. The status of conference proceedings depends on the discipline; they are typically more important in the applied science and engineering, especially for industrial scientist and engineers.

In many scientific and engineering disciplines, advancement depends upon publishing in so-called "high-impact" journals, most of which are English-language journals. Scientists and engineers with poor English writing skills are at a disadvantage when trying to publish in these journals, regardless of the quality of the scientific study itself. Yet many international universities require publication in these high-impact journals by both their students and faculty. One way that some international authors are beginning to overcome this problem is by working with technical copy editors who are native speakers of English and specialize in editing texts written by authors whose native language is not English to improve the written quality to a level that high-impact journals will accept.

This is necessary because a scientific article has a standardized structure, which varies only slightly in different

subjects. Ultimately, it is not the format that is important, but what lies behind it, the content, and how well the content is explained by the authors. In most cases, several formatting requirements need to be met. For example, the title should be concise and indicate the contents of the article. Most important, the names and affiliation of all authors are given – because of case of misconduct, the publisher may require that all co-authors know and agree on the content of the article.

The format of the paper is also subject to certain requirements there should be an *abstract* (a one-paragraph summary of the work, usually less than a specified number of words) which is intended to serve as a guide for determining if the article is pertinent to potential readers. Following the *abstract*, there is an *introduction* in which previous works relevant to the work in the paper should be presented in the context of previous scientific or engineering investigations, by citation of relevant documents in the existing literature. Then follows the *experimental* section in which the method and materials are described after which the data are presented in the *results* section. Interpretation of the meaning of the results is usually addressed in a *discussion* section and the conclusions should be based on previous literature and/or new empirical results, in such a way that any reader with knowledge of the field can follow the argument and confirm that the conclusions are sound. The final section is *references* (literature cited) section in which the sources cited by the authors are listed in the format required by the journal.

8.3 The Journals

Science and engineering is supposed to be a project centered on building a body of reliable knowledge about the universe and how various pieces of it work. This means that the researchers contributing to this body of knowledge for example, by submitting manuscripts to peer reviewed

scientific journals, are supposed to be honest and accurate in what they report. They are not supposed to make up their data, or adjust it to fit the conclusion they were hoping the data would support. Without this commitment, science and engineering turns into creative writing with more graphs and less character development.

Because the goal is supposed to be a body of reliable knowledge upon which the whole scientific community can draw to build more knowledge, it's especially problematic when particular pieces of the scientific literature turn out to be dishonest or misleading. Fabrication, falsification, and plagiarism are varieties of dishonesty that members of the scientific community look upon as high crimes. Indeed, they are activities that are defined as scientific misconduct and (at least in theory) prosecuted vigorously.

It is to be hoped that one consequence, of identifying scientists and engineers who have made dishonest contributions to the scientific literature, would be removal of dishonest contributions from the literature. Yet, whether that hope is realized is an empirical question.

Journals occasionally report on notorious research integrity violations, summarizing information from scientific misconduct investigations, and noting the affected publications. Many other lesser-known cases of fraudulent publications have been identified in official reports of scientific misconduct; yet there is only a small body of research on the nature and scope of the problem, and on the continued use of published articles affected by such misconduct.

The standard for being caught is having an official finding of misconduct against the authors or perpetrators of the misconduct. In part, this is because such a finding usually includes consequences connected to publications that may embody the dishonesty toward fellow scientists and engineers.

Not every retraction is the result of a finding at the end of an inquiry into misconduct. Conversely, in situations

where there has been an inquiry into misconduct and the finding is that there has been misconduct that requires correction of the literature (via a correction or a retraction), it is hoped that the coauthors of the paper would be subject to the appropriate action. However this is not always the case. Numbers are not always available, but many perpetrators of misconduct are exonerated with time (time is a great healer and memory scrubber) and continue to practice science and engineering as if nothing had ever happened.

It is also to be hoped that scientific journals would recognize their interest in serving their readers by ensuring the scientific quality of the articles they publish. The prepublication screening (via peer review and editorial oversight) can do part of the job, but even in situations where there is nothing like misconduct on the part of authors, occasionally honest mistakes are discovered after publication. Some journals even have a policy that would prevent authors who become aware of such mistakes from communicating the relevant information to their fellow scientists and engineers who have access to the published work now known to be mistaken, whether through the publication of a correction or a retraction.

