The peer review process in medical research: positive and negative effects on scientific advancement

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Abstract

Peer reviews have remained anonymous for centuries and accessible only to a selected group of members in the scientific community, even they existed since the 17th century. Things, however, are changing, specially in medicine (Piqué & Posteguillo, 2006). Peer reviews are absolutely essential in the development of medical research. It is through these texts that decisions on what is to be published or rejected are taken. Several issues remain open for further study in relation to peer review in medicine: the bias to non-US authors and the role of women in the reviewing process of top journals; in addition, women's presence in editorial boards of high-ranked medical journals which is not proportional neither to their presence in medical associations or to their proportion of papers published in those same journals; finally, the problem of manuscript rejection which has even affected Nobel prize winners (Campanario, 2004, 2007). Complementarily, the authors suggest that many of the lacks of the reviewing process may be offset implementing training courses for prospective reviewers.

Key words: peer review, medical journals, paper rejection, referees, gender bias

Introduction

Peer review, with a history of over 200 years, is present in most professional journals; however, it did not become an institutionalized process until the 1940s, although "in no organised fashion" (Rennie, 1999: 4). Through peer review referees and the editorial board in general try to guarantee that research reports and different types of articles are worth publication. In its early steps, the emphasis on the need of peer review was such that most journal editors thought it assured a quality product once a paper had passed the necessary review process. However, different editors employed different means for publication in their journals; the *British Medical Journal* "sent every noneditorial submission to a recognized expert by at least 1893" (Benos et al., 2007: 145); the *Lancet*, however, did not implement the peer review process prior to 1976; the *Journal of the American Medical Association* (*JAMA*) used an internal review panel, and on occasions sent manuscripts to outside experts. In modern times peer review is used by most biomedical journals, although many voices have claimed that it is still an understudied genre.

The debate on peer review in health science publications lies on several issues related to its effectiveness and quality, as claimed by numerous articles (Jefferson et al., 2002a; Jefferson et al., 2002b; Hagan, 2003), and also by several major publications on the subject, such as Lock's *A Difficult Balance: Editorial Peer Review in Medicine* (1986),

Godlee's and Jefferson's *Peer Review in Health Sciences* (1999), or Weller's *Editorial Peer Review: Its Strength and Weaknesses* (2001); in addition, several conferences on peer review have been held, particularly related to biomedical publications, such as the ones in Chicago (1993), Prague (1997), or Barcelona (2001). This awareness of the peer review process has produced an avalanche of book reviews, letters to editors, commentaries, etc. Authors are particularly concerned on how to avoid bias in the editorial process (Olson et al., 2002), or whether there is gender bias in it (Gilbert et al., 1994; Dickersin et al., 1998), or why are women so scarce in the review process (Davo et al., 2003). In addition, they inquire if nationality has something to do with success in publication (Link, 1998), or how possible data fabrication can be controlled (Al-Marzouki et al., 2005). In this paper, we aim at having a look at the positive or negative effect peer review might have on scientific advancement and at analyzing how the literature has reacted to the process in the last few years.

Characteristics of peer reviews

With Davison et al. (2005: 969), we may define peer review as "a critical assessment by knowledgeable scholars of the quality of a scholarly article submitted for publication to a scholarly journal." Although peer reviews began as discussions among scholars at society meetings, as exemplified by the Royal Society of London whose meetings began in the 1660's; later, the editors took the burden of selecting the papers. In fact, the concept of peer review is fairly old and may be ascribed to the Royal Society and its publication *The Philosophical Transactions*, in 1752.

Modern authors point at complete transparency as the main characteristic in the peer review process, as claimed by Smith (1999: 4) in one of his editorials for the *British Medical Journal*. According to most authors, the anonymity is what can guarantee this transparency, which is also one of the peculiar things of this genre, its hidden status; in the same line, Swales (1996) spoke of it as an "occluded genre." According to some authors, this "invisible hand" is what guarantees and maintains the quality of future publications (Harnad, 2000). Peer reviews have remained, in fact, anonymous for centuries and have only been accessible to a selected group of members in the scientific community.

