

Critiques of Citation Analysis:

Donovan, C. (2007). The Hidden Perils of Citation Counting for Australasian Political Science. *Australian Journal of Political Science* 42: 665–678.

Donovan responds to a recent publication attempting to rank Australasian political science departments using bibliometric indicators gathered from the online database Web of Knowledge by offering a critical analysis of not only the bibliometrics themselves, but the sociology of ‘standard’ indexing databases, particularly the kind of research that is ‘valued’ by these practices. Not only do ‘standard’ bibliometrics and search indexes favor quantitative political science publications over “historical, humanistic and qualitative” research, but they also “allow ISI data to define what constitutes ‘quality’ in political science research, and to accept this in Australasia is to endorse a shift towards ‘positivistic data gathering’.” This, in turn, reinforces the types of quality judgments that are made based on such analyses (i.e. the most ‘visible’ research is rendered the gold standard of ‘quality’ research). She strongly warns other Australasian political scientists to be wary of how such analyses surreptitiously steer the course of research. Although this critique is somewhat isolated to the field of political science, and more specifically to Australasian political science, the Donovan’s criticisms and concerns about ‘standard’ indexes and bibliometrics analyses are apropos from any field in the humanities or social sciences.

Donovan, C. (2009). Gradgrinding the social sciences: The politics of metrics of political science. *Political Studies Review* 7: 73–83.

Donovan again writes to warn of the implicit dangers of metrics-only research quality evaluations, especially at the national level (although she concedes that Norway’s approach seems to work well for them), and she does so in the wake of i) the Research Quality Framework (RQF) coalescing in the UK and ii) two notable articles attempting to evaluate the feasibility of applying metrics to political science as a substitute for peer review. Donovan analyzes these two articles, which employ different but equally flawed bibliometric approaches, and refers back to many of her previous arguments citing the inevitable failures of metrics as “objective” measures when turned on the social sciences. She specifically identifies the epistemological assumptions and steering effects of a metrics-only approach, and alludes to Dickens’ *Hard Times* to illustrate how the social sciences are being “Gradgrinded” by quantitative analysis. Not only do metrics make the ontological assumption that a discipline “is” only the sum of its individual parts, but metrics also make the epistemological and normative claims that only knowledge that can be counted is “worthy” knowledge, and that this knowledge (more “scientific”; what she calls “positivistic”) is the paradigm of quality and value. As these “audit culture” practices only serve to “strip the discipline (political science) of its humanism,” she argues for the incorporation of bibliometric measures *only as a supplement* to expert peer review.

Erne, R. (2007). On the use and abuse of bibliometric performance indicators: A critique of Hix’s ‘global ranking of political science departments.’ *European Political Science* 6: 306–314. doi:10.1057/palgrave.eps.2210136.

Erne, like Donovan (2007), writes in response to an attempt by David Hix to rank political science departments and institutions worldwide using the academic output (i.e. publications in high-ranking political science journals) of faculty members as the main evaluative

criteria. His strongly-worded critique of bibliometric analysis of departments on a global scale primarily attacks the assumption that the field of political science operates according to a coherent and universal value system that is amenable to quantification according to Hix's bibliometric criteria. He especially criticizes the relatively arbitrary nature of the selection criteria and argues that reliance on such things as search indexes biased to English-language publications (Hix used the Web of Knowledge database) results not only in a global ranking biased to research published in English, but quality judgments founded on the particular political structure and assumptions of those who accumulate such data. He concludes by arguing that these assumptions are incongruent with the goals and values of the academy, those of "academic freedom and methodological and intellectual pluralism... it is very doubtful that such a process will enhance the quality of higher education"

Hicks, D. (2006). The dangers of partial bibliometric evaluation in the social sciences, *Economia Politica* 23: 145-162.

