(i) Title:
Peer Review: Consensus and Contradiction, a Qualitative Approach

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Manuscript Peer Review

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Abstract

Manuscript peer review is considered crucial to the selection and publication of quality scientific research, however, the practice is being increasingly challenged as a non-standardized process of unknown scientific validity with substantial weaknesses. Scientific disciplines appear to be confronted by a process of limited efficacy, resistant to rational maneuvers for its improvement, which yet continues to receive strong support from its practitioners. When a practice's efficacy in achieving its goals is questionable and yet the practice persists, questions of its social functions arise which can only be addressed by qualitative research. This paper describes a normative model of peer review based on a qualitative profile of the attitudes of 72 peer reviewers towards the practice of manuscript peer review (obtained from extensive structured interviews). Masked by consensus amongst respondents about methods and goals were concerns centering on a series of contradictions inherent in the process. While at a practical level peer review was seen by respondents as a triage exercise, it was, at the same time, on a social level, valued as a mode of disciplinary discourse, important not only in the production of disciplinary knowledge, but also in the construction of the disciplinary identities of those who labor to bring that knowledge into being, i.e., the peers.

Peer Review: Consensus and Contradiction, a Qualitative Approach

Background

Peer review is held to be the prime means by which the scientific community confers validity on disciplinary knowledge.

> There is no process more central to the institution of science than that of peer review…. Central to the process of doing science is the belief that only peers can judge the quality of the scientific enterprise. Institutional science is totally reliant on this notion. (Higgins 1990, 634)

Emanuel, addressing manuscript peer review within medicine, sets out the standard defense of the process:

> We believe that the most important feature of the peer review role that garners its special standing is this: it provides the self-regulation component that is the *sine qua non* of medical professionalism. In medical peer review journals, peer reviewers are asked to evaluate in a fair-minded fashion the quality of a study using accepted biomedical research and clinical standards. Two aspects to this role are essential: impartial judgment and use of the accepted standards for evaluation that the profession endorses….. Why is self-regulation so important in professionalism?.... [O]ur view is that the foremost reason is that the profession holds a unique social mandate to altruistically use important expertise that is not more available or reliable anywhere else in society. Because this expertise is

> potent and because it is used among people rendered vulnerable by illness, society needs assurances that this expertise is to be used only in the setting of a protective value system with identified goals of patient care. The supreme mandate to professionals to 'above all do no harm,' in the end depends on impartial evaluation of potential knowledge by medical professional standards. (2005, 2559)

However, peer review has been challenged as a non-standardized process of unknown scientific validity with substantial weaknesses (Callaham 2002, 313; Judson 1994, 92; Locke 1993, 382; Smith 2006, 178; Wager 2001, 257). The effectiveness of peer review has been called into question in medicine and in the social, physical and biological sciences (Cicchetti 1980; 300; Groves 2006; Ingelfinger 1974, 686; Scott 1974, 698). Research on the sensitivity, specificity and reliability of manuscript peer review has yielded disappointing results. (Abby 1994, 105; Finn 1986, 14; Lock 1991; Gillespie 1985, 44; Nylenna 1994, 149; Pierie 1996, 1480; Schulman 1994, 154). Several studies suggest that reviewer agreement about the merits of any particular article is little better than would occur by chance (Cole 1981, 881; Rothwell 2000, 1964; Scharschmidt 1994, 1877). There are concerns about the fairness of peer review, its lack of reproducibility, its costs and its inefficiencies (Goodman 1994, 11; Higgins 1990, 634; Overbeke 1999, 32; Siegelman 1991, 637).

Improving the process of peer review has thus been taken on as a major task by journals and journal editors. Much of this effort focuses on improving the reliability and quality of reviews by improving the selection and training of reviewers However, such attempts have yielded mixed and, again, disappointing results (Baxt 1998, 310; Black 1998, 231; Callaham 1998, 318; Callaham 2002, 323; Callaham 2002, 313; Evans 1993, 422; Fontaine 1995, 259; Garfunkel 1990, 1369; Jefferson 2002, 2786; Kliewer 2005,

1731; Norman 1998, 158; Schroter 2004, 637; Strayhorn 1993, 947; Stossel 1985, 658). We appear to be confronted by a process of limited efficacy, resistant to rational maneuvers for its improvement, which yet continues to receive strong support. Jefferson points out that: 'Despite lack of evidence [for its effectiveness], peer review is well established in most academic disciplines. It is therefore possible that peer review is retained for different reasons than those stated' (2002, 2784). In situations where a practice's efficacy in achieving its stated goals is questionable and yet the practice persists, questions should arise.

In the case of manuscript peer review, the mechanics of review are given in journals' instructions to reviewers and there is no lack of editorial comment stipulating what peer review *ought* to be (Arrington 1995, 249; Groves 2006, Rennie 1998, 300; Smith 2006, 178; Wager 2001, 257). However, it is not known to what extent the formal goals and methods advocated by journals are accepted by reviewers, nor what reviewers' attitudes, values and beliefs are towards these—the extent to which they coincide and the ways in which they differ. This paper describes a normative model of peer review based on a qualitative profile of the values, beliefs and attitudes of peer reviewers. That is, it describes a model of peer review as it is conceived of by peer reviewers in an attempt to discern where the effects and effectiveness of the process are thought to reside.