Another major characteristic is that peer reviews are usually blunt in their use of language. This is quite striking in the scientific community where mitigated and hedged assertions and modalized statements are the basic characteristics of the rest of genres, particularly in research articles. In a research on polemicity in research writing, Salager-Meyer (1999: 26) says that modern authors "were characterized for being hedgy and fact-finding (i.e., object-) responsible," and that authors in general have tended "to remain non-committal and modulate their statements by means of hedging devices" (ibid.). In her numerous diachronic studies on medical discourse, she has detected a clear evolution of the language towards a more hedged and polite atmosphere, as opposed to a very factual and blunt criticism she had found in decades back.

Davison et al. (2005: 974) list and describe a series of qualities reviewers should have: humane, competent, open-minded, free of biases and prejudices, ethical, persuasive, timely, decisive, and diligent. We would like to underscore "humane" as most applicable when referring to the use of appropriate language the reviewers should use;

in this humanitarian approach they specify that the comments should be "kind, respectful and polite, tactful and non-confrontational," rather than blunt and often distasteful; furthermore, quoting Black et al. (1998) among others, Davison et al. (op. cit., p. 971) add that reviewers should be constructive rather than destructive, "tearing down the paper and the author."

Controversy in peer reviews

We have outlined above some of the more controversial issues in the whole review process, perhaps the main one which concerns authors most is manuscript rejection and particularly why manuscripts are rejected. As explained above, peer reviews are essential in the development of scientific research and it is through these texts that decisions on what is to be published or rejected are taken. Several authors have recently undertaken the task of analyzing this important issue. For example, Campanario & Acedo (2007: 734) point to resistance to important discoveries: "some theories or discoveries [collide] with the dominant paradigms in science, and [are] therefore slow to be accepted"; thus, "authors of very innovative papers are openly criticised." Sometimes this resistance takes the form of an excessive and "unjustified delay in the review from the referees" (ibid., p. 736), a difficulty which is prominently pointed out in the literature (Campanario, 1998a and 1998b).

Another area of concern is the anonymity, or the "invisible hand" we mentioned above. It is generally assumed that it protects reviewers against possible reactions of authors who may be reluctant to accept a negative review of their work. Often this reaction against referees may be derived from the actual selection of referees and their credentials. Campanario (1998a), in part one of his state-of-the-art paper on peer reviews, quotes Lindsey (1978) when he discovered that "the majority of the members of editorial boards in social work had never published an article abstracted by the major abstracting services, but members of sociology and psychology journal boards had published a number of articles" (Campanario, 1998a: 185). Although establishing selection criteria is another neglected research issue, in some areas it remains a mystery while in others the selection criteria are clearly defined. Several journals and associations search committees have been established, for instance, in the American Psychological Association (APA), whose members take considerable time looking for well-qualified individuals: they review their curricula, letters of recommendation and previous publications (ibid., p. 186). Wager et al. (2006) report that BioMed Central requires authors to suggest four reviewers when submitting their papers. The authors of this research, however, do not seem to favor this solution, since they conclude that the reviews of reviewers suggested by authors produced similar quality to the product of reviewers chosen by the editor, but "it could affect acceptance decisions if journals rely heavily on reviewer recommendations" (ibid., p. 64).

Some authors have delved on the possibility of gender bias in peer reviews. Gilbert et al. (1994) already recognized that there were gender differences in editor and reviewer characteristics in *JAMA*'s review process, although they did not detect any apparent effect on the final outcome of the process or on final acceptance rates for publication. However, in their results they do indicate that male editors tend to utilize male reviewers more often than female reviewers, while male reviewers also wrote significantly longer reviews and took more time in writing them than female reviewers.

Dickersin et al. (1998: 261), studying editorial staffs in US epidemiology journals, found that the proportion of women editors was low, but recognized that the proportion had been increasing in recent years and quoted a precedent set by editors who have been seeking women for editorial positions (ibid., p. 263). The study reveals, however, that the proportion of women authors (28.7%) was considerably higher than the proportion of women editors (12.8%).