In any case, the present study points to policies and facts on the ground that might make us worry about how completely errors in the scientific literature (whether honest mistakes or intentional deceptions) are corrected.

Publishing may not always move quickly, but surely that three years is sufficient to communicate to the scientific community that draws on the literature whether a particular piece of that literature is not as reliable as it was first thought to be.

For example, the published findings of misconduct in the *NIH Guide for Grants and Contracts* and in the ORI Annual Reports for 1991–2001, one hundred and two articles were identified as needing retraction or correction. There were forty one researchers whose misconduct was tied to the

one hundred and two articles, nineteen of them identified as responsible for a single problematic paper and twenty two were responsible for two or more problematic papers. One of those forty one researchers was responsible for a ten articles that were in need of retraction or correction.

Furthermore, of those one hundred and two articles, seventy nine reported results that were fabricated, falsified, or misrepresented; two contained plagiarism; sixteen gave inaccurate reports of the methodology the researchers actually used; and five reported "results" from fabricated experimental subjects. Just over half of the forty one researchers (responsible for fifty three of the flagged articles) accepted the findings of misconduct, while five were recorded as disagreeing with the findings or denying responsibility for the misconduct. The other misconduct findings didn't record the response of the respondents to the findings. By the time the findings of misconduct were published, corrigenda (corrections) had already been published for thirty two of the flagged articles and sixteen more were in press. Retractions or corrigenda needed to be published for another forty seven of the flagged articles.

This leaves seven of the articles flagged (as reporting results that were fabricated, falsified, or misrepresented, or as containing plagiarism, or as giving inaccurate reports of the methodology the researchers actually used, or as reporting results from fabricated experimental subjects) for which the administrative actions did not specifically call for correction or retraction. However, it's not unreasonable to think that articles flawed in these ways ought to be corrected or retracted; in order to protect the reliability of the scientific literature and the trust scientists and engineers need to be able to place in the reports published by their fellow scientists and engineers.

Potentially, this is a problem.

The thought goes to the means by which the continued citation of research affected by scientific misconduct can be

reduced. More prominent labeling in the literature is desirable to alert users to notices of retraction and errata. This could take the form of larger or bold fonts for these notices. Alternatively, or in addition, a prominent placement of the word *retraction* on the first page of such articles would be useful, because once a user downloads an article, any notices related to retraction of the article may be are left behind.

Some of the problem, in other words, may be due to the vigilance (or lack thereof) displayed by those using the scientific literature, but some of it may come down to the extent to which that scientific literature is accessible to the researchers.

Laboratory directors and principal investigators often do not check every detail of the work by students or their junior colleagues but the onus is on the director or principal investigator work and trust that the work is accurate (Ritter, 2001). Thence, it falls upon the shoulders of universities, journal editors, and reviewers to determine that the directors or principal investigator has submitted a manuscript that is accurate and true.

Weeding out such problematic papers out of the pool of scientific literature that researchers cite may require journal editors, manuscript authors, and even journal readers to take on more responsibility. For example, before authors submit a manuscript for publication (either initially or after the last set of revisions), they must ensure that none of the sources they cite have been retracted or corrected. Failing to exercise such vigilance could inadvertently render the paper a problematic, especially if the paper depends in part on another problematic paper (and so on).

However, until the scientific community is willing to recognize and practice such vigilance as a duty, it's unlikely that failing to exercise it could itself rise to the level of scientific misconduct.

8.4 Data Manipulation for Publication

Data manipulation for publication must not be used as an excuse for unethical behavior; it is recognized the Internet has changed the way science and engineering is done, particularly when it comes to publication. Manuscripts are now submitted, reviewed and authors notified electronically. But although the efficiency and speed of the peer-review process has increased, a set of attendant issues has arisen (Oxender Burgess, 2004).

Specifically, it is now easier to detect breaches of ethical behavior than ever before. As evidence, the number of reported ethical problems involving publications of the American Physiological Society (in 14 separate journals) rocketed from an average of less than one a year before 1999 to more than 50 a year in 2004, when all of the society's publications became available online.

When evaluating a manuscript, a reviewer no longer has to trek several blocks to the library to scour the printed journals in search of a paragraph or a figure that seemed familiar. All that has to be done now is to type a few keywords into an appropriate search engine and, hey presto, all the relevant articles will appear on your desktop. Although for the more meticulous, anti-plagiarism software is available for free download.