Method

Seventy-two experienced manuscript reviewers at the *Annals of Emergency Medicine* participated in a semi-structured telephone interview focusing on reviewer attitudes towards and beliefs about the practice of peer review. *Annals of Emergency Medicine* is the leading journal in the specialty of emergency medicine and ranks in the

top 11% among 5,876 science and medical journals listed by the ISI in frequency of citations (Journal 2005). *Annals* has a pool of 487 active reviewers. The sample used in this study was limited to those reviewers who had completed at least five reviews in the past two years and was stratified to represent a broad cross section of quality of reviews, years of experience, academic rank, and other characteristics thought relevant to review quality.[1] Of the 107 subjects contacted, 72 responded and all 72 were interviewed. The forty-minute interviews were directly transcribed by the interviewer and recorded on tape. Subject responses were coded and categorized using grounded theory to produce a qualitative profile of reviewers' beliefs about peer review (Clarke 2005; Glaser 1998; Strauss 1990). Descriptive statistics were generated with the use of the Statistical Package for the Social Sciences (SPSS) software program. The average number of reviews done per year per reviewer for the *Annals* was 6 (median, 6; SD, 3.2). However, 86.8% (59/68) of reviewers reviewed for other journals, so that the average total number of reviews done per year was 13 (median, 12; SD, 6.69) with a minimum of 2 and maximum of 45. This average of 13 reviews per year coincided with reviewers' assessment of 10 to 12 reviews as an appropriate number of reviews to do per year. The mean number of years that respondents had been reviewing was 9.33 (median, 7; SD, 4.77) with a range of 2 to 20 years. This particular reviewer population has been well studied in the past and has performed similarly to journal reviewers in other specialties (Baxt 1998, 310; Callaham 1998, 318; Callaham 2002, 323; Callaham 2007).

Results

I. Consensus: Practices & Principles

[1] Though there was a high response rate, we speculate that reviewers who did not bother to respond might also be less experienced and less capable reviewers, and thus this study population may under-represent the opinions of that group.

A. Practices

The respondents in this study demonstrated a high degree of consensus in their descriptions of their actual practice of review, which, perhaps not surprisingly, mirror prescriptive instructions set out by journal editors (Arrington 1995, 249; Ingelfinger 1974, 686; Jefferson 2002, 2784; Rennie 1998, 300; Smith 2006, 178; Wager 2001, 257). The majority of reviewers (92%) read each manuscript two or three times, usually in two or three separate sittings. A typical pattern consisted of:

> 'I read it through once, writing on it. Set it aside for a couple of days, then read it through again more slowly, doing a line by line reading, making detailed comments. Set it aside again for a couple of days, then come back and look at general things and write my comments to the editor and author'.[2]

The first read was described as a quick pass to get a general idea of what the research is about and to determine whether or not they feel comfortable reviewing it. The second read was to pick up and comment on 'big picture' items, looking primarily for major errors. The third pass was a detailed line by line critique commenting on errors that require fixing and giving suggestions for correction when possible. The third pass was also used as an opportunity to revise the reviewer's initial impression if necessary. The most significant variation in practice was the amount of time spent doing the review. The mean time reviewers say they spent doing a typical review was 3 hours 35 minutes, however the range was from 1 to 10 hours (median 3, SD 2.05). The following composite description of the process of doing a review is also a typical description:

ABSTRACT
- 'What is the manuscript about?'
- 'Is it in my area of expertise?'

INTRODUCTION
- 'Is it concise?'
- 'Does it tell you what the study is about?'
- 'Does it make you interested in the study?'

HYPOTHESIS
- 'What is the study question?'
- 'What are the stated goals of the study?'

[2] All such quotes are taken directly from the interview material.

'Does it answer the 'So what?' question?'

METHODOLOGY / STUDY DESIGN

'Is the study design valid and the methodology appropriate?'

RESULTS

'Are the results self-explanatory and clearly presented?'

DISCUSSION

'Does the discussion deal with the data as it is presented?'

'Does the discussion place the study within the relevant literature?'

CONCLUSION

'Does the conclusion answer the question that was asked in the hypothesis?'

'Have the stated goals been accomplished?'

'Is the conclusion supported by the results?'

'Does the conclusion avoid overreaching extrapolation?'

GRAPHS / TABLES

'Are graphs and tables clear and comprehensible?'

CITATIONS

'Are all the important articles about the subject mentioned?'

Most respondents (96%) stated that they prefer to print out the manuscript and work off of a hard copy, making marginal notes on that hard copy. They then go on to formulate a list of bullet points from the marginal comments. These are then transposed to computer, at the same time turning the bullet points into narrative. The resulting notes are used to compose the letter to the editor and comments to the author. The letter to the editor is usually written first and typically consists of a short summary of the paper to show the editor that the reviewer understands what the paper is about. This is followed by a statement about the importance of the research, its clinical and scientific interest, then a list of major strengths and flaws. Forty nine percent of respondents then give a recommendation to publish or not to publish and reasons for that recommendation. The letter to the author is then written as a revision of the editor's letter, however, the language is usually reconfigured less judgmentally and more constructively. A typical letter begins with positive points, then goes on to outline major concerns and then a detailed line by line critique. [3]

[3] It needs to be kept in mind when assessing interview material about any practice that what respondents say they do does not of necessity (in fact seldom does) correspond to

Though reviewers indicated that they seldom discuss manuscripts with anyone else, in obedience to instructions from the journal on the importance of confidentiality, only 43% of reviewers said that they *never* have such discussions. The most common reasons given for discussing a manuscript with a colleague were: the clinical or scientific content was outside the reviewer's area of expertise, there was a methodological or statistical problem that the reviewer did not feel competent to handle, the manuscript demonstrated a good teaching point, or the research was exceptional, that is, exceptionally good or exceptionally bad.