In a recent study, Symonds et al. (2006) undertook the question of gender differences from the point of view of publication output in the field of ecology and evolutionary biology since the subjects' first publication; the imbalance shown in publication output may influence not only success in obtaining grants, but also in the selection of reviewers among scientists by volume of publications; thus they introduce the possibility of finding a new metric in order to take into consideration both quantity and quality of publications. They found clear discrepancies in publication rate between men and women, but most importantly their research also illustrates potential biases in current research performance metrics; they conclude, quoting information from a column published in *Science* (Lawler, 2006), that

> Until the career structure of science finds ways to assess females and males on a level playing field that takes into account the prevalent gender differences and imbalances (whatever their causes), we will continue to perpetuate inequality, and fail to maximize our intellectual capital. (Symonds et al., 2006)

Davo et al. (2003) also discuss the problem of reviewers' bias in paper rejection or acceptance related to gender, and perhaps based on this gender imbalance in editorial and review boards. Based on the editorial board of the *Journal of Epidemiology and Community Health*; they suggest an increase of women visibility in the process which, in turn, would "contribute to the amelioration of such a bias"; however, the policy of increasing only women could also have "perverse effects" (ibid., p. 937); they also add that men differ somehow from women in rejecting (19% in men and 17% in women) or accepting (15% in men and 13% in women) submitted papers for publication (ibid., p. 936). This leads us directly to the issue of peer review and manuscript rejections.

Peer reviews and manuscript rejection

Rejection of manuscripts is another area of conflict and peer reviews are the tool used for these rejections. However, as mentioned by Campanario (1998b: 278), "most journals do not have formal appeal mechanisms or describe in their guidelines how an author might attempt to reverse a negative decision." In a paper under revision, Campanario (2007) gives an ample compilation of more than 20 Nobel Prize winners having their papers being rejected by many journals, and also others who have received resistance to publication from other scientists (Campanario & Acedo, 2007). This was also exposed in the prestigious journal *Nature* (16 October 2003) quoting from an early draft of Campanario's (2007) publication.

In terms of authors' subjective assessment, they actually feel peer review is to blame for manuscript rejection; they consider one third of these reviews as irrelevant (32.5%) and 17.5% as incompetent (Kourilova, 1996: 9). If this were true, relevant research is not being published for subjective reasons. Weber et al. (2002: 2793), while admitting that peer review is imperfect, found authors who submitted their research to a specialty

journals to be "only modestly satisfied with the peer-review process" and, obviously, this modest satisfaction was associated to acceptance of the manuscript and also with prior publication experience. They further point to the importance to the author of receiving a rejected manuscript with a review stating the reason for the rejection as opposed to receiving the rejection notice without a review. According to them, journals should focus on dedicating more energy "on communication and timeliness" (ibid.).

Lack of training

While it is true that editors rely on their reviewers, it is also true that reviewers have no specific training to carry out their task, and some of the problematic issues around it are due to the absence of standardized forms as to what a review should contain (Gosden, 2003). Recent research has been addressed to this particular issue and claims that since peer review is "an extension of the basic principles of science and scholarship, […] it is surprising that so little is known of its aims or effects" (Jefferson et al., 2002b: 2787). Thus, they propose that these aims should be clearly defined in order to properly "estimate the effectiveness of the process or to improve it systematically" (p. 2789); this would avoid what Wager (2006) contends that the blinded may be leading the blinded. As she says, in medicine different methods are being used (unblinded but anonymous, blinded and open); however, "there is no clear evidence about which is best" (ibid., p. 13).

There seems to be an obvious need to adequately train reviewers since they are responsible for assessing whether a manuscript is scientifically valid, and thus the success of peer review "hinges on the skill, discernment, dedication, and fair-mindedness of a large coterie of expert reviewers" (Kliewer et al., 2005: 1731). Lack of preparation of reviewers may lead to fraudulent papers because the errors contained in them had not been detected by the referees in question (Campanario, 1998b: 279-280). Reviewers are only given instructions as to what to assess, but to have proficient referees seems essential to appropriately filter the papers received in a top medical journal. Thus, and since no training programs for reviewing are yet implemented, the best solution so far seems to select the best reviewers possible. In addition, "the growth of electronic publishing has increased the urgency of establishing and effective and efficient system for evaluating scientific information" (Jefferson et al., 2002b: 2789), which compounds even more the issue of the reviewer selection problem. The question, however, remains because it is not clear who is supposed to be the best reviewer.