Hicks largely draws on arguments relating to a lengthy analysis of bibliometric evaluation in the field of social science and her previous distinctions between four different types of literature important to the discipline: international literature (primarily journals), national literature (primarily journals), books, and "enlightenment" literature (intended to communicate directly with the lay public or non-academics). She contends that the publishing habits of social scientists are such that international literature is the most well-represented in bibliometric search indexes (and even then, not as thoroughly as scientific international literature) such as the Social Science Citation Index (SSCI). National literatures, usually published in the vernacular, are not well served by such indexes, nor are books, monographs, or non-scholarly "enlightenment" publications, despite that these works comprise the majority of social science publications. Thus, it is the most science-like, quantitative work that is indexed in the social sciences, forcing researchers in the field to become accountable to narrow assumptions of what social science research "is" and abandon three of the "historical four modes of scholarship and communication."

Hicks, D., Potter, J. (1991). Sociology of scientific knowledge: A reflexive citation analysis or science disciplines and disciplining science. *Social Studies of Science* 21: 459-501.

Hicks and Potter present an interesting take on the subject of citation analysis. The article is divided into two distinct texts: the first is a citation analysis of the field sociology of scientific knowledge (SSK), and as such attempts to define the key contributors to the SSK literature; the second text serves as an analysis of the underlying theoretical assumptions of citation analyses themselves, using the first text as a case study. The second text is arguably more interesting, as citation analyses of whole fields are plentiful; this subsequent evaluation of such analyses in terms of practical significance and consequences makes far more arresting claims. Beginning with a discussion of the equivocal nature of disciplinary boundaries and the consequences of categorization, Hicks and Potter examine SSK through the lens of citation analysis, particularly with reference to literary critics and philosophers such as Latour, Derrida, and Foucault. The authors question the popularized notion of a "citation" and compare its use in citation analysis to summing up the individual 'parts' of a society (i.e. the beliefs, customs, etc of its individual members) in order to understand the whole; inevitably, influential processes that operate in a collective manner (i.e. social

normative, institutional influences) would be ignored. More specifically, the authors references Foucault's notion of "disciplinary power" to describe how "citations become quality itself"; scientists can now police themselves, appealing to an authority (i.e. citations) that seems omniscient. But the authors identify a more sinister consequence of citation analysis: the provision of normative individualism can lead to dramatic and drastic changes in individual behavior that feed into the scheme of self-normalization, a scheme that begins to "permeate practice and self-understanding" not just for those in power, but for individual members of academia.

Najman, J. A., Hewitt, B. (2003). The validity of publication and citation counts for sociology and other selected disciplines. *Journal of Sociology* 39: 62–80.

Like many bibliometricians, Najman and Hewitt provide a long list of caveats related to bibliometric analyses, particularly of whole departments across various disciplines, and then promptly proceed to perform such an analysis. The analysis is couched in terms of the typical hierarchy of academic disciplines, with the "hard" sciences on top as the more "mature" disciplines and thus the disciplines that make greater and more important contributions to knowledge, as opposed to the "weak, dispersed" body of scholarship in the "soft" social sciences and non-science humanities. The authors conclude a number of key reasons why a departmental-level bibliometric analysis is problematic, such as the ever-changing, fluid nature of academic departments and their varying publication habits, and state that "For these reasons, comparisons between disciplines are often not helpful." Despite this insightful claim, the authors qualify it with the following somewhat contradictory statement: "however, they are important from the perspective of attracting funding into a field when different disciplines are competing for the same funding dollars," which begs the question of why bibliometrics are not sufficient for quality analysis but are suitable, even important, when it comes to allocating funding.

van Noorden, R. (2010). A profusion of measures. *Nature* 465, 864–866.

Van Noorden recounts a brief history of metrics, beginning in the early 20th century with James Mc Keen Cattell's call for tracking individual performance to serve the progress of science and, more recently, taking off with Eugene Garfield's establishment of the Institute for Scientific Information (ISI), the first bibliometric indexing endeavor. From there, the article becomes a description of current, popularized methods of bibliometric analysis and the current trends in bibliometrics, such as citation mapping. The author gives a brief consideration of the more obvious epistemological shortcomings of metrics, such as the problem of multiple authors and differences between indexing databases (although the problems of this are far more worrisome than the article admits), before moving to a discussion of the current push for reflexivity in bibliometrics, which may be a minor one; no indication is given of the level of support for it. For one who is familiar with the superficial deficiencies with bibliometrics, this is arguably the most interesting comment in the piece: "The point should not be to come up with a new metric. It should be to explain what metrics represent, and why we want them," says Bollen [Johan Bollen, an informatics scientist at Indiana University]. "Can we come back to the scientific community and say 'if this is what you want to measure, then this is a good way to do that'?"