B. Principles

Respondents indicated that, in principle, the peer review process should be:

1) *Effective* - promote therapeutic progress by improving the quality of research published (74%).[4]

2) *Sensitive and Specific* - insure that important research is published and poor research is not published (59%).

3) *Fair* - objective and unbiased (28%).

4) *Efficient* - timely for the author (22%) and time well-spent for the reviewer (21%).

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what they actually do. To determine how closely statements about practice and actual practice correspond would require a series of detailed observational ethnographies.

[4] Percentages quoted are the percent of subjects offering a response that falls within that particular reviewer-generated category of response. It is not a percentage of the total number of responses as questions were open ended and so multiple responses to questions were generated. Thus, when asked "What are the desired characteristics of a journal's peer review process?", the fact that 74% stated that the process should be effective should not be taken as indication that 26% believed the opposite, i.e., that it should be ineffective. Rather, all such a figure indicates is that 74% of respondents mentioned effectiveness as one of the desirable characteristics of a peer review process.

To achieve those goals, reviewers described the desirable attributes of manuscript, review, reviewer and process:

i) The Manuscript:

The research evaluated should have:

- sound study design / methodological rigor (87%),
- be clinically relevant (66%),
- well-written (43%) and
- original (22%).

ii) The Review:

The review should be constructed as

- instructive (74%), i.e., provides the author with useful advice for improving the manuscript) and
- evaluative (34%), i.e., provides the editor with direction about publication.

The review should

- identify major weaknesses (58%), yet
- present its criticism in a constructive manner (44%).

iii) The Reviewer:

The ideal peer reviewer is:

- knowledgeable about the subject area (54%),
- thorough (46%),
- possessed of research experience (41%)
- methodological expertise (31%),
- fair (28%), and
- skilled in critical evaluation (21%).

These characteristics were thought to be secured through the selection, education and retention of a pool of quality reviewers. Review skills were believed to be improved through experience and training, but most especially through feedback from editors.

iv) The Process:

The majority of respondents (87%) believed that the peer review process does, for the most part, accomplish what it sets out to do, which they described as filtering out poor research and improving the accuracy, clarity and utility of the research that does get published. Reviewers described the following weaknesses in the peer review process:

- potential for bias (40%),
- poor sensitivity—it fails to publish important research that should be published (24%),
- poor specificity—it allows poor research into the literature (14.7%),
- lack of timeliness (22%).[5]

Suggestions for improvement of the process were:

- increase the value of peer review in academic performance evaluations (50%),
- increase feedback from editors (43%),
- improve the reviewer selection process (25%) and
- provide more reviewer training courses (13%).

Respondents' declared motivations for and rewards from reviewing mapped closely onto each other, falling into four major categories:

[5] In this particular journal, this was considered less of a problem since the journal's implementation of electronic submission and review.

- fulfillment of duty to specialty and to peers (as a motivation 71% / as a reward 59%)
- skills acquisition (65% / 60%)
- career advancement (33% / 28%)
- personal satisfaction (24% / 26%)

Despite criticism of weaknesses in the process and suggestions for improvement, the agreement between motivation and reward appears to indicate that the process meets reviewers' expectations and this is supported by the previously mentioned 87% of respondents who believe that the peer review accomplishes what it sets out to do. Eighty-two percent of respondents stated that they found the rewards offered by the process sufficient recompense for their participation in it. Though respondents recognized weaknesses in the process, nevertheless, peer review was commonly justified as ‘better than any of the alternatives’.

The above quantitative assessment describes, at least in part, a normative model of peer review as a conventional practice with high levels of consensus and satisfaction amongst its practitioners. However, qualitative material from the interviews tells a somewhat a different story.

II. Contradictions

The close consensus amongst respondents on the conventional model of peer review and their stated satisfaction with it masked a set of concerns about which they also expressed strong consensus. The anxieties of reviewers were based not on disagreements about the methods, criteria and aims of the process but on certain contradictions inherent in its practice, which were seen as complicating its operations and outcomes. These contradictions, as defined by respondents, had to do with:

- the job of the reviewer,

- the goals of review,

- the structure of the process, and

- the motivations and rewards of reviewing.

1) The Job of the Peer Reviewer: Censor / Mentor

Respondents saw the peer reviewer as having two important tasks: instruction and evaluation.

> 'Triage and instruction are important. My job is the first: my duty is the second. My job is to filter what gets published. My duty is to improve the world of research both published and performed.'
> 'Generally, a competent reviewer should be able to come to a decision over whether the paper is basically valid and relevant enough to publish…. It's no good just saying that something is good or bad, but you should be able to say why, so the author can correct it.'
> 'The manuscript review has multiple missions: Trying to help the author but also to determine if the manuscript is any good.'

As an evaluative exercise, peer review was described as a form of triage—selecting submissions for publication by filtering out incorrect or inadequate work. Peer review should prevent poor research from being published. This triage or censoring function was seen as being exercised in service to scientific progress, therapeutic efficacy and disciplinary validity.

> 'Peer review shapes the direction of research…. directing it along more fruitful lines… it's part of my responsibility—to insure that the academic literature is rigorous and current.'
> 'Review is a screening tool. Want the regular emergency doc to be able to read the manuscript once and walk away with useful information.'
> 'It identifies manuscripts that advance the specialty.'

In terms of its instructional function, respondents believed that a good review should improve the accuracy, clarity and utility of published research. In providing the author/researcher with concrete suggestions for improving the manuscript, the reviewer

was described as a mentor, not only helping improve that manuscript but also helping improve the performance of the individual researcher.