Reviewer selection

Journal editorial boards seem to favor younger reviewers –in their 40s rather than in their 60s– and of junior status in the academia. Kliewer at al. (2005: 1734), for instance, found that the best reviewers at the *American Journal of Roentgenology* "tend to be younger individuals from academic institutions." Black et al. (1998) made a survey of reviewers of 420 manuscripts submitted to *British Medical Journal* in 1997. While commenting that there has been little published about identifying the characteristics of good reviewers, they establish several characteristics which can be summarized as follows: young, resident in the U.S., trained in epidemiology or statistics, currently a research investigator, and having taken three hours to write the report (Black et al.,

1998: 232). When commenting on these results, however, they point to the fact that the objectively best reviewers were not producing the best reviews:

> We had expected that those actively involved in research, those occupying academic position, and member of research funding bodies would have made better reviewers than others. This was not so. (Black et al., 1998: 233)

According to Godlee et al. (1998: 238), reviewers with training in epidemiology or statistics, or experience as a peer reviewer, would be able to identify more weaknesses in the manuscripts, although this did not prove to be significant. Black at al.'s (1998: 233) conclusion was that they either did not measure relevant factors or possibly because no consistent pattern exists, and add: "there are as almost as many types of good reviewers as there are good reviews" (ibid.). However, reviewers who have published extensively themselves seem to produce better and more reliable reports.

The new reviewing process

Things, however, are changing and particularly in such fields as medicine, although it is also true that peer review "has not always successfully identified significant new work" (Piqué & Posteguillo, 2006: 656), as shown by Campanario's (2004) compilation of rejections and criticisms of manuscripts reporting Nobel-quality breakthroughs.

Authors agree that peer review needs improvement since the quality of many manuscript reviews is excellent, but in many others is far from optimal (Davidoff, 2004: 657); nevertheless, the solutions offered do not seem to satisfy everyone. Blinding reviewers as to the identity of authors decreases the rejection rate, and even more if editors make sure that no reviewer reports on any author he or she may know personally (Godlee et al., 1998: 239). In another study published in the same journal, however, Van Rooyen et al. (1998: 237) write that they found little evidence "to support current practice by blinding or unmasking to improve the quality of reviews," the advantage being, however, that "the review process is seen to be fair." In addition, it is claimed that articles published after double-blinded reviews "were more likely to be cited in future articles" (Katz et al., 2002: 1417, quoting a 1994 study by D. N. Laband & M. J. Piette of 1051 articles in 28 economic journals, published in *JAMA* 272: 147-149). Double-blind reviewing is not a generalized practice; however, it may be more transparent as Gleditsch (2002) argues. One of the drawbacks of the double-blinded system is also pointed out by Katz et al. (op. cit., 2002) when they report that in a considerable percentage (34%) of instances papers submitted to two radiology journals contained information that allowed reviewers to identify their authors or institutions; they recommend, however, that authors submitting their papers for review should take steps to avoid authors to unblind their identities and their institutions (ibid.), and thus also prevent biases.

Nevertheless, there seems to be a tendency to accept signing reviews among the medical community at large. Some feel that if reviewers are asked to sign their reviews, rejection may decrease considerably. In 1998, about 50% of reviewers did not wish to sign their reports or to have their reports made public (Godlee et al., 1998: 238). Hagan (2003) points out that the *British Medical Journal*, along with leading medical journals, in its effort to make the peer review system more transparent, is posting open peer reviews on

the Internet, along with comments from other parties. It is likely, therefore, that important journals might start to make their reviews known via official websites.

An alternative to peer review?

Rennie (1999), former *JAMA* editor, questions many areas of the peer review process as it stands today and gives a full array of opinions he has gathered from several authors. Rennie feels peer review is "unreliable, unfair," particularly if by fairness we mean "an effort to overcome partiality and bias, and the editor behaves as more than a vote counter" (p. 8); he further adds that the peer review process has no "clear standards and structure, is idiosyncratic, and open to every sort of bias" (ibid.); quoting his previous publications and several other authors (Altman, 1996; Harnad, 1996, among others), Rennie (1999: 9) also says that peer review "secrecy leads to irresponsibility, insulates reviewers from unaccountability, and invites malice."

Facing all these problems, Rennie questions the whole process by asking: "how can peer review be growing in popularity?" (p. 10). Probably because scientists and himself accept it –moralists would say– as the lesser evil of all possible existing bad methods, and agrees with most scientists in comparing it with democracy. He quotes Churchill when he spoke to the House of Commons, on 11 November 1947, about democracy: "it has been said that democracy is the worst form of government except all those other forms that have been tried from time to time" (Rennie, 1999: 10).