Other, more draconian misconduct-detection measures are aimed at identifying image manipulation. These are currently being considered and even implemented by some journals.

It is all too easy for authors to manipulate images for publication. For example, digital image-processing programs make it a simple matter to remove *non-specific* bands can be easily removed from the final figure. Since the foundation of good science and engineering is accurate, reliable and reproducible data, then images that are less than perfect must be accepted. If images are manipulated to enhance

presentation, the integrity of the scientific and engineering enterprise may be compromised and erase the trust that the public places in our work.

Two of the most obvious ways that data distortion can be produced are by altering the relationship between the horizontal and vertical scales and the use of different scales on the left and right hand sides of the graph or along the bottom of the graph.

Quality data, reported in a clear and concise format, may be the dominant factor in determining whether the information presented is used or disregarded as worthless, or worse, intentionally misleading. Only by creating and maintaining some sort of organizational ethical guidelines and educating data graphics designers on the effect poorly designed graphics have on people's perceptions can we ensure quality data presentations.

However, it may not be prudent for journal editors to seek out potential misconduct in every submitted manuscript. That would impose an unnecessary confrontational relationship on authors and publishers, even before the process of peer review began. However, journal editors may be responsible for ensuring the integrity of the scientific record but if scientists and engineers do not police their own actions and actively instruct students in proper behavior, someone else will and the consequences may be unpalatable.

8.5 Detecting Falsified Data

With the popularity of the Internet as an information source, there are now several tools available to aid in the detection of plagiarism and multiple publications of the same paper within the scientific and engineering literature.

In addition to the various software packages, other tools which may be used to detect falsified data include error

analysis. Error analysis is based on the principle that experimental measurements generally have a small amount of error, and repeated measurements of the same item will generally result in slight differences in readings. These differences can be analyzed, and follow certain known mathematical and statistical properties. Should a set of data appear to be too faithful to the hypothesis, i.e., the amount of error that would normally be in such measurements is not evident, a conclusion is that the data may have been subject to manipulation (forged). Error analysis alone is typically not sufficient to prove that data has been falsified, but it may provide the supporting evidence necessary to confirm suspicions of misconduct.

8.6 Peer Reviewers and Their Duties

Peer review is the means by which scientific and technical manuscripts submitted for publication in journals undergo quality control in the form of a check on technical quality, the lack of flaws in the data, and the validity of the conclusions drawn from the data. The lack of peer review is what makes most technical reports and World Wide Web publications unacceptable as contributions to the literature. The relatively weak peer review often applied to books and chapters in edited books means that their status is doubtful, unless an author's personal standing is so high that his or her prior career provides an effective guarantee of quality. Even then, it is not beyond a reputable scientist or engineer writing a book that is of very low quality both in terms of the writing and the content.

Formal peer review is in flux and likely to change fundamentally owing to the emergence of institutional digital repositories where scholars can post their work as it is submitted to a print-based journal. Though this does not prevent peer review, it permits an unreviewed copy into general circulation.

The peer review process is central to scholars' perception of quality in a journal that its retention is essentially a *sine qua non* for any method of archival publication, new or old, to be effective and valued (Harley et al., 2007). Peer review is *the* hallmark of quality that results from external and independent valuation. It also functions as an effective means of winnowing the papers that a researcher needs to examine in the course of his or her research.

Peer review is an essential factor when faculty were asked about their perceptions of both standard and newer forms of publication, disadvantages of newer forms of publication, where to publish to make a name for oneself in the field, and, of course, when we asked about peer review specifically.

There is a strong tendency for many members of the research community to equate electronic-only publication with lack of peer review, despite the fact that there are many examples to the contrary. Because of the very nature of peer review, this factor inhibits publication in electronic-only venues even among those who are aware of the existence of fully peer-reviewed e-journals. Simply put, they know that the individuals reviewing their work for advancement may well not have that awareness.

It will be important to try to separate the issue of peer review for newer, electronic journals from those issues associated with the fact that most such journals are simply new and not yet well established. To some degree, however, peer review and the means of publication and dissemination can be separated. For example, there are authors whose work is peer reviewed and published in prestigious print journals, but who also retain rights to place the article on their own Web site. The result is that the work appears to be accessed far more often on the Web site than in the published print journal.

