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EDITORIAL

# Impactitis and Predatory Open Access

'Impactitis' is an infection that appears to have spread like wildfire through India's scientific community. The disease may have first been identified in Europe (Zwahlen, M. *et al.*, *Soz. Praventivmed.*, 2004, **49**, 19). Government departments routinely request (and often insist) that publication lists indicate the impact factors of the journals in which the listed papers appear. The more demanding may ask for citation counts. Scientists, in turn, have become increasingly self conscious. It is not uncommon to find researchers who spend significant effort to add impact factors to their publication lists. 'Average impact factors', a wonderfully misleading index, popularised by a science agency some years ago, are proudly displayed as a vital statistic on curriculum vitae. A variant of the disease compels researchers to display '*h*-indices', another single number criterion which permits ready ranking of individuals. Science can be assessed, even by the ignorant, by simple minded comparisons of average impact factors and the *h*-index. For administrators in science departments of government and academic institutions, these tools of measurement allow judgements to be made without any knowledge of the subjects being considered. The ability to apparently rank scientists and institutions using a single number often fuels the arrogance of science administrators. A combination of ignorance and arrogance can be invincible. Senior scientists, who serve on advisory bodies and peer review committees quickly get infected by the 'impactitis' virus and its numerous variants. A new breed of 'information scientists', with little understanding of the practice of science is proliferating; producing mind numbing figures and statistics, continually inventing new metrics which quantitatively 'measure' science. Thomson Scientific (*Web of Science*), Elsevier (*Scopus*) and Google (*Google Scholar*) market the databases and tools for analysis. A quick view of your competitors *h*-index is only a mouse click away. Age and seniority (and presumably, experience) do not provide protection from this virus. Otherwise reasonable academics, who should know better, quickly succumb to 'impactitis'. The young are not immune. It is commonplace to find students, on the verge of submitting their first paper, choose journals on the basis of impact factors; often using even the second decimal to discriminate. The reservoir of this virus is undoubtedly well nourished in the organisations that are charged with funding science and recognising and rewarding scientists – government departments, academies and institutions.

I have had a love–hate relationship with scientometrics over the years. As an early follower and admirer of Eugene Garfield's seminal work in the analysis of science and its development, by inventing tools to mine the scientific literature, I was fascinated by the use of citation networks to map the intellectual origins of new fields. The *Web of Science* seemed the key to mapping the sociology of science. The journal impact factor appeared indispensable to librarians managing tight budgets and a demanding clientele. Garfield's essays uncovered the importance of scientific work unknown to a wider community. I recall reading in the 1980s, with rising excitement, the work of Sambhu Nath De who discovered cholera enterotoxin in Calcutta in the 1950s. In analysing the work of S. Chandrasekhar, the legendary astrophysicist, who was to later receive the Nobel Prize, Garfield discovered his cousin S. Chandrasekhar, whose work contributed greatly to the development of liquid crystals. Citation analysis in the early days was a tool that seemed to uncover fundamental contributions, with little need for a deep knowledge of the subject involved. In the 1980s computers and networks were rare and the internet was still in gestation. The information technology revolution that followed in the 1990s transformed the practice of scientometrics. Over the last decade, the tools of scientometrics have been readily accessible at many centres in India. Citation counts and impact factors now have uses far removed from those envisaged in the early days. They are, today, mundane metrics used thoughtlessly to rank scientists and institutions; dangerous weapons in the hands of administrators and politicians. My distaste for constant emphasis on impact factors of journals prompted a mischievous colleague to draw my attention to an editorial in a professional journal, with the stated intention of providing 'ammunition' for this column. I have been quick to succumb to the bait.

In an article aimed at 'dispelling the myths surrounding the Research Excellence Framework', P. Trevorrow and D. A. Volmer criticise the use of journal metrics in determining the outcome of the institutional funding