Campanario (2002b: 169), author of numerous papers on peer review, is rather critical of the system and points that experts may coincide in accepting an original manuscript, in requesting some changes from authors, or when they reject it, but they do this, at times, for different and even contradictory reasons. For this reason, he offers a few alternatives in an attempt to diminish the problem, namely (ibid., p. 177): open revision (authors know the identity of their referees); payment for the referees (to increase to seriousness of the evaluation process); do without referees (let the scientific community be the judge) and let the communication in the Internet do the job. In Physics, he writes, "el principal canal de comunicación es Internet y son pocos los científicos que esperan a que se publiquen los artículos en las viejas revistas en formato impreso para leerlos"; and he adds: "Si este sistema se extendiera a otros campos, la revisión por expertos podría incluso llegar a desaparecer" (ibid.).

Finally, in two of his papers, Campanario (2002a and 2002b) proposes the use of modern information technology to overcome the drawbacks of the present system. He introduces the concept of Metajournal, or a Central Facility, that could be made available to scholars who wish to make public relevant results. To this metajournal, organized by disciplines or topics, abstracts or full manuscripts would be submitted and the editorial board of a specific journal could scan the metajournal for exceptional, high impact, and innovative manuscripts. Once an extraordinary paper is located, the journal contacts the author and, in turn, the author is free to choose then the journal he wants to publish in. Figure 1 gives a visual description of the system proposed.

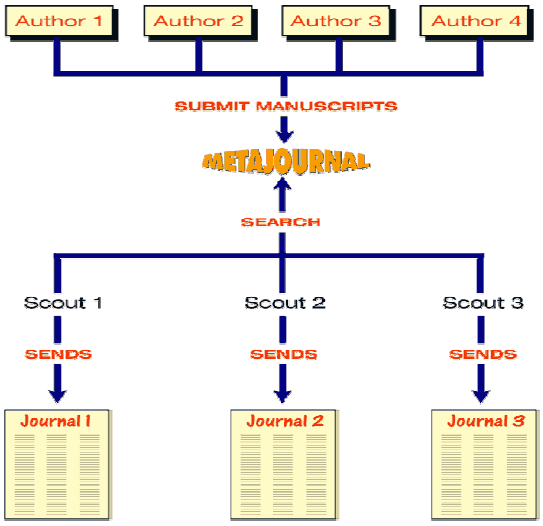

Figure 1. Central Facility of the new review process proposed by Campanario (2002b).

With this system, the figure of the "journal scout" appears and part of its mission would be to look for new manuscripts for the journal. As Campanario (2002a) adds, this metajournal could coexist with the traditional system, but the new system "would also make reviewers more accountable for their actions and commitments."

Accepting reviewers' comments and recommendations

The relationship between reviewers and authors is a very special one since it represents two sides of the same coin. From the point of view of reviewers, Myers (1990: 64) suggests that referees of scientific articles seem to be abused nearly as much as the referees of football matches. Most researchers, however, have anecdotes to offer in reference to required alterations of their texts, alterations that in their opinion would diminish the scientific value of their paper. Some authors, therefore, would prefer to react as Albert Einstein did when he is quoted as having said: "I didn't send my paper to be criticized. I sent it to be published."

Since around the 1990's, most medical journal editorialists have been focusing on promoting research into peer review (Smith, 1994, 1997; Davidoff, 1998, among others), and different suggestions on how to improve the process have been advanced. Through this research, however, we would like to provide ground to improve the review process in two complementary ways: first, by recognizing that many of the lacks of the reviewing process may be offset by implementing training courses for prospective reviewers, as some authors have suggested (Guilford, 2001; Davidoff, 2004; Schroter & Groves, 2004); second, researchers may find the whole strive for publication and, more specifically, the tough review process, less threatening if they are aware of both the strong and the weak points of having their own work evaluated by their peers.

In addition, there are some methods that candidates can use to overcome the barriers encountered in their work, such as challenging the editor's rejection, or using friends or patrons to help get published, and also submitting their manuscripts to other journals. First attempts at publishing are usually disappointing due to the potential author's lack of experience, but they must keep trying to publish despite initial refusals. Rejected

papers can also be submitted to other journals and after the initial breakthrough, they should keep publishing, often by seeking wider audiences beyond the key discipline and seek some kind of coverage in the mass media.