> 'I used to be more concerned with criticizing the manuscript, picking out reasons not to publish, now I try more to help the author improve the manuscript.'
> 'Even if the paper doesn't get published, the review should help improve the skills of the researcher.'

Though respondents perceived instruction and evaluation to be complementary, and not mutually exclusive, there was much discussion over the difficulty of balancing the roles of mentor and censor. The tasks of instruction and evaluation and the roles of mentor and censor were seen as arising out of the dual purpose of peer review: assistance in the production of good research and prevention of the dissemination of poor research.[6]

2) The Goals of Review: Poor Research / Good Research

Concerns were expressed that peer review often failed at exercising selectivity for poor papers and sensitivity for important research, i.e., poor research is getting into the literature and important research is being overlooked. Good research was primarily valued as improving therapeutic efficacy (disciplinary practice), whereas poor research was more frequently seen as a threat to the validity of disciplinary knowledge (disciplinary status). Though, vice versa, good research was recognized as strengthening disciplinary knowledge and poor research as a threat to patients, that was not, for the most part, how concerns over good and poor research were expressed.

[6] It might be noted that these tensions are rooted in peer review's historical development. Peer review evolved out of, on the one hand, government control and censorship of scientific publication in the 17th century and, on the other, the increasingly collaborative production of scientific knowledge in the 18th (Biagioli 2002, 20; Shapin 1987, 417). The result being that from its inception the process has had the dual duties of preventing the dissemination of poor research and assisting in the production of good research, the review the tasks of evaluation and instruction, and the peer reviewer the roles of censor and mentor.

The problem of poor research slipping into the literature is a particular concern of editors:

> One trouble is that despite this system, anyone who reads journals widely and critically is forced to realize that there are scarcely any bars to eventual publication. There seems to be no study too fragmented, no hypothesis too trivial, no literature citation too biased or too egotistical, no design too warped, no methodology too bungled, no presentation of results too inaccurate, too obscure, and too contradictory, no analysis too self-serving, no argument too circular, no conclusions too trifling or too unjustified, and no grammar and syntax too offensive for a paper to end up in print. (Rennie 2002, 2759)

Reviewers, however, appear to be more concerned that innovative research is being 'strangled in its cradle'. They worry that ideas that are unusual or methods that are different are likely to be either misunderstood or undervalued by at least one reviewer on a panel. The review process was described by respondents as having an inherently conservative tendency, privileging the status quo and thus impeding scientific progress and therapeutic innovation.

> 'There is a danger of good work being stifled rather than encouraged.'
> 'There is an inherent timidness in the process…. stifles avant-garde science and takes the joy out of research.'

There is ample evidence in the literature that peer review occasionally falls down on both counts: on the one hand, disseminating poor research by failing to identify major errors and, on the other, failing to recognize important advances (Baxt 1998, 310; Wager 2001, 257; Nylenna 1994, 149; Locke 1993, 382). The point here is not to prove or disprove claims about the sensitivity and specificity of peer review, but rather to indicate that the

sensitivity / specificity issue is a tension inherent in the process over which reviewers express considerable concern.

3) The Structure of the Process: Triage / Collaborative Dialogue

i) Triage: Checks and Balances

Respondents believed the validity of peer review to be guaranteed by the objectivity of the reviewer and the fairness of the process. Both personal bias (disciplinary politics, conflicts of interest, petty jealousies) and selection bias (arbitrariness or favoritism in the selection of reviewers and constitution of review panels) were considered possible problems. Personal bias was seen as being countered by the ethics of the individual reviewer and by blinding. As imperfect as most respondents claimed blinding to be, nevertheless, the majority (73%) maintained that the review process should continue to be blinded. The most common argument made in favor of blinding was that it prevents knowledge of provenance from influencing judgment. The most common reasons given for discontinuing blinding were that open review would make possible a more direct dialogue between reviewer and author leading to improvement of the manuscript, and that reviewers' awareness that their names would be known might increase accountability and temper the 'tone' of reviews, that is, decrease the incidence of 'mean-spirited' reviews.

Distinct from insuring the objectivity of individual reviews, respondents believed that the fairness of peer review as a process is determined less by blinding or individual ethics than by the corporate structure of the review panel.

> 'I think the validity of the review process operates more at the level of…. assembling the right team of reviewers. Each reviewer brings his own view to the article. It is not good to have a team of reviewers with all the same abilities and strengths.'
> 'Each reviewer has their own strengths – so there is a variety of talents working to improve the quality of the research.'

A balanced review team made up of qualified individuals with a range of knowledges and skills was thought to increase the probability of producing a fair decision about publication. However, there was concern that such balance might be compromised by selection bias. Selection bias was seen to operate at two levels:

a) Reviewer pool - the selection of researchers to become part of the journal's reviewer pool.

b) Review panel - the selection of a panel of reviewers to review a particular manuscript.

Concerns expressed over selection bias at these two levels appeared to be paradoxical:

a) Reviewer pool – The concern was too much variation in the quality of reviewers in the reviewer pool.

> 'There is a lot of individual variation between reviewers. As an author it's luck of the draw who you get as a reviewer.'
> 'Journals should… be more selective about who they ask to review.'

b) Review panel – The concern was too little variety in the viewpoints of reviewers on the review panel.

> 'The *Annals* seems to use the same reviewers all the time. I suppose because the specialty is so small. I think there's a danger in this, in that it could lead to the only a certain type of research being published.'
> 'Need broader pools of reviewers. Need to go beyond the usual sets of reviewers to increase the richness of the pool.'