Parkins, D. (2010). Do metrics matter? *Nature* 465, 860–862.

In the effort to parse out exactly how influential bibliometrics are in academia, *Nature* conducted a poll of its readers to “gauge how researchers believe such metrics are being used at their institutions, and whether they approve of the practice.” In addition to this, deans, provosts, and department heads were contacted to gauge “how heavily [metrics] are relied on. The results suggest that there may be a disconnect between the way researchers and administrators see the value of metrics.” What is most interesting about these findings is that they offer a rough account of the sociology of interactions between administrators and academic research communities. Not only does there appear to be a paucity of communication about the use of metrics, there also seems to be a distrust of the capability of administrators, as non-experts, to use metrics in a meaningful and appropriate manner. Most administrators were adamant about the small part played by metrics in evaluations, and yet some seemed to be giving mixed messages about their importance. The majority of researchers were dissatisfied with the (perceived) use of metrics, and were concerned with the influence of departmental and university politics as well as unintended steering effects. Some respondents “welcomed the use of metrics” because, they believe, metrics provide objectivity and transparency for administrative decision-making. A portion of respondents aptly identified that the question is not to use or not to use metrics, but to use them well.

Weingart, P. (2005). Impact of bibliometrics upon the science system: Inadvertent consequences? *Scientometrics* 62: 117–131.

Weingart gives an insightful and frank review of the dangers associated with the institutionalization of bibliometrics in the scientific and science evaluation communities from a number of different perspectives. He begins by outlining the problematic nature of reliance on commercialized data from a private source (the ISI), but argues that, even more troublesome than the private nature of the data itself and data review procedures, the externalization of the research quality control process effectively puts evaluative tools in the hands of non-experts. Most notable of the unintended steering effects of this are changes in individual behavior in the direction opposite of what was intended; Weingart references a *Nature* article contending that because of the push toward bibliometrics, “the objective presentation of work, the accessibility of articles and the quality of research itself are being compromised.” He goes further to outline secondary, more insidious effects on the university and the process of scientific communication as a whole, such as favoring quantity over quality, instilling biases toward short-term performance and conventional approaches, and promoting undesirable and distasteful practices by journals and journal editors in the effort to boost ratings. The ready availability of unreliable but popularized measures presented in dramatic, media-hype language have led to one-dimensional interpretations by non-experts that inform decisions of the utmost importance in the scientific community. According to Weingart, metrics have become a commercial and political quasi-scientific tool with such destructive potential that their application “warrants a professional code of ethics.”

Critiques of Incorporating Bibliometrics in Research Evaluation Policy:

David, M. E. (2008). Research quality assessment and the metrication of the social sciences. *European Political Science* 7: 52–63. doi:10.1057/palgrave.eps.2210176.

David addresses the issue of “metrication” of academic research assessment from a policy perspective, analyzing the UK’s Research Assessment Exercise in the context of recent debates between policy makers and scholars in the social sciences. While the RAE has been constantly evolving, David gives a review of the mounting concerns with the recent shift to including primarily bibliometric criteria for research evaluation and subsequent funding decisions. She also airs the concerns of social scientists in countries such as France and the Netherlands who have expressed feeling “pressured” to devise new metrics that fairly represent the types and qualities of research pursued within and necessary to the social sciences. David ultimately concludes that the bibliometric trend is advocated primarily by private knowledge management and information companies that are not sensitive to the more nuanced citation behavior and environments of the social sciences and humanities, and that this “league table mentality helps to foster a notion of increasingly rigid and stratified systems of higher education, in terms of research versus teaching.”