There is a growing tendency to rely on secondary measures associated with peer review. These include perceived

journal quality, selectivity, and/or stature; whether papers or keynote lectures for conferences are invited; and the growing reliance on editors of university presses and reviewers for journals to evaluate scholarly work. Even though reviewers for university presses are academic faculty, the editor exerts much more independent judgment than is typical for peer-reviewed journals published by scholarly societies. In some cases, the impact factor may also serve as a gauge of quality, a development that many view as problematic, as long as the impact factor is not a measure invented by one publisher for application to journals published by that particular company.

For example, what does the impact factor really mean if papers from journals of Publisher A have higher impact factors when judged using the system that originated from Publisher A? This question is skirting the issue of unethical behavior; but isn't such a system setup to make publishers A's journals more in demand than the journals of other publishers?

The peer-review process is more complicated for compound disciplines which cross over between science and engineering because many such fields are relatively nascent, and therefore, result in small, specialized communities of scholarship.

Scientists and engineers, in these interdisciplinary fields, often prefer to publish within a single traditional discipline because the most highly respected and recognizable outlets reside there; however, divergent expectations (ranging from quantity to methodology to writing style) and standards (especially with regard to quality) among fields often make it difficult for reviewers in standard fields to judge submissions from compound disciplines. Interdisciplinary publications may address this concern more readily as they become more prestigious. However, in such fields, the utilization and perception of peer review is particularly complicated, given the prominence of student-edited law reviews.

8.7 Duties and Responsibilities of a Journal Editor

Descriptions for duties and responsibilities of an editor of a scientific or engineering journal are scarce.Generally, the editor of a peer-reviewed journal is responsible for deciding which of the articles submitted to the journal should be published, often working in conjunction with the relevant society (for society-owned or sponsored journals). The validation of the work in question and its importance to researchers and readers must always drive such decisions. The editor may be guided by the policies of the journal's editorial board and constrained by such legal requirements as shall then be in force regarding libel, copyright infringement and plagiarism. The editor may confer with other editors or reviewers (or society officers) in making this decision.

More specifically, the Journal Editor (or Editor in Chief, as the title may indicate) has final decision-making authority on, and is responsible for the appropriate delegation of Editorial Board responsibilities related to, the scientific, engineering, and other editorial content of the journal: including solicitation and acceptance or rejection of manuscripts; selection of editorial board members and reviewers; and the approach to correspondence with authors, reviewers, and readers.

In order to accept these duties and responsibilities, the editor must be skilled in the areas of scholarship covered by the journal. In short, the editor of a scientific or engineering journal has the added responsibility to check the technical soundness and technical quality of the content. For this, the editor is required to have the technical skills and up to date knowledge of the area of scholarship covered by the subject matter of the journal.

For example, the scientist or engineer who takes work from a previously unknown paper (say one published in

a foreign journal that is little-known and little-read in the west) should give credit to the original work and not ignore it on the basis of personal likes and dislikes, or even on the basis of the personal likes and dislikes of his supervisor/mentor.

An editor who is up to date in his own area of scholarship would immediately recognize such omissions.

Thus, the assumption (often correct, but not always) is that the editor chosen for a journal is the most appropriate scientist or engineer because the editor is the "gatekeeper" or "watchdog" for the journal; anything published in the journal must pass across the editor's desk and *must* be reviewed by the editor. Authors who submit manuscripts to the journal for possible publication are often swayed by the qualification and knowledge of the editor – the reputation of the editor is a direct influence on the reputation of the journal.

The editor is, in fact, the quality control officer for the journal where a check is made on the content (authenticity and relevancy to the topic), language (grammar and content flow) and aesthetics (photos, images, sound, audio and video) of the articles or documents appearing on the specified medium. An editor is required, with the consent of the relevant authors, to change, modify, paraphrase or condense the content in order to enhance its quality and approve or reject the piece based on preset grounds. The job of the editor also involves relationship building and communication with the author. The editor is required to use his creative skills and human resource skills to maintain a cordial relationships with authors whose article are rejected.

Above all, journal editorship is not a resumé builder! In fact, the success of a journal will depend on the performance of the editor and it is the job of the editor to shepherd the journal through lean times and through good times (McHugh, 1998). For those who seek to build a resume by

including journal editorship as a glowing one-liner, it is recommended that they seek early retirement.

In addition being the good shepherd, the other major responsibility of the editor is the administration of the peer review process.