As members of the academia, we are constantly pressured to publish, based on the old aphorism "publish or perish." There are several means through which these difficulties can be smoothed, and persistence usually pays. Resubmitting manuscripts, following the reviewers' guidelines, should be a first step. It is a fact that many resubmissions are being published; however, the problem is that many novel authors do not resubmit. With this resubmission, a letter explaining which corrections the author has made should be included, and when the reviewers' comments are not accepted, reasons why the author does not accept them have to be given, providing complementary data or references supporting that view; in any case, these comments should always be polite, since a reviewer can afford to be blunt, but not the author.

In this process, a good advice is to be patient, since a resubmission may be peer reviewed all over again; besides, there may be contradictions between one reviewer and another, or between the first set of reviewers and the second, which is quite common. If such inconsistency exists, underline politely the fact to the editor in your final submission. Gosden (2001: 9) illustrates different categories of referees' comments, which are a good way to start one's own reflection when submitting a paper for publication. He speaks from the standpoint of a nonnative speaker of English, but the results and recommendations are worth considering by anyone. Based on his analysis of 40 referees' reports and adapting Halliday's (1985) metafunctions, Gosden categorizes revisions as follows:

> Ideational: Technical Detail (26.9%)
> Interpersonal: Claims (19.8%) + Discussion (33.8%) + References (12.5%) = 66.1%
> Textual: Format = 7.0%
>
> (Gosden, 2001: 10)

This provides an overall indication as to main areas of concern for authors submitting their manuscripts. The success will depend on balancing the ideational and interpersonal orientation of the authors' replies; the former, because it is a frequent target of criticism usually due to omission of data, the latter, because unjustified conclusions may have been included (see also Kourilova, 1996).

A further recommendation would be, therefore, to be thorough with your final revisions prior to submitting by means of revising spelling and structure, revising your bibliography and making sure all references are included in the bibliography, always following the journal's author guidelines. The abstract should also be carefully written, making sure that it unveils at least the aim and main results of your paper. As Robert Day (1988) used to say, the abstract is a miniversion of the paper and, as such, it should contain more than just a simple expression of purpose, but at least something about each of the main parts of the paper, and this will suppose a good start.

Conclusions

It is widely understood by the scientific community in general that all prospective publications must be subjected to some sort of critical evaluation, the so-called peer

review process. Mann and Schmidt (2005), while recognizing that "the process of peer-review does usually work in the end" since it "is an undisputed cornerstone of modern science," advise observers "to be extremely skeptical of any claims […] of some new «bombshell» or «revolution» that has not yet been fully vetted by the scientific community." As we mentioned earlier, medical journal editorialists keep emphasizing the need of improving the whole peer review process (Schroter & Groves, 2004; Davidoff, 2004). This latter author considers the process as a fundamental element of critical thinking; however, it is not the responsibility of editors alone, and proposes that they should "«train the trainers," rather than trying to train reviewers directly," and suggest, for promotion, tenure, and funding decisions, to take "the quantity and quality of candidates' peer reviewing into account" (Davidoff, 2004: 657). It is also worth considering those proposals for fostering and improvement of the peer review process suggesting new ideas (Davison et al., 2005) and also making aware that it is a common responsibility of the whole scientific community, namely authors, reviewers and editors.

References

Al-Marzouki, S., S. Evans, T. Marshall & I. Roberts (2005). "Are these data real? Statistical methods for the detection of data frabrication in clinical trials." *British Medical Journal* 331: 267-270.

Altman, L. K. (1996). "The Ingelfinger rule, embargoes, and journal peer review – part 1." *The Lancet* 347: 1382-6; part 2: 347: 1459-1463.

Benos, D. J., E. Bashari, J. M. Chaves et al. (2007). "The ups and downs of peer review." *Advances in Physiology Education* 31: 145-152.

Black, N., S. van Rooyen, F. Godlee, R. Smith & S. Evans (1998). "What makes a good reviewer and a good review for a general medical journal?" *JAMA* 280: 231-233.

Campanario, J. M. (1998a). "Peer review for journals as it stands today–Part 1." *Science Communication* 19,3: 181-211.