Thus, on the one hand, the requirement for a large pool of reviewers was seen as resulting in the recruitment of reviewers with inadequate skills, producing unacceptable variation in the quality of the reviews. On the other, there was equal concern that if review panels were drawn from too small a group of reviewers, reviews would become too uniform with the same type of manuscripts being published and the same type rejected. Unsurprisingly, when respondents were asked how they would improve the peer review process, recommendations for improving reviewer selection involved both narrowing and broadening the pool of reviewers.

Overall, respondents described a system where the fair assessment of a manuscript depends upon the right mix of ethical reviewers whose range of expertises and skills complement each other, canceling out individual ignorances and biases. Though the ultimate goal of the process was seen as being agreement on what constitutes valid science, the process was thought to maintain its internal validity through the review panel's potential for disagreement. In agreement with this, peer review was explicitly described by many respondents as a system of checks and balances. Such a system was seen as requiring a degree of separation of authorial, review and editorial functions, achieved through a combination of blinding and multiple, independently generated reviews. The most frequent analogy used by respondents when discussing both the strengths and weaknesses of the process was 'democracy'.

> 'Peer review is like democracy… Like the American system it's not perfect but it is the best thing we have.'

ii) Collaborative Dialogue: The Importance of Feedback

A desire for, but problems with, more effective reviewer to author dialogue was made evident in respondent attitudes towards blinding. While most respondents supported blinding (73%) and shied away from constructing reviewer to author feedback as a direct encounter, the majority also believed that the most important function of peer review is to give feedback to authors so as to improve the submitted manuscript, improve the researcher's skills and provide encouragement. In their discussion of the instructive work of the review, respondents often presented themselves not merely as judges of research but as co-participants in it, placing the reviewer in a collaborative position within the research enterprise. The literature supporting open review makes the case for what has been labeled 'dialogic collaboration' (Fontaine 1995, 259; Groves 2006; Hunter 1995, 265; Jefferson 2002, 2784; Justice1998, 240).

Respondents, in their strongly expressed concerns about defects in feedback, conveyed a desire for a more effective system of dialogue. Two issues involving feedback arose repeatedly in the interviews:

- condemnation of feedback from reviewers to authors in the form of the 'mean-spirited' review, and
- frustration at a perceived lack of feedback from editors to reviewers.

These concerns over feedback surfaced in multiple places in the interviews—in discussions of reviewer skills, training, evaluation, motivation and reward, in assessments of the relations between editors, reviewers and authors, and in recommendations for improvements to the process.

a) Reviewer to Author Feedback: Tone

The big concern related to reviewer to author feedback was the issue of the 'tone' of reviews. This concern has been noted by other authors (Fontaine 1995, 259; Siegelman 1991, 637).

> 'Some reviewers have a real mean streak in them….I was getting reviews back that were mean-spirited and not helpful in terms of fixing the manuscript…. It motivated me to improve my own reviewing skills.'
> 'Certain journals include derogatory comments in the letter to the author – authors need to believe in themselves and this kind of behavior doesn't help'.
> 'Sometimes the reviews are so intimidating they discourage good authors from getting published.'
> 'I want to give authors good reviews that are helpful. I have received reviews that I felt were unprofessional with aggressive, poisonous language that has no place in review comments'.

This concern over reviews that were mean-spirited, arbitrary or hypercritical was raised in other key areas in the interview, as when respondents discussed how their reviews had changed over time and ways of improving the peer review process. A not uncommon narrative of reviewer development over time involved a progression in reviews from commentary that was necessarily vague due to reviewer inexperience,

through a period of hyper-critical critique as skills were acquired, on to a more constructive analysis focused on assisting the author.

> 'When I first started I didn't have a focused method. I just gave vague impressions. Then I evolved into a devil's advocate type role – really picking apart and criticizing manuscripts. But now I try to be more supportive – I try to make the manuscript as good as possible. It's like working with a colleague to make the manuscript better…. My overall approach is no longer just to pick the study apart and show what is wrong – I've moved beyond that – to a more productive attitude – I'm no less critical but I do it in a different way.' [7]

b) Editor to Reviewer Feedback: Content

At this journal, editorial feedback to the reviewers occurs in the form of the editor's letter to the author to which reviewers have electronic access and the review quality score.[8] However, the helpfulness of these in improving reviewer skills was considered limited.

> 'I'm interested in knowing what the final disposition of the manuscript is and whether the editor agrees with me or not, but I can't say I learn much from the editor's letter to the author. I would prefer a direct assessment of my review by the editor.'
> 'What would be more helpful would be specific comments by the editor about the review. Constructive criticism. What I did good on, what I did bad on.'

When asked how they would improve the peer review process, respondents' most frequent recommendation was for the same type of detailed feedback on their reviews that they themselves give on the manuscript, that is, editorial comment on strengths,

[7] Given the almost universal condemnation of the mean-spirited reviewer, one wonders who it is that is writing these negative reviews. Reviewers not contacted by this study? Or is what appears to be a detailed, conscientious critique when given as a reviewer read as mean-spirited when received as an author? This question was not explored in these interviews.

[8] For over fifteen years every review at this journal has been rated for quality by an editor based on a predefined 5 point score (Callaham 1998b, 229; van Rooyen et al. 1999, 625). Reviews rated 1 or 2 are unsatisfactory, 3 satisfactory, 4 superior and 5 outstanding.

weaknesses and means of improvement.[9] Direct editorial feedback to reviewers about their reviews was, with few exceptions, perceived as being insufficient. Though, respondents' comments about lack of feedback were frequently framed in the language of pedagogy, there was a distinctly emotional quality to many complaints.

