

*Future of Publishing***Unequal opportunities in science: expanding our perspectives****Morgan David**

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Abstract

Scientific merit is commonly assessed through a researcher's number of publications, or other citation metrics. However this procedure has been criticized as being biased, unfair and not representative of the true contribution of academic researchers to the advancement of science. Notably, citation metrics have been found to be detrimental to the assessment of female researchers' achievement and maybe to women's representation in academia. Yet very little is known about the real causes of differential gender representation in science. In this paper, I discuss these causes, and argue that recently proposed improvements in favour of more equal opportunities may instead generate other inequalities. I also anticipate that discriminative guidelines, if employed, should take other potentially disadvantaged communities into account and eventually promote communitarianism in science. I conclude that science as a whole has a lot more to gain by adopting a multi-dimensional, universal, and qualitative perspective when assessing scientific merit.

Keywords: citation metrics; scientific merit; communitarianism

Introduction

The objective assessment of scientific merit is an important matter of concern, as tough competition for research positions and funding programs has promoted the need to reliably evaluate researchers' qualities (Acuna et al. 2012). An implicit consensus in the scientific community consists in assessing academic

researchers through their number of publications, or using different citation metrics such as the h-index (Franceschini et al. 2012). Despite the many critiques provided against the biases and unfairness generated by a thorough and extensive reliance on citation metrics (Leimu and Koricheva 2005, Lawrence 2006, 2007, 2008, Neylon and Wu 2009, Fisher et al. 2012, Kaushal and Jeschke 2013), scientific merit is virtually never assessed by taking multiple dimensions of a researcher's work into account (Wilson 2006, Lawrence 2007, Neylon and Wu 2009, Lane 2010, McDade et al. 2011, Kaushal and Jeschke 2013). Yet, scientific enterprise is pluralist by nature. An academic researcher's professional life is classically shared among student supervision, writing and reviewing papers, institutional activities, teaching, communicating findings to the public, organizing scientific meetings, etc... (Pavlou and Diamandis 2011). It *de facto* makes science a multi-dimensional activity for which researchers have precisely been hired, but to which researchers' relative contribution differs. It follows that citation metrics are very unlikely to capture the overall contribution of academic researchers. Importantly, citation metrics indices have different consequences on the relative achievement of males and females in science (Symonds et al. 2006), and have eventually been thought of being responsible for female underrepresentation in science (Cameron et al. 2013). Calls for gender-equal metrics and equal representation of males and females in science are therefore increasingly addressed (Symonds et al. 2006, Cameron et al. 2013). The aim of the present paper is twofold: briefly discussing the causes of gender representation in science, which are thought to result in part from unfair citation metrics, and questioning the solutions put forward to make the assessment of female and male

researchers more equal. I first emphasize the need to think more objectively about the causes of gender representation in science, with discrimination against women, although suggested (Budden et al. 2008), remaining one of several possibilities. Then I argue that the scientific community has a lot to gain by adopting a multidimensional, universal and qualitative perspective in the assessment of its members' merit, rather than setting up discrimination processes (in this case, taking a researcher's gender or other personal details into account in academic decisions. Note that I distinguish personal details from personal experience, where maternal or paternal leaves can be involved). I finally argue that discriminative guidelines, if employed, should lead us to take other clearly disadvantaged communities into account, eventually promoting communitarianism in science. I suggest that this option may not be the best way of promoting the necessary collegiality for creative and collaborative science within laboratories. I thus use the legitimate concern that female researchers are underrepresented in the academics, and its link with citation metrics, to argue that the assessment of academic researchers should turn qualitative and universal rather than quantitative (Pautasso 2013).

Why are women underrepresented in science?

A current concern in the scientific community is the progressive loss of female students across educational degrees. Indeed, whilst women outnumber men at an undergraduate level in science, they are found in smaller proportions in lectureships. It has been proposed that discrimination (Budden et al. 2008), unfair citation metrics, as well as societal causes act as barriers to female achievement in science, with a lack of self-confidence likely to play a crucial role (Cameron et al. 2013). However recent research suggests that a lack of self-confidence can boost performance (Beckmann et al., 2009, Woodman et al. 2010). Moreover, a recent study shows that Iranian female students display higher levels of self-confidence compared with males (Rezaei 2012). These findings suggest that the exact reasons for female underrepresentation in science are far from obvious and may still not be well understood. It then turns out that knowledge about the subjective and objective causes of withdrawals in science remains incomplete (see O'Brien and Hapgood 2012). I believe that people's genuine preferences and inclinations for different scientific disciplines depend on many factors, including gender, personality, history, and psychology (Lawrence 2006). In addition, overall representation in academia depends on the scale at which one beholds the situation. For instance, the question of why men may be relatively underrepresented at undergraduate levels is rarely addressed (Goldin et al. 2006). If one worries about the loss of potential future geniuses for its