Campanario, J. M. (1998b). "Peer review for journals as it stands today–Part 2." *Science Communication* 19,4: 277-306.

Campanario, J. M. (2002a). "A new approach to make scientific journals actively compete for good manuscripts." *European Science Editing* 28,3: 78-79. Also available at www2.uah.es/jmc/metajournal.htm [24/11/2007].

Campanario, J. M, (2002b). "El sistema de revisión por expertos (peer review): muchos problemas y pocas soluciones." *Revista Española de Documentación Científica* 25,3: 166-184.

Campanario, J. M. (2004). "Rejecting Nobel class papers." Available at: http://:www2.uah.es/imc/nobel.html [accessed November 2, 2004].

Campanario, J. M: (2007) "Rejecting Nobel class articles and resisting Nobel class discoveries." Universidad de Alcalá de Henares. http://www.uah.es/otrosweb/jmc

Campanario, J. M. & E. Acedo (2007). "Rejecting highly cited papers: the views of scientists who encounter resistance to their discoveries from other scientists." *Journal of the American Society for Information Science and Technology* 58,5: 734-743.

Davidoff, F. (1998). "Masking, blinding, and peer review: the blind leading the blinded." *Annals of Internal Medicine* 128,1: 66-68.

Davidoff, F. (2004). "Improving peer review: who's responsible?" *British Medical Journal* 328: 657-658.

Davison, R., G. J. de Vreede & R. O. Briggs (2005). "On peer review standards for the information systems literature." *Communications of the Association for Information Systems* 16: 967-980.

Davo, M. del C., C. Vives & C. Álvarez-Dardet (2003). "Why are women underused in the JECH peer review process?" *Journal of Epidemiology and Community Health* 57: 936-937.

Day, R. A. (1988). *How to Write and Publish a Scientific Paper*, 3rd ed. Phoenix-New York: Oryx Press.

Dickersin, K., L. Fredman, K. M. Flegal, J. D. Scott & B. Crawley (1998). "Is there a sex bias in choosing editors? Epidemiology journals as an example." JAMA 280,3: 260-264.

Gilbert, J. R., E. S. Williams & G. D. Lundberg (1994). "Is there gender bias in JAMA's peer review process?" *JAMA* 272: 139-142.

Gleditsch, N. P. (2002). "Double-blind but more transparent." *Journal of Peace Research* 39,3: 259-262.

Godlee, F., C. R. Gale & C. N. Martyn (1998). "Effect on the quality of peer review of blinding reviewers and asking them to sign their reports." *JAMA* 280: 237-240.

Godlee, F. & T. Jefferson (Eds.) (1999). *Peer Review in Health Sciences*. London: BMJ Books.

Gosden, H. (2001). "«Thank you for your critical comments and helpful suggestions»: compliance and conflict in authors' replies to referees' comments in peer reviews of scientific research papers." *Ibérica* 3: 3-17.

Gosden, H. (2003). "«Why not give us the full story?»: functions of referees' comments in peer reviews of scientific research papers." *Journal of English for Academic Purposes* 2,2: 87-101.

Guilford, W. H. (2001). "Teaching peer review and the process of scientific writing." *Advances in Physiology Education* 25,3: 167-175.

Hagan, P. (2003). "Peer review under scrutiny." *The Scientist* 4,1 (February 3).

Halliday, M. A. K. (1985). *An Introduction to Functional Grammar*. London: Edward Arnold.

Harnad, S. (1996). "Implementing peer review on the net: scientific quality control in scholarly electronic publications" in R. P. Peek & G. B. Newby (Eds.), *Scholarly publishing. The electronic frontier*. Cambridge, MA: MIT Press, pp. 103-118.

Harnad, S. (2000). "The invisible hand of peer review." *Exploit Interactive* 5. Available at http://www.exploit-lib.org/issue5/peer-review/ [20/11/2007].

Jefferson, T., P. Alderson, E. Wager & F. Davidoff (2002a). "Effects of editorial peer review. A systematic review." *JAMA* 287: 2784-2786.

Jefferson, T., E. Wager & F. Davidoff (2002b). "Measuring the quality of editorial peer review." *JAMA* 287: 2786-2790.

Katz, D. S., A. V. Proto & W. W. Olmsted (2002). "Incidence and nature of unblinding by authors: our experience at two radiology journals with double-blinded peer review policies." *American Journal of Roentgenology* 179: 1415-1417.