Donovan, C. (2005). Setting the scene: A review of current Australian and international practice in measuring the quality and impact of publicly funded humanities, arts and social science research. REPP Discussion Paper 05/3. Canberra: Research School of Social Sciences, The Australian National University. URL:

<http://repp.anu.edu.au/papers/200511_disc03_review.pdf>

At the request of multiple research funding agencies in Australia, Donovan compiled a review of Australasian and international research evaluation policies and programs, with specific attention to the differences in evaluation and funding criteria between science and arts/humanities/social science programs and institutions. In Australia, funding decisions for institutions are determined only by the number of publications produced by a department or institution. Donovan argues that not only is this not a measure of research quality or impact, but also that any attempts to modify the publication count criteria (including introducing citation metrics) will also not produce measures of quality or impact precisely because such criteria will still be based only on the volume of work produced. Other existing bibliometric indicators favor quantitative, science-like research and do not incorporate considerations of broader social impact, such as “enlightenment” literature that seeks to communicate directly with the lay public or with non-academics. She ends by comparing and contrasting international policies with those of Australian funding agencies, and considers alternative measurements of research impact, particularly for arts/humanities/social sciences.

Donovan, C. “Dr Spendlitttle and the Pushmi-pullyu: a terrible tale of research evaluation.” *Times Higher Education*, 24 January, 2008 at:

<http://www.timeshighereducation.co.uk/story.asp?storyCode=400257§ioncode=26>.

In this short but insightful expose on the recent changes in the UKs research assessment policies, Donovan identifies the number of tensions at work in the policy of research evaluation, tensions that resemble a two-headed llama attempting to move in opposite directions at once. The most notable change includes a switch from a predominantly peer-review based evaluation scheme to one that relies almost solely on citation metrics to inform policy and funding decisions, with a light peer-review reserved for the social sciences and humanities. Donovan calls this policy change “retrograde and divorced from innovation,” and out of touch with “international expert opinion.” She argues that the REF

has fallen into the “mania for metrics,” the idea that numbers are more objective, “scientific,” and thus better measures of research quality, instead of acknowledging the international move toward “contextual qualitative frameworks” that seek to recognize and honor the complexity and diversity of academic research; these measures, she says, are the future of research evaluation. Donovan concludes that the REF ultimately “must decide between what is easy and what is right,” and divorce itself from the notion that traditional quantitative metrics are rigorous measures of research quality.

Geisler, E. (2005). The measurement of scientific activity: Research directions in linking philosophy of science and metrics of science and technology outputs. *Scientometrics* 62: 269–284.

The article is a critical and somewhat crude treatment of the subject of research indicators, but Geisler gives an interesting overview of the different taxa for measuring scientific research activities and their subsequent foundations in philosophy of science. He identifies what he believes are the seven unique categories into which all existing metrics can be lumped: economic and financial; commercial and business; bibliometrics; patents; peer-review; organizational, strategic, and managerial; and stages of outcomes (e.g. short-term, intermediate, and long-term). Geisler then argues that each of these categories correlates with one of three different philosophies of science. Popper’s “critical rationalism” is best captured with metrics such as bibliometrics that measure immediate outcomes (i.e. publications and citations), while the more intermediate outcomes of Carnap, Lakatos, and Kuhn’s “programmatically, social progress” science is best captured with metrics such as peer-review, patent counts, or economic and financial gains. Feyerabend’s “humanistic” model of science requires more long-term indicators of scientific activity, such as improvements in social welfare and quality of life (so-called “ultimate outcomes”). This paper is unique in its direct correlation of metrics and indicators to philosophical systems.