discipline, why not ask the question of why both males and females are differently represented across different educational degrees? One neglected but plausible phenomenon may be that students disappearing from the educational system opportunistically find jobs in industry or in governmental and non-governmental organizations. This may reasonably be considered as a possible loss for science. On the other hand, from an individual point of view, it can be seen as the successful outcome for what undergraduate and postgraduate degrees have been created: training young citizens for specialized professions. In a world where academic positions are rare, and young researchers compete for a small number of vacancies, opportunistic people could be seen as well-informed of future prospects.

Embracing a universal perspective

In addition to biased representation across educational degrees, it has been shown that women, on average, publish fewer papers than their male counterparts (Symonds et al. 2006, Cameron et al. 2013), although evidence in this sense appears to be mixed (see van Arensbergen et al. 2012, Barrios et al. 2013). It follows that the use of publication rate as an index of scientific merit can be detrimental to female achievement in science. On the other hand, women have a higher number of citations for a given publication rate than men (Symonds et al. 2006), and some authors thus propose that the number of citations obtained per published paper should be preferentially used as a measure of scientific merit (Cameron et al. 2013). However, it seems to me that focusing on citation rate rather than publication rate switches the problem from one discriminative process to another. Will science gain by replacing one unfair process (the use of metrics favouring men) by another (the use of other metrics favouring women)? Should we consider that, after all, each gender will have had its own share of the citation metrics' cake? From a moral viewpoint, this solution simply looks, to me, fallacious at best, and dishonest at worst. I believe that it would be fairer for everyone to not focus on a single metric, but both appraise the scientific quality of one's publications, and take several dimensions of an academic's work into account (Lane 2010, Kaushal and Jeschke 2013). Noticeably, adopting a multidimensional approach has been suggested to improve gender representation in science (Lawrence 2006, Pautasso 2013), precisely because it could overcome the issue of female- or male-biased metrics. Therefore, switching from a quantitative to a more qualitative merit assessment would certainly provide a relevant solution to the issue of unequal opportunities in science by making gender differences in quantitative metrics obsolete and irrelevant (Pautasso 2013). The scientific community as a whole may gain far more by

addressing the drawbacks of the current use of citation metrics at the *individual* level (i.e. the universal perspective) than at the *gender* level (Lawrence 2006, Pautasso 2013).

The potential threat of communitarianism

One reason why the issue of unequal opportunities in science should be addressed from a universal perspective is the potential threat of communitarianism in science (i.e. the role of the community to which a researcher belongs—gender, nationality, religious background, etc.—on any of his/her academic prospects). There is no reason why our quest against inequality and discrimination should, beyond genders, not be expanded to all potentially disadvantaged communities in science. For instance, in a world where English dominates scientific publications and most of the research is performed in western countries, scientists for whom English is not their native language are clearly at a disadvantage (Leimu and Koricheva 2005, Marshall and Travis, 2011). I am surprised that this issue is not raised more in debates about equal opportunities. I cannot see why gender issues should monopolize our quest for a fair assessment of scientific merit, and I hope its proponents are not driven by unavowed selfish interests that would lead them to think too subjectively about those issues. Overall—given the high competition between junior scientists nowadays—I hardly think that making women and men confront each other (e.g. by including a candidate’s gender in academic decisions) is a thoughtful step towards promoting collaborative and creative science within laboratories (Brischoux and Cook, 2009; Kaushal and Jeschke, 2013). In a general manner, science may have more to gain by treating all its fellows as equal within a universal and qualitative framework. Solutions to make the assessment of scientific merit fairer, similar to those I described here, are regularly put forward (Wilson, 2006; Lawrence, 2007; Fisher et al., 2012). Things are not fixed in stone. It is up to all of us to emphasize and insist on the multidimensional and qualitative aspect of scientific achievement.

Conclusion

To conclude, I believe that science as a whole has a lot to gain by promoting equal opportunities and fair assessment of scientific merit without discrimination, not least by taking the multidimensionality of science and diverse research activities into account. This also goes with acknowledging that we know little about people’s genuine motivation in science, and that the causes of representation patterns are likely to be diverse. Therefore, we should guard against selfishly focusing on a single community by adopting a more universal and qualitative (vs. quantitative) perspective.

Acknowledgments

I thank Emma Parfitt for her comments on previous drafts, and Peter Lawrence and Frida Piper for their thoughtful reviews. I was funded with a fellowship from the Bettencourt-Schueller Foundation for Life Sciences.

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