> 'Most of us want to do a good job and more guidance would be welcome and encouraging.'
> 'I have asked for feedback from editors – I feel that I'm on my own.'
> 'I would love to have insight from editors as to what they consider a good review…. I don't know because no one has ever told me.'

c) Reviewer to Reviewer Feedback: Dialogue

Reviewers at this journal also have electronic access to the other reviewers' reviews of any manuscript they have reviewed. Respondents claimed that access to other reviewers' reviews was the most effective means of skills acquisition. The importance of reviewer-reviewer dialogue was emphasized in comments about the utility of and satisfaction gained from reading these reviews.

> 'The more you are involved in a discussion and able assess your own reviews against other people's comments, the better. It allows you access to other people's thought processes.'
> 'Reviewing is quite isolated. Often don't know where one stands. Not a lot of interaction – so it is useful to see what others are doing.'

The value placed on peer dialogue and its role in skill improvement was also evident in reviewers' comments about participation in 'crossover' activities such as journal clubs, grants and IRB committees. Respondents placed emphasis on the opportunities that the committee format opened up for dialogue between peers.

> 'Grant review committees involve interactional feedback. It's a collaborative process which helps improve skills.'

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9 A previous study on editorial feedback looked at the effect of apprising reviewers of their review quality scores. That study indicated that such feedback had little, if any, effect on performance (Callaham 2002, 2781). Other studies have also questioned the efficacy of feedback to both researchers and reviewers (Goodman 1994, 11; Higgins 1990, 634; Pierie 1996, 1580).

> 'Grant review and research committees are very useful as everyone reviews the same material and you get to discuss it with a group of people.'

They claimed that their ability to engage in dialogue produced better reviews than individual critique.[10] The use of manuscripts as teaching tools for residents and fellows was also seen as another means of establishing a dialogue between peers around scientific work.

4. The Motivations and Rewards of Reviewing

As mentioned previously, respondents' perceptions of the motivations for and rewards of peer review coincided closely. Motivations and rewards fell under the categories of skills' acquisition, career advancement, responsibilities to peers and discipline, and personal satisfaction. These, in turn, might be seen to reflect two general categories of duty:

i) Duty to self: satisfied in the improved knowledge and skills gained by reviewer, and in career advancement.

ii) Duty to others: satisfied by fulfilling the reciprocal obligations to one's peers and to the discipline that structure the process of peer review.

i) Duties to Self: Self-Improvement

a) Skills Acquisition and Training

Skills acquisition was the most frequently cited reward and second most frequently cited motivation for participating in peer review. The acquisition of *review skills* was valued not just for their own sake but even more because the acquisition of such skills was believed to lead to improvement of the reviewers' own *research skills*. Respondents asserted that skills were primarily acquired 'on-the-job'. Three modes of

[10] However, again, there is little evidence that participation on such panels significantly improves review quality (Callaham 1995, 164; Callaham 2007; Stossel 1985, 658).

on-the-job experience were deemed useful in the production of a competent peer reviewer: research experience, clinical experience and review experience. Experience doing research (41%) was mentioned twice as often as clinical experience (18%) and clinical experience twice as often as experience in doing reviews (9%). Experience doing research encompassed not just the active production of research by the reviewer but also the reviewer's experience of the review process as an author (see following).

> 'They [reviewers] should be someone that does research themselves – whose been on the other end and received reviews and had to modify their work. It helps you see how the whole system is put together.'

Eighty-one percent of reviewers had some formal training in peer review in the form of in-house workshops, seminars or as part of a residency, fellowship or advanced degree. However, the usefulness of such training was thought to be primarily in introducing junior reviewers to the process of review and that workshops, etc. were of decreasing utility once experience was gained. This was reflected in the low priority given to formal training in a number of areas: only 7% of respondents cited training as contributing to the competence of a reviewer, 13% suggested that more courses for reviewers might be a way of improving the peer review process, and 21% recommended training courses as a form of reward. Of interest, in terms of the progression from competence (7%) to reward (21%), was a point made by a number of respondents: that workshops, while communicating information, functioned as occasions for dialogue with other reviewers, editors and 'leaders in the field'.

> 'At our retreats we will discuss difficult manuscripts and it's very useful to get in a dialogue with the editors and see how they look at a review'
> 'The training sessions exposed reviewers to leaders in the field… helped communicate attitudes, and helped improve morale.'

Workshops were thus valued, at least by some reviewers, as not merely vehicles for skills acquisition but as motivational. They were seen as motivation and reward by giving

reviewers access to increased dialogue with respected peers and editors. A not infrequent theme in a number of spots in the interviews was the importance of the 'collegial' aspects of peer review.

> 'I gain in the collegiality of meeting people in the discipline…. It is also good for networking. It gives me contacts for doing my own research. I get to know who the experts are and how to access them. You end up knowing the players as well as the literature'. [11]

b) Career Advancement:

Career advancement held third place (after duty to others and skills acquisition) as both motivation and reward. A concern stated by 50% of the respondents was the low weighting given peer review by academic departments in performance assessments (upon which career advancement is based).

> 'More weight should be given to doing reviews by academic departments when they are promoting people…. As a division chief, I have difficulty in getting faculty motivated to review. They say, 'I get to put a line on my CV, but it doesn't really help me.' There needs to be more academic recognition, more points given in the advancement process for doing reviewing.'