Kliewer, M. A., K. S. Freed, D. M. DeLong, P. J. Pckhardt & J. M. Provenzale (2005). "Reviewing the reviewers: Comparison of review quality and reviewer characteristics at the *American Journal of Roentgenology*." *American Journal of Roentgenology* 184: 1731-1735.

Kourilova, M. (1996). "Interactive functions of language in peer reviews of medical papers written by non-native users of English." *Unesco ALSED-LSP Newsletter* 19,1: 4-21.

Lawler, A. (2006). "Universities urged to improve hiring and advancement of women." *Science* 313: 1712.

Lindsey, D. (1978). *The Scientific Publication System in Social Science*. San Francisco: Jossey-Bass.

Link, A. M. (1998). "US and non-US submissions. An análisis of reviewer bias." *JAMA* 280: 246-247.

Lock, S. (1986). *A Difficult Balance: Editorial Peer Review in Medicine*. Philadelphia, PA: ISI Press.

Mann, M. & G. Schmidt (2005). "Peer review: a necessary but *not* sufficient condition." *Real Climate* (20 Jan.). Text from a blog available through the Internet at: http://www.realclimate.org/index.php?p=109 [28/11/2007].

Myers, G. (1990). *Writing Biology. Texts in the Social Construction of Scientific Knowledge*. Madison: The University of Wisconsin Press.

Olson, C. M., D. Rennie, D. Cook et al. (2002). "Publication bias in editorial decisión making." *JAMA* 287: 2825-2828.

Piqué-Angordans, J. & S. Posteguillo (2006). "Medical Discourse and Academic Genres," in K. Brown (Ed.), *Encyclopedia of Language and Linguistics*. Oxford: Elsevier, vol. 7, pp. 173-81.

Rennie, D. (1999). "Editorial peer review: its development and rationale" in Godlee & Jefferson (Eds.), pp. 1-13.

Salager-Meyer, F. (1999). "From «Mr. Guthrie is profoundly mistaken ...» to «Our data do not seem to confirm the results of a previous study on ...»: A diachronic study of polemicity in academic writing (1810-1995)." *Ibérica* 1: 5-28.

Schroter, S. & T. Groves (2004). "BMJ training for peer reviewers." *British Medical Journal* 328: 658.

Smith, R. (1994). "Promoting research into peer review." *British Medical Journal* 309: 143-144.

Smith, R. (1997). "Peer review: reform or revolution?" *British Medical Journal* 315: 759-760.

Smith, R. (1999). "Opening up *BMJ* peer review. A beginning that should lead to complete transparency." *British Medical Journal* 318: 4-5.

Swales, J. M. (1996). "Occluded genres in the academy" in E. Ventola & A. Mauranen (Eds.), *Academic Writing*. Amsterdam: John Benjamins, pp. 45-58.

Symonds, M. R. E., N. J. Gemmell, T. L. Braisher et al. (2006). "Gender differences in publication output: towards an unbiased metric of research performance." *PLoS ONE* (Public Library of Science) 1,1: e127.

Van Rooyen, S., F. Godlee, S. Evans, R. Smith & N. Black (1998). "Effect of blinding and unmasking on the quality of peer review." *JAMA* 280,3: 234-237.

Wager, E., E. C. Parkin & P. S. Tamber (2006). "Are reviewers suggested by authors as good as those chosen by editors? Results of a rater-blinded, retrospective study." *European Science Editing* 32,3: 61-64.

Wager, L. (2006). "The blinded leading the blinded." *European Science Editing* 32,1: 13-14.

Weber, E. J., P. P. Katz, J. Waeckerle & M. L. Callaham (2002). "Author perception of peer review." *JAMA* 287: 2790-2793.

Weller, A. C. (2001). *Editorial Peer Review: Its Strength and Weaknesses*. Medford, NJ: American Society for Information Science and Technology.

Posteguillo Gómez, S., J. Piqué-Angordans & N. Edo Marzá (2008). "The peer review process in medical research: positive and negative effects on scientific advancement". *The Language of Health Care. Proceedings of the 1st International Conference on Language and Health Care. 24-26 October, 2007*. Alicante: IULMA, Universitat d'Alacant (CD-ROM ed.).