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Papers about papers

Publishing a paper in a journal has traditionally marked the end of a research project, but increasing numbers of academics are becoming interested in the publication process itself.

As the scientific literature continues to expand through the growth of existing journals, the launch of new journals, the rise of e-prints, the mushrooming of web-only supplementary information and so on, the number of papers about papers is also increasing. At first these papers tended to appear in specialist journals but, fittingly, they have also started to appear in high-profile journals. Many of these papers are concerned with citations and impact factors — researchers looking to get more citations for their papers are advised to write longer papers[1], work in teams[2] or write the first paper on a topic[3]. However, other authors have started to look behind the scenes at issues such as the changing nature of collaboration.

A major challenge in this line of work, as in all research, is deciding what to measure and then making sense of the data you collect. With thousands of journals and millions of papers published on all areas of science, there is a need for robust and transparent measures to make sense of it all. This is why the *h*-index (proposed by the physicist Jorge Hirsch in 2005) has become popular as a way of measuring the performance of individual researchers: in a nutshell, a scientist has an *h*-index of *n* if they have published at least *n* papers, each of which has received at least *n* citations[4].

The appeal of the *h*-index is that it takes both the quality and quantity of work by a given researcher into account (assuming you agree that citations and publications can be used as proxies for quality and quantity). Of course the *h*-index is not perfect because, like all citation-based metrics, it can be inflated by self-citations[5]. Moreover, typical values of the *h*-index vary from field to field (being highest in the biological and biomedical sciences), and even within fields.

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This latter problem was recently tackled by Filippo Radicchi and co-workers[6] who introduced “a generalization of the *h*-index suitable for comparing scientists working in different fields.” Radicchi *et al.* start by confirming that there are large variations in the average number of citations received by papers in different fields: this number (which they call c_0) varies from 5.65 in aerospace engineering to 38.67 for developmental biology for papers published in 1999. Put crudely, this means that a bad paper in developmental biology will probably get more citations than a good paper in aerospace engineering. However, they find that the distribution of c/c_0, where c is the actual number of citations received by a paper, is basically the same in all the fields they studied. Moreover, they also see this universal behaviour when they compare papers from different years.

Future challenges include removing any bias associated with the fact that the number of citations increases with the number of authors on a paper[7], and addressing the problem that each author on a multi-author paper receives the same amount of credit as the author of the single-author paper in most citation-based measures of performance[8].

Meanwhile Brian Uzzi and co-workers have been looking at author lists in more detail and, not surprisingly, they have found that collaborations between different universities have increased steadily over the past three decades and that collaborations produce the highest-impact papers when they include a ‘top-tier’ university. However, they also find worrying evidence that the best science is being concentrated in fewer rather than more universities, a process they term “stratification”[9].

It is difficult to draw any conclusions about nanoscience and technology based on these papers, and so far such research in the nanoworld has focused on identifying which countries are strongest in nanotechnology[10,11]. But the diverse nature of the field means that it will probably not be possible to define a meaningful value of c_0 — assuming that one can agree on a definition of nanotechnology in the first place.

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