Respondents argued that peer review merits increased weighting not merely as a service to the profession but as an effective mode of professional development—improving knowledge and skills by keeping the physician on top of recent clinical and scientific developments and by fostering good research and critical skills. Peer review was also thought to improve teaching skills, as the skills learned in the practice of peer review might then be passed on to interns, residents and colleagues. Other authors have made convincing arguments for review as a form of scholarship and thus worthy of increased recognition by academic departments (Emanuel 2005, 2559; Hesse 1995, 254).

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[11] Such comments suggest that training seminars, whose effect on review quality remains difficult to prove, might also be examined as motivation and reward and for their possible effects on reviewer satisfaction, retention and the character of the larger disciplinary discourse.

c. Payment

Payment for reviewing was *not* brought up spontaneously by any respondents, but, when introduced into the discussion by the interviewer, 57% were against payment and 43% thought it might possibly be useful. However, even within that group who thought payment might be useful, support for payment was lukewarm. The most frequent reason given for instituting payment of reviewers was that it might encourage reviewers to spend more time on reviews. An interesting variation was brought up by a couple of respondents who construed payment less as motivation / reward for the quality of the product produced than as a mark of the value of the labor that goes into it.

> 'In the new climate of corporate academics, there is pressure by the institutions on individuals and departments, that if it isn't bringing in money then they don't want to know about it. There is less appreciation of the importance of academic duties… Payment gives real value to the work and product.'

The implication being that paying reviewers might flag reviewing as an activity of worth and give more weight to it in the performance assessments. Common reasons given against payment were that it would be financially untenable for the journal, ethically questionable because of possible conflict of interest, and it runs the risk of taking the 'peer' out of peer review by turning the process over to a small group of paid experts. Respondents showed little real enthusiasm for reward in the form of monetary payment and, though tokens of appreciation (such as T-shirts) were very welcome, they did not figure highly in respondents' lists of motivations.

ii) Duties to Others: Satisfaction

Fulfillment of one's duty to others was the most frequently cited motivation (71%) and second most frequently cited reward (59%) for being involved in peer review. Such duty was construed as operating at a number of overlapping levels as a duty to patients,

to fellow researchers and to editors. Respondents described themselves as having (what amounts to) an ethical duty towards society (as represented by the patient) to improve therapeutic efficacy by fostering scientific progress. Duty to the discipline was seen in operational terms, whereby the practice of peer review (transforming individual research into disciplinary knowledge) guaranteed the validity of the knowledge supporting the status of the discipline. The process of the construction of disciplinary knowledge was described as a system of reciprocities in which reviewers see themselves as logically compelled to participate That is, reviewers provide for others the necessary evaluative service of review that they themselves require to get their own work published.

> 'I see it as an exchange. As I submit papers and want them to be peer-reviewed and published, so I think that I in turn have a duty to review other people's papers.'

This operative reciprocity, though a systems' requirement for the maintenance of disciplinary knowledge, was closely coupled to a duty to one's peers, expressing itself in a strong empathetic identification on the part of the peer reviewer with the author.

> 'Every paper is an opportunity to help a colleague.'
> 'Someone gave their time to help me and I should do likewise.'
> 'Often I will do extremely meticulous reviews of bad articles because I see it as way of paying back people who spent time on my own error-filled work.'

As already mentioned, though it was largely the peer reviewer's experience of doing research that qualified them as a reviewer, it was the fact that they themselves knew what it *felt* like to receive reviews of their own work that qualified them as a peer.

> 'As a person who both submits and reviews manuscripts. I have had the experience of being both wronged by the process and seeing how good the process is. This is why it is important that reviewers be researchers also'.
> 'You can't be a good reviewer unless you've been an author and had experience of success and failure.'

Certainly, in their discussions of feedback tone, respondents indicated that this can be a highly emotionally charged affair.

Respondents further emphasized the importance of affective factors ('enjoyment', 'pride', 'good feeling', 'satisfaction') as motivation / reward for participating in peer review.

> 'It's a good feeling to know that you help bring quality work out and help make authors better researchers.'

They claimed that satisfaction was experienced in fulfilling their duties to fellow researchers, in helping others and in the recognition they receive from journals and editors.[12] Loyalty to the editor-in-chief and/or the section-editors was given by close to half of the respondents (48%) as one of the main reasons why they continued to participate in the peer review process.

> 'Loyalty is an important part of building up the informal system of give and take that helps keep the system operating.'

Discussion

Disciplinary Identity

The reviewers interviewed in this study ascribe to a fairly conventional model of peer review, appear to be satisfied with it and display a high degree of consensus in their attitudes towards it. Nevertheless, buried within this consensus are significant concerns over the sensitivity, specificity and conservative tendencies of the practice, echoing the literature's misgivings about its efficacy. As indicated at the beginning of this article, in situations where the efficacy of a practice is questionable and yet the practice continues to receive strong support, one may need to look beyond the practice's stated purposes for evidence of effect.

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[12] The form of such recognition appeared to matter less than its fact. The annual listing of reviewers' names in the journal and letters of appreciation from the editor were particularly well received. Respondents who had received top consultant awards showed great pride in them.

The reviewer, centrally positioned within the system of feedback loops that make up peer review, perceives themselves as being in a particularly ambivalent position: both researcher and reviewer, judged and judging, censor and mentor. Especially noteworthy during these interviews was the tendency of respondents to slip back and forth from the point of view of one judging to the point of view of one judged—from talking about the quality of the research they review to talking about the quality of the reviews of their research.