Hicks, D., Wang, J. (2009). Towards a bibliometric database for the social sciences and humanities. Accessed September 24, 2009, at: http://works.bepress.com/diana_hicks/18. The analysis begins with an astute summary of the values instantiated in bibliometrics, which determine what types of literature are well-indexed and receive the most visibility; this visibility is often and mistakenly characterized as quality. Even though these values are “often antithetical” to those of scholarship in the social science, humanities, and arts, both authors believe that a thorough index of social sciences/humanities (SSH) scholarship is possible, and the remaining analysis focuses on the logistics of challenges of amassing quality and thorough coverage of European SSH scholarship available for bibliographic evaluation. Six journal lists are investigated for coverage and “scholarliness” in the context of possible inclusion or use as the foundation for a new, standardized European SSH index. The authors also address the difficulties of including national literature (especially journals published in the vernacular) and “enlightenment” literature designed to communicate directly with the public, both of which are vital contributors to the corpus of SSH literature. The report concludes with an overview of multiple European nations’ SSH evaluation systems, insofar as they differentiate between scientific and SSH research, and offers recommendations for beginning to construct a database of indexed SSH literature.

Martin, B., Tang, P., Morgan, M., Glanzel, W., Hornbostel, S., Lauer, G., Lenclud, G., Lima, L., Oppenheim, C., van den Besselaar, P., Zic-Fuchs, M. (2010). Towards a bibliometric database for the social sciences and humanities – A European scoping project. Accessed September 27, 2009, at:

http://globalhighered.files.wordpress.com/2010/07/esf_report_final_100309.pdf.

This report was designed to provide a bridge between accountability in social sciences and humanities researcher from an operational/policy perspective and retaining the historical characteristics and humanistic nature of such research. Current performance measures, notably bibliometric analysis, heavily favor quantitative research and as such are unfit for providing a quality measure for the social sciences and humanities. This report identifies other such problems that would be encountered if attempting to establish or build a comprehensive bibliographic/bibliometric database for European social sciences and humanities and recommends four distinct options for proceeding with a database based on an analysis of recent and relevant bibliometric developments, as well as the role and importance (or perceived importance) of bibliometrics as research quality measures. Many of the arguments set forth are based on the work of Diana Hicks and reference her critical examinations of bibliometrics, both why they are currently insufficient for capturing the nature of humanistic research and how they can be altered to do so.

Sivertsen, G. (2006) 'A Bibliometric Model for Performance Based Budgeting of Research Institutions', in *Proceedings of the 9th International Conference on Science & Technology Indicators held in Leuven, Belgium, 7–9 September 2006*. Leuven, Belgium: Katholieke Universiteit Leuven/Steunpunt O&O Statistieken: 133–135.

The article serves as a protocol overview for the new research funding allocation framework for Norway, based on bibliometrics monitoring of academic publishing activity at the institutional level.

Critiques of Bibliometric Databases:

Adam, D. (2002). The counting house. *Nature* 415: 726–729.

This Nature spread gives a useful account of the degree to which the ISI holds an information monopoly over bibliometric data. As of 2002, there were no existing competitors that could match the ISI in the size and breadth of its indexing; however, there are numerous examples, both anecdotal and published, of errors and slipping quality in the manner in which journals and articles are indexed in the ISI database. Adam makes the argument that private, commercial interests underlie the secrecy in ISI's data management and "cleaning" procedures. He seems to suggest that because they are a monopoly, ISI has no incentive to provide the highest quality data possible, but never quite makes the point explicit. With the ever-increasing popularity of bibliometric indicators and impact factor analyses, the ISI is under more pressure to provide clean, quality data; however, upon being sold to Thompson in 1990, the company has decidedly shifted its philosophy to one of hard-line capitalism and away from the scientific curiosity of its former owner Eugene Garfield, implementing new restrictions and rising costs on the use of its data. While policy makers seem eager to jump on board with the quick and dirty numerical evaluations, noted

bibliometricians interviewed for the piece offer salient warnings against placing so much trust in the quality of ISI data.

Editors of *Nature*. (2002). Errors in citation statistics. *Nature* 415, 101.