The peer review process assists the editor in making editorial decisions and through the editorial communications with the author may also assist the author in improving the paper. The process is an essential component of formal scholarly communication, and lies at the heart of the scientific method. All scientist and engineers who wish to contribute to publications should be willing (perhaps even have an obligation) to act as peer reviewers.

Any selected reviewer who feels unqualified to review the research reported in a manuscript or knows that its prompt review will be impossible should notify the editor and excuse himself from the review process.

In addition, the journal peer review process has three purposes. The first is quality control, to eliminate major errors in papers and unsuitable papers. Second, the review process should ensure fair treatment of all authors (not just for cronies of the editor) and especially not for paper authors or co-authors by the editor. Third, the review process encourages the publication of papers that contain new and useful findings.

Furthermore, the editor should also know the reviewers sufficiently well to know that they are qualified, impartial and fair and the confidentiality of the review process must be preserved.

Protecting intellectual property is a primary responsibility of the editor. The editor should know the reviewers well enough so that any thoughts of plagiarizing manuscripts by reviewers should not be an issue. Reviewers must not use ideas from or show another person the manuscript they have been asked to review without the explicit permission,

via the journal editor, of the author of the manuscript. Advice regarding specific, limited aspects of the manuscript may be sought from colleagues with specific expertise, provided the author's identity and intellectual property remain secure.

The editor must accept it as a hard and fast rule (a rule without exception) that unpublished materials, disclosed in a submitted manuscript, must not be used in a reviewer's own research without the express written consent of the author. Privileged information or ideas obtained through peer review must be kept confidential and not used for personal advantage. Reviewers should not consider manuscripts in which they have conflicts of interest resulting from competitive, collaborative, or other relationships or connections with any of the authors, companies, or institutions connected to the submitted unpublished papers.

The editor must also maintain reviewing schedules by ensuring that reviewers meet agreed-upon reviewing deadlines. And, in order to maintain good reviewers the editor should have the means to evaluate performance of editorial review board members and coach when appropriate.

Whilst some editors consider themselves to be the all-powerful authority for publication in the journal, the editor should be willing to step down from this lofty perch and assist authors in developing articles to the fullest potential. To do this, the editor must maintain all communications with all authors and reviewers in a courteous and diplomatic manner. This also involves correspondence sent to authors in relation to checking every manuscript for completeness, references, tables, figures suitable for reproduction, legends, abstracts, permission to use copyrighted material, and mailing address for proof.

Above all, and certainly in the context of the present text, the editor must not be involved in positions where conflicts of interest can arise so that all decisions are beyond reproach.

A conflict of interest may exist when a manuscript under review puts forth a position contrary to the reviewer's published work or when a manuscript author or reviewer has a substantial direct (or indirect) financial interest in the subject matter of the manuscript. A conflict of interest may also exist when a reviewer knows the author of a manuscript. The editor should ensure that such conflicts do not occur and that he is also beyond reproach.

The editor should also assure that proper acknowledgment of the work of others must always be given. Authors should cite publications that have been influential in determining the nature of the reported work. Information obtained privately, as in conversation, correspondence, or discussion with third parties, must not be used or reported without explicit, written permission from the source. Information obtained in the course of confidential services, such as refereeing manuscripts or grant applications, must not be used without the explicit written permission of the author of the work involved in these services.

The editor should recognize that a conflict of interest does not exist when an author disagrees: with a reviewer's assessment, that a problem is unimportant, or disagrees with an editorial outcome.

When an author discovers a significant error or inaccuracy in his own published work, it is the author's obligation to promptly notify the journal editor or publisher and cooperate with the editor to retract or correct the paper. If the editor or the publisher learns from a third party that a published work contains a significant error, it is the obligation of the author to promptly retract or correct the paper or provide evidence to the editor of the correctness of the original paper.

An editor should take reasonably responsive measures when ethical complaints have been presented concerning a submitted manuscript or published paper, in conjunction with the publisher. Such measures will generally include

contacting the author of the manuscript or paper and giving due consideration of the respective complaint or claims made. Actions taken by the editor may also include further communications to the relevant institutions and research bodies; and, if the complaint is upheld, the publication of a correction, retraction, expression of concern, or other note, is required. Every reported act of unethical publishing behavior must be investigated, even if it is discovered years after publication.

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