exercises in the UK. The British appeared for some time to be the last bastion surviving the onslaught of 'impactitis' in Europe. Their Research Assessment exercises in the period 1986–2008 were based on conventional peer review panels. Most importantly, 'the use of journal metrics (citation counts, impact factors, etc.) was explicitly ruled out' (Treverrow, P. and Volmer, D. A., *Rapid Commun. Mass Spectrometry*, 2012, **26**, 399). According to the authors, it was really 'a report from the UK Treasury' which 'suggested a more economical approach for the future of funding: the use of metrics'. Clearly, the bureaucrats who held the purse strings had sensed an opportunity to measure that one parameter so dear to the hearts of many economists and policy makers – the cost–benefit ratio. The UK's assessment panels continue to be advised that 'metrics' should not be indiscriminately used, but the virus has begun to spread. Further, as the authors point out, 'peer panelists in this epoch of metricisation are not blind to the mechanics of publishing or the shortcomings of ranking mechanisms'. While this may be true of UK panels, peer review committees in India are generally innocent of the dangers of blindly using journal metrics. A curious point to emerge in the UK analysis is that impact factor rankings 'play a definite role in the selection of publications by researchers and department heads', which are presented to the Research Assessment Exercise committees.

Treverrow and Volmer are concerned about the effects of 'impactitis' on professional journals which cater to distinct fields of science. Authors necessarily target high impact journals, which appear to be excessively weighted in assessment exercises. The same article appears to be of different quality if it were published in *Nature* as compared to any specialist journal. This misperception is based on the wrong notion that all articles contribute equally to determining a journal's impact factor. They cite a published study which provided an example of *Nature* for the year 2004, where 'a quarter of the articles resulted in 89% of the citations'. The inescapable conclusion which holds good in almost all cases is that a vast majority of the articles received fewer citations than reflected by the impact factor. Another illustrative example is provided by 'an analysis of all journals in the spectroscopy category contributing to the 2008 impact factor of the host journals'. In this case, '50% of journal citations are attributed to 11% of articles, 96% of the citations are from 50% of the articles, with 44% of the articles remaining uncited'. These distributions were repeatedly emphasised in the early discussions of impact factors, with Garfield himself sounding many a warning on the uncritical use of journal metrics in assessment of scientific output. The impact factor has proved resilient and acquired a special importance as the virus of 'impactitis' spreads worldwide. Even as authors rush to submit their work to high impact general journals, *Nature* and *Science* pre-eminent among them, the journals themselves often do a poorer job of peer review as compared to the 'community' or specialist journals. A provocative commentary entitled 'Bibliometrics as weapons of mass citation' notes that 'it is not rare to read papers in *Science* that are as muddled in their argumentation as spectacular in their claims' (Molinie, A. and Bodenhausen, G., *Chimia*, 2010, **64**, 78). The recent controversy over the 'arsenic bacteria' is a clear case in point.

The race to publish is becoming increasingly more competitive as the worldwide community of scientists grows rapidly. Publication counts are routinely used to compare the state of science in different countries. The pressure on scientists to publish their work has been recognized as a clear business opportunity by publishing houses. Scientific publishers constantly expand their stable of journals. As library costs escalate, the pressure to ensure easy access to the results of publicly funded research has grown. The 'open access' movement, which began by promoting self archiving and institutional repositories is now suddenly dominated by a growing number of journals which transfer the costs of publication to authors, while allowing readers free access. These costs can be considerable. For example, the *PLoS ONE* charge of $1350 per paper might put the journal out of reach for a majority of authors in Indian institutions. Papers in journals of this type are peer reviewed and judged not on potential impact or importance, but on scientific validity. The result is a growing volume of published papers. New open access business models are emerging. *Peer J*, a new journal, offers authors a deal that many may find hard to refuse; pay $299 for unlimited open access publications and submissions. For more limited numbers and to cater to impoverished authors, packages are available for $199 or $99. While each author on a multi-author paper must be a paying member there are concessions. Papers with more than a dozen authors need only 12 paying members (Van Noorden, R., *Nature*, 2012, **486**, 166). The drive to 'open access' has spawned a new breed of publishers who appear to be exploiting the author pay model. Jeffrey Beall of the University of Colorado has compiled a list of 'Predatory Open-Access Publishers' for whom gullible authors, attempting to publish articles rejected by mainstream journals, are easy prey (*The Charleston Advisor*, April 2010, pp. 10–16). Beall's 2012 compilation, available on the internet, lists among others Bentham Open which is described as a 'scholarly vanity press'. There is also a watchlist which includes Hindawi. Both these enterprises bombard scientists with e-mails to contribute as authors or editors for a rapidly growing stable of journals.

Impact factors and publication counts are the dominant metrics used for assessing individual scientists and their institutions. The assessors may do well to understand the limitations of journal metrics and the dynamics of scientific publications.

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