The editors of *Nature* respond in an interesting manner to recent errors in the rankings of “hot papers” by the ISI. Instead of leaving the correction as an internal exchange between these two private entities, the editors chose to highlight the deficiencies of the ISI’s data interpretation systems in a news brief to their readers – partially, one can guess, out of a sense of being wronged in a public manner, but also out of the desire to publicize what happens when bibliometric data analysis (and important data, at that) is done by non-experts on the payroll of a private corporation. The ISI’s data interpretation software failed to recognize citations to the article published in *Nature* recounting the sequencing of the human genome. While the correction and apology on the part of the ISI was quick, further investigation by *Nature* uncovered serious flaws in the calculation of journal impact factors, which in some countries is extremely influential in the allocation of research funding. The ultimate point of the article: “these examples highlight an even greater need than previously realized — by us, at least, we confess — to check the ISI’s data. Researchers, policy-makers and publishers who depend heavily on citation statistics should be urged to treat them with greater caution. And, it would seem, the ISI has some further investigation to do.”

Proposals of Citation Indicators:

Egghe, L. (2008). Theory and practise of the *g*-index. *Scientometrics* 69: 131–152.

Egghe proposes a new citation metric to account for some of the shortcomings of the *h*-index, notably the lack of consideration of very highly cited articles that may look like errant data points in a researcher’s body of work. Thus, a researcher with low output (in terms of number of articles) but high impact (in terms of number of citations of those few articles) will be given a fairer account of his or her contribution to the field with the *g*-index. Egghe believes that because it is as simple a measure as the *h*-index (i.e. only requires two sources of information: publications and citations of those publications), the *g*-index is just as feasible for determining a researcher’s impact but better accounts for that impact in terms of lifetime achievement to-date. He does not, however, offer a discussion of the relative strengths and weaknesses of the *g*-index.

Hirsch, J. E. (2005). An index to quantify an individual’s scientific research output. *Proceedings of the National Academy of Sciences* 102: 16569–16572. doi:10.1073/pnas.0507655102.

Arguably Hirsch’s most influential publication, the physicist proposes a new mathematical measure, the *h*-index, as a simple and straightforward account of a researcher’s impact on his or her particular field of study. The *h*-index is defined as *h* such that *h* number of publications have been cited at least *h* or more times; in other words, a researcher has an *h*-index of 10 when he or she has 10 articles have each been cited 10 times or more. Hirsch conducts a case study of notable physicists and uses this to enter a thorough discussion of the relative strengths and weaknesses of his measure. While the *h*-index accounts for a number of shortcomings in existing measures of impact at the time, he recognizes “a

number of caveats that should be kept in mind,” most notably that “obviously, a single number can never give more than a rough approximation to an individual’s multifaceted profile, and many other factors should be considered in combination in evaluating an individual.”

Radicchia, F., Fortunato, S., Castellano, C. (2008). Universality of citation distributions: Toward an objective measure of scientific impact. *Proceedings of the National Academy of Science* 105: 17268–17272. doi:10.1073/pnas.0806977105.

Just two years after Hirsch proposed his h-index, Radicchia et al. introduced “a generalization of the h-index suitable for comparing scientists working in different fields.” After analyzing meta-citation patterns in different academic disciplines and fields, universal behaviors emerged such that patterns of cited and citing behaviors could be reproduced mathematically. The paper is very technical; however, the main point behind this discovery of universality is the index proposed by the authors seeks to capitalize on this universal behavior in order to facilitate comparisons of researchers in different fields by standardizing for varying average publication rates and citation rates of articles in various academic disciplines. The primary limitation of relying on this measure, however, lies in the lack of sufficient and sufficiently robust metadata in search indexes that track citations, and the lack of coverage in search indexes of many academic fields and sub-fields.

Schreiber, M. (2008). To share the fame in a fair way, h_m modifies h for multi-authored manuscripts. *New Journal of Physics* 10: 1–9. doi:10.1088/1367-2630/10/4/040201. Schreiber proposes yet another “correction” to Hirsch’s h-index, one that scales for multiple co-authors on single works. This is primarily an issue in fields such as particle physics, where individual publications can have hundreds of co-authors. Schreiber feels that, in these cases, it is unfair to give each individual author equal credit for citations of the article when their individual contributions are minimal. Like Hirsch’s analysis, the discussion includes a thorough treatment of the pros and cons of using the new index. Schreiber shares Hirsch’s primary concern – in Schreiber’s words: “how problematic and dangerous it is to reduce the complete scientific output of a researcher to a single number” – but goes further to address the problematic nature of the search indexes themselves, that different indexes will give different results for the same researcher’s body of work. He is attentive to the broader uses of citation metrics, and believes that more meaningful refinements of the Hirsch index can come to a better approximation of research impact.

