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Short communication

A Hirsch-type index for journals*

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We suggest that a *h*-type index – equal to *h* if you have published *h* papers, each of which has at least *h* citations – would be a useful supplement to journal impact factors.

Recently, Hirsch[2] proposed what he called the "*h*-index" (a scientist has index *h* if *h* of his/her *N* papers have at least *h* citations each, and the other (*N*–*h*) papers have fewer than *h* citations each) to quantify an individual's scientific output. The idea was effectively publicized by Ball's news item in *Nature*,[3] and it has got positive reception in the physics community[4,5] and also in the scientometrics literature.[6] Yet, its widespread use will presumably be severely hindered by a series of technical shortcomings (e. g., the lack of common consent on disciplinary and sub-disciplinary standards, on the proper weighting of co-authorship, etc.) and, most of all, by the natural and justifiable resistance of the scientific community to use however igenious numerical indices to assess individual research performances.

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There are, however, other areas of bibliometrics, where citation-based indicators have a much wider acceptance, and more positive experience has been accumulated. One of these areas is the citation analysis of journals. Journal impact factors (whose first mention in the literature is just 50 years old[7]) became a shaping factor of scientific communication; in the words of the Wikipedia[8]: they "have a huge, but controversial, influence on the way published scientific research is perceived and evaluated". We suggest that a *h*-type index would be a useful supplement to journal impact factors. First, it is robust, i. e., insensitive to an accidental excess of uncited papers and also to one or several outstandingly highly cited papers. Second, it combines the effect of "quantity" (number of publications) and "quality" (citation rate) in a rather specific, balanced way that should reduce the apparent "overrating" of some small review journals. The journal *h*-index would not be calculated for a "life-time contribution", as suggested by Hirsch for individual scientists, but for a definite period – in the simplest case for a single year.

Fortunately, the Web of Science database offers a very simple way to determine the annual *h*-index of a journal without the need for any off-line data processing. Retrieving all source items of a given journal from a given year and sorting them by the number of "Times Cited", it is easy to find the highest rank number which is still lower than the corresponding "Times Cited" value. This is exactly the *h*-index of the journal for the given year.

We chose 2001 as source year, and looked for citations until the time of accessing the database: 16 September 2005. We used the *Journal Citation Reports* 2001 for comparative impact factor data. The list of journals with the highest *h*-index for their 2001 papers is given in Table 1. Conspicuously, the first and second ranked journals of the 2001 impact factor list – the *Annual Review of Immunology* and the *Annual Review of Biochemistry* – are missing from the table. Since they published 24 and 23 papers, respectively, in 2001, they had no chance to compete with the chart toppers (obviously, the *h*-index cannot be larger than the number of papers it is based on). This in no way meant to belittle the significance of these journals, but does stress the different dimensions emphasized by the two indicators.

Not surprisingly, the majority of the journals in Table 1 are from the biomedical field, a fact that underlines the necessity of discipline-specific evaluation of this indicator, as well. Nevertheless, beyond the two multidisciplinary journals leading the list, there are two physics journals (*Physical Review Letters* and *Astrophysical Journal*) and one from chemistry (*Journal of the American Chemical Society*) in the top 20 list. These three journals, although the most prestigeous in their fields, ranked outside the top 100 by impact factor. This demonstrates a slightly more balanced character of this indicator. On the other hand, the highest journal *h*-index in mathematics is 12 for the *Journal of Functional Analysis*, which, with a multiple tie somewhere around the 1500th position is certainly meaningless if the real "impact" of the journal is sought.

Table 1. Journals with the highest *h*-index for their 2001 papers

Rank by *h*-index	Journal title	Journal *h*-index	Rank by 2001 impact factor
1	*Nature*	157	10
2	*Science*	155	13
3–4	*New England Journal of Medicine*	113	5
3–4	*Proceedings of the National Academy of Sciences of the USA*	113	59
5	*Cell*	109	3
6	*Journal of Biological Chemistry*	100	104
7	*Physical Review Letters*	96	130
8	*Lancet*	89	65
9	*Circulation*	86	58
10	*Nature Genetics*	85	4
11	*JAMA – Journal of the American Medical Association*	80	27
12	*Cancer Research*	79	91
13–14	*Nature Medicine*	78	6
13–14	*Journal of Immunology*	78	118
15–16	*Journal of Cell Biology*	77	37
15–16	*Neuron*	77	30
17–19	*Astrophysical Journal*	76	574
17–19	*Journal of Clinical Investigation*	76	50
17–19	*Blood*	76	82
20–21	*Nature Neuroscience*	75	46
20–21	*Journal of the American Chemical Society*	75	149
22	*Embo Journal*	74	36
23–24	*Nature Cell Biology*	73	51
23–24	*Genes & Development*	73	19
25–26	*Molecular Cell*	72	24
25–26	*Nature Immunology*	72	0
27–28	*Journal of Experimental Medicine*	71	28
27–28	*Journal of Neuroscience*	71	88
29	*Journal of Clinical Oncology*	70	84
30	*Molecular and Cellular Biology*	68	69
31	*Oncogene*	66	127
32	*Applied Physics Letters*	63	314
33	*Immunity*	62	16
34	*American Journal of Human Genetics*	58	64

Table 1 (continued)

Rank by *h*-index	Journal title	Journal *h*-index	Rank by 2001 impact factor
35–38	*Nature Reviews Molecular Cell Biology*	57	0
35–38	*Angewandte Chemie-International Edition*	57	87
35–38	*Circulation Research*	57	79
35–38	*Journal of Virology*	57	160
39	*Chemical Reviews*	56	18
40–42	*Physics Letters B*	55	279
40–42	*Gastroenterology*	55	48
40–42	*Current Biology*	55	92
43–49	*Nucleic Acids Research*	54	187
43–49	*Nature Reviews Neuroscience*	54	0
43–49	*Annals of Internal Medicine*	54	68
43–49	*Neurology*	54	231
43–49	*Journal of Clinical Endocrinology and Metabolism*	54	181
43–49	*Analytical Chemistry*	54	245
43–49	*Journal of Physical Chemistry B*	54	419
50–52	*Plant Cell*	53	56
50–52	*Diabetes*	53	100
50–52	*Development*	53	72
53–57	*Journal of Cell Science*	52	154
53–57	*Hepatology*	52	106
53–57	*Nature Biotechnology*	52	54
53–57	*American Journal of Respiratory and Critical Care Medicine*	52	183
53–57	*Advanced Materials*	52	180
58	*Human Molecular Genetics*	51	80
59–63	*Journal of the National Cancer Institute*	50	34
59–63	*American Journal of Pathology*	50	114
59–63	*Journal of Molecular Biology*	50	189
59–63	*Clinical Cancer Research*	50	243
59–63	*Chemistry of Materials*	50	369

Source: Web of Science accessed on 16 September 2005; Journal Citaton Reports, 2001

Hirsch's *h*-type indices will certainly challenge scientometrists and other number crunchers for a while, and their use in the citation assessment of journals seems to have promising perspectives with a lot of systematic analysis and statistical background work to be done.

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