> 'The best reviews are the ones that aim at making the study better rather than just sniping. The biggest problem I've seen in reviews is when the reviewer doesn't try to make the article better. They complain about the way you designed the study rather than offering help improving it.'

As already discussed, respondents indicated that it is precisely this position of ambivalence—researcher / reviewer, judged / judge, censor / mentor—that enables the reviewer to acquire the skills and authority necessary to balance the contradictions inherent in the process.

This interlinked set of contradictions is apparent to reviewers. Though reviewers cite evaluation of the manuscript (selecting submissions for publication by filtering out incorrect or inadequate work) as the primary goal of the process, the majority of them consider instruction of the researcher (improving the accuracy, clarity and utility of published research) more important in practice. Though it is recognized that there is a problem with poor research entering the literature, there is greater concern over innovative research being 'strangled in its cradle'. Though the reviewer's authority is seen as being based largely on their research and review skills, their efficacy is strongly linked to an empathetic identification with the author/researcher. Though reviewers believe that the objectivity of a review is determined primarily by the ethics of the individual reviewer, they maintain that the validity of the process is guaranteed by the corporate nature of the review panel acting within a system of checks and balances.

Though perceiving this system of checks and balances as requiring a degree of separation of authorial, review and editorial functions; reviewers, at the same time, express a strong desire for a more comprehensive system of feedback leading to a more intensive disciplinary dialogue. Though satisfying a practical duty to the discipline based on the system's operative requirement for reciprocity, reviewers are also motivated by an ethical duty to their peers based on an empathetic identification of reviewer with researcher. While fulfilling such duties and thus advancing disciplinary knowledge; reviewers, through their acquisition of knowledge and skills and their involvement in a formal disciplinary dialogue, see participation in peer review as important in advancing their own status within the discipline.

Reviewers' strongly expresses concerns over the tone of reviews and the quality of editorial feedback, and their search for reassurance and support in feedback, might be taken as attempts to cope with the tensions inherent in the process by using the practice of peer review itself to strengthen disciplinary identity. Peer review becomes a mode of disciplinary discourse necessary not only to the production of knowledge, but, through the logical, ethical and emotional reciprocities developed in its practice, crucial to the identities not just of the researchers seeking entry to that discourse but, perhaps even more so, to the reviewers who regulate it.

By allowing or barring a researcher's work entry into the disciplinary canon, the peer reviewer, in their evaluative role, determines in a direct way who may or may not aspire to the status of peer. In the reviewer's instructive role, he or she not only corrects factual and methodological errors in the research but in a helping to improve the research skills of the author encourages his or her development as a peer. At the same time, reviewers' perceive peer review as a means by which they themselves develop as peers. One instance of this is how the acquisition of *review* skills is valued not just for its own sake but because the acquisition of such skills is believed to lead to an

improvement of the reviewer's own *research* skills. While at a practical level peer review was construed by respondents as a triage exercise, it was, at the same time, on a social level, valued as a mode of disciplinary discourse, important not only in the production of disciplinary knowledge but also in the construction of the disciplinary identity. The high value placed on helping others develop as peers, the improvement of the reviewer's own skills, the opportunities for interaction with leaders in the field and the need for increased recognition re: career advancement are indications that the peer review process is valued by reviewers as much for the part it plays in the formation of disciplinary identity as for its validation of disciplinary knowledge, as much for the production of peers as for the production of research, as much for the satisfaction born of participation in it as for the facts born from it. Disciplines, the governing structures for modes of practice, though defined by the content of their disciplinary knowledges, are composed of people and the relations developed amongst them as they labor to bring that knowledge into being. As such, the effect of peer review on the development of disciplinary identity may be a significant contributory (albeit subconscious) reason for reviewers' strong support of the practice despite doubts about its efficacy.

Conclusion

Respondents, in their concerns about the practice of peer review, delineated quite nicely the inherent ambivalences and contradictions constitutive of an epistemologically recursive and ontologically tautological system, where practice and practitioner, knowledge and discipline are self-generated. In modern science and medicine, facts attain their status as facts by subjecting the results of hypothesis-driven experiment to scrutiny in a system of multiple feedback loops that search out error, identify it, correct it if possible and validate the result as knowledge. This 'recursive correction of error' has been, at least from the sixteenth century, the defining mechanism

of scientific inquiry and the means by which scientific disciplines generate knowledge. In adherence to the modernist formula of form following function, the modern discipline operates as a set of self-generated and self-governing social relations reifying normative values through a discursive system of feedback loops. Respondents in this study identified peer review as *the* fundamental recursive discourse necessary to this construction. As an epistemological operation, peer review translates the results of research into consensual knowledge, bridging the gap between the messy practice of experiment and the ideals of scientific theory. As a political exercise, it assists in determining the scope of the discipline and legitimating it in the eyes of other disciplines and the public. As a normative practice, through its effective *and* affective power over researchers and reviewers, peer review helps mold disciplinary identity, incorporating the individual disciplinary subject into the discipline as "peer".

As noted in the Introduction, the peer review process is subject to increasing criticism and critique. It is being affected by ever more sophisticated communications technologies and changes in review practice (e.g., electronic submission and review [*Annals*], pre-publication access [*Nutrition*], open access [California Digital Library], open review [*BMJ*], post-publication review [*PLoS One*], and post-publication editing [Wikies], etc.). In assessing and attempting to manage and navigate such changes, it needs to be kept in mind that any particular system of knowledge production produces not only facts but those who produce the facts.

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