Others – General or Theoretical Treatments of the Topic:

Corbyn, Z. (2010). An easy way to boost a paper’s citations. Accessed 24 September, 2010, at: <http://www.nature.com/news/2010/100813/full/news.2010.406.html>. doi:10.1038/news.2010.406.

This *Nature* news brief recounts a study published in *Science* identifying a strong correlative relationship between the number of references in a scientific paper and its resulting number of accrued citations. The general reaction of those interviewed about the study are somewhat unremarkable: in general, this seems to confirm an existing inclination

within the research community, but most conclude that more investigation would be necessary, including a breakdown by discipline to account for different publication and citation patterns, before accepting a causal relationship. But the interpretation of this study by its author (a psychologist at the University of Florida) proves much more intriguing. He argues that the correlation reflects the influence of human psychology on the research endeavor. "Scientists," says the study's author, "are subject to social forces as much as anyone in any other profession," thereby identifying another element of humanism in the scientific process – very interesting indeed.

Lawrence, P.A. (2002). Rank injustice. *Nature* 415: 835–836.

The author's main thesis is the injustice of rankings, both in the sense of impact factor and departmental rankings, but also in the sense of the hierarchies of researchers in scientific laboratories and research centers. He lists a number of examples in which great discoveries made by junior researchers are credited, without much effort at correction, to their senior advisors or laboratory PIs. This especially becomes problematic for the allocation of awards, namely the Nobel Prize, as injustices may be recapitulated by prestigious honor systems. The more arresting analysis, however, lies in his implication of the urge to rank that has permeated higher education, but most notably the politics and policy of science. His first sentence: What has rank to do with the process of creative discovery in science? Very little. What has rank to do with the politics of science and the allocation of credit for discoveries? Almost everything." The article ends by returning to this statement with the example of impact factor rankings. Not only does this practice induce changes in journal editors, but it demeans the creative, rewarding nature of scientific research. Researchers become more concerned with their careers (and boosting the numbers that reflect them) than with the pursuit of discovery and, in the biomedical context, understanding of human ailments.

Lynch, K. (2010). Carelessness: A hidden doxa of higher education. *Arts and Humanities in Higher Education* 9: 54–67. doi: 10.1177/1474022209350104.

What I found useful in this article: "What is new about the commercialization of university education in the 21st century is its moral legitimacy. Commercialization is normalized, and its operational values and purposes have been encoded in the systems of all types of universities (Dill and Soo, 2005; Marginson, 2006; Steier, 2003). Surveillance, and the unrelenting measurement of performance, are institutionalized and normalized in everyday life. Performative technologies, involving auditing and evaluating, have directed attention to the measurable, no matter how inappropriate this may be in educational and research terms. The changes are significant in terms not only of how they refocus research and teaching efforts, but also of how they change the cultural life of the university and other higher education institutions. Incessant auditing and measuring is a recipe for self-display and the fabrication of image over substance."

Uriarte, M., Ewing, H. A., Eviner, V. T., Weathers, K. C. (2007). Constructing a broader and more inclusive value system in science. *Bioscience* 57: 71–78.

Uriarte et al. identifies in the opening of the article the prevailing scientific culture as one of narrow values established and reiterated by a focus on rewarding a narrow range of outcomes and a limited definition of prestige. Other important functions of the scientific

enterprise, such as teaching and public outreach, that are crucial both for science's own sake and for the betterment of society are discouraged by customary practices like the emphasis on publishing original work in high-impact journals, closely monitoring citations, and basing tenure and promotion decisions on the common definition of research output as number of publications and their subsequent citations. The authors suggest initiating a shift in the scientific culture toward a more inclusive values system through a number of incremental changes, such as promoting faculty and student diversity, interdisciplinary, problem-based research with an eye to broader societal impacts, and altering the faculty and promotional reward systems to reflect these more inclusive values.