

# The use and misuse of bibliometric indices in evaluating scholarly performance

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# What do you think about how scientists are being assessed for promotion?

**Very positive = 1.77%**

**Positive = 20%**

	Very positive effect overall	Positive effect overall	No effect overall	Negative effect overall	Very negative effect overall	I don't know
How scientists are assessed for promotion during their careers	1.77% 12	20.06% 136	12.68% 86	38.79% 263	14.75% 100	11.95% 81



Nuffield Council on Bioethics

The culture of scientific research

Preliminary results of online survey  
27 March – 4 June 2014

# Scholarly

**“Involving or relating to serious academic study”**

**“Having or showing knowledge, learning, or devotion to academic pursuits”**



# What are the best journals in your field?

ISI Web of Knowledge<sup>SM</sup>

Journal Citation Reports<sup>®</sup>

 WELCOME  HELP

## Journal Summary List

Journals from: **subject categories FISHERIES**  VIEW CATEGORY SUMMARY LIST

Sorted by:

Journals 1 - 20 (of 52)

Navigation icons: Home, Previous, [ 1 | 2 | 3 ], Next, End

Ranking is based on your journal and sort selections.

Mark	Rank	Abbreviated Journal Title <i>(linked to journal information)</i>	ISSN	JCR Data 				
				Total Cites	Impact Factor	5-Year Impact Factor	Immediacy Index	Articles
<input type="checkbox"/>	1	<a href="#">FISH FISH</a>	1467-2960	2526	8.258	8.083	2.027	37
<input type="checkbox"/>	2	<a href="#">REV AQUACULT</a>	1753-5123	355	3.923	4.481	0.471	17
<input type="checkbox"/>	3	<a href="#">REV FISH BIOL FISHER</a>	0960-3166	2407	2.726	2.970	0.918	49
<input type="checkbox"/>	4	<a href="#">FISH SHELLFISH IMMUN</a>	1050-4648	8732	2.674	2.996	0.367	376
<input type="checkbox"/>	5	<a href="#">FISH OCEANOGR</a>	1054-6006	2012	2.543	2.788	0.457	35
<input type="checkbox"/>	6	<a href="#">ICES J MAR SCI</a>	1054-3139	8113	2.377	2.576	1.030	237
<input type="checkbox"/>	7	<a href="#">CAN J FISH AQUAT SCI</a>	0706-652X	16689	2.287	2.764	0.376	170
<input type="checkbox"/>	8	<a href="#">MAR RESOUR ECON</a>	0738-1360	740	2.071	2.179	0.364	22
<input type="checkbox"/>	9	<a href="#">J FISH DIS</a>	0140-7775	3750	2.056	2.112	0.378	119
<input type="checkbox"/>	10	<a href="#">AQUACULT ENV INTERAC</a>	1869-215X	221	1.964	2.443	0.200	30



# Who are the best researchers in your field?



Publication Analysis 1996-2007 – Plant & Animal Ecology

## Most Cited Authors...

	Cit-ations	Art-icles
1. <b>Anders Pape Møller</b> , Lab Parasitol. Evol., CNRS, Univ. Paris	10,686	329
2. <b>Kevin J. Gaston</b> , Anim. & Plant Sci. Univ. Sheffield	8,749	250
3. <b>Godfrey M. Hewitt</b> , Sch. Biol. Sci. Univ. East Anglia Norwich	7,374	91
4. <b>I. Colin Prentice</b> , Dept. Earth Sci. Univ. Bristol	7,280	80
5. <b>Nils C. Stenseth</b> , Zool. Univ. Oslo	7,020	229
6. <b>Bernhard Schmid</b> , Environm. Sci. Univ. Zürich	6,371	162
7. <b>Ernst-Detlef Schulze</b> , Max Planck Inst. Biogeochem. Jena	6,278	117
8. <b>John H. Lawton</b> , Ctr. Populat. Biol. Imperial Coll. Univ. London	6,147	63
9. <b>Ian T. Baldwin</b> , Max Planck Inst. Chem. Ecol. Jena	5,722	125
10. <b>David A. Wardle</b> , Forest Ecol. Swedish Univ. Agricultural Sci. Umeå	5,561	91
11. <b>Josephine M. Pemberton</b> , Mol. Ecol. Evol. Biol. Univ. Edinburgh	5,375	80
12. <b>Tim H. Clutton-Brock</b> , Large Anim. Res. Grp. Zool. Univ. Cambridge	5,330	113
13. <b>Riccardo Valentini</b> , Forest Ecol. Lab Univ. Tuscia Viterbo	5,228	63
14. <b>Pierre Taberlet</b> , Lab Biol. Populat. Altitude, CNRS, Univ. Grenoble	5,117	99
15. <b>Ilkka Hanski</b> , Ecol. & Systemat. Univ. Helsinki	5,077	91
16. <b>Carlos M. Duarte</b> , Inst. Mediterr. de Estud. Avanzados Univ. Mallorca	5,025	198
17. <b>Reinhart Ceulemans</b> , Plant & Vegetat. Ecol. Grp. Univ. Antwerp	5,008	150
18. <b>Rémy J. Petit</b> , INRA-UMR Biodiv., Genes & Commun. Univ. Bordeaux	4,883	74
19. <b>André Granier</b> , INRA Res. Ctr. Forest Ecol & Ecophysiol. Champenoux	4,716	78
20. <b>Chris D. Thomas</b> , Dept. Biol. Univ. York	4,582	79
21. <b>Christian Körner</b> , Bot. Univ. Basel	4,578	128
22. <b>Alastair H. Fitter</b> , Dept. Biol. Univ. York	4,527	84
23. <b>Ben C. Sheldon</b> , Zool. Univ. Oxford	4,508	77
24. <b>Josep Peñuelas</b> , Ctr. Ecol. Res. & Forestry Appl. Univ. Barcelona	4,146	178
25. <b>David W. MacDonald</b> , Zool. Univ. Oxford	4,104	250
26. <b>Tim M. Blackburn</b> , Inst. Zool. Zool. Soc. London (ZSL)	4,051	111
27. <b>Sandra Lavorel</b> , Alpine Ecol. Lab, CNRS, Univ. Grenoble	3,991	55
28. <b>Peter Högberg</b> , Forest Ecol. & Manag. Swe. Univ. Agric. Sci. Umeå	3,902	66
29. <b>Richard D. Bardgett</b> , Soil & Ecosyst. Ecol. Grp. Univ. Lancaster	3,899	84
30. <b>J. Philip Grime</b> , Comp. Plant Ecol. Univ. Sheffield	3,848	48



# Reducing a scholar's work to a number is the antithesis of scholarship

**”Use of indices and factors as performance metrics, *without a thorough and insightful understanding of their (few?) strengths and (many?) weaknesses*, is a denial of the very activity that they purportedly measure.”**



# Who are these metrics for?



Scholarly

Involving or relating to **SERIOUS**  
academic study

Having or showing knowledge, learning,  
or devotion to academic pursuits



# What is "quality"?

# What is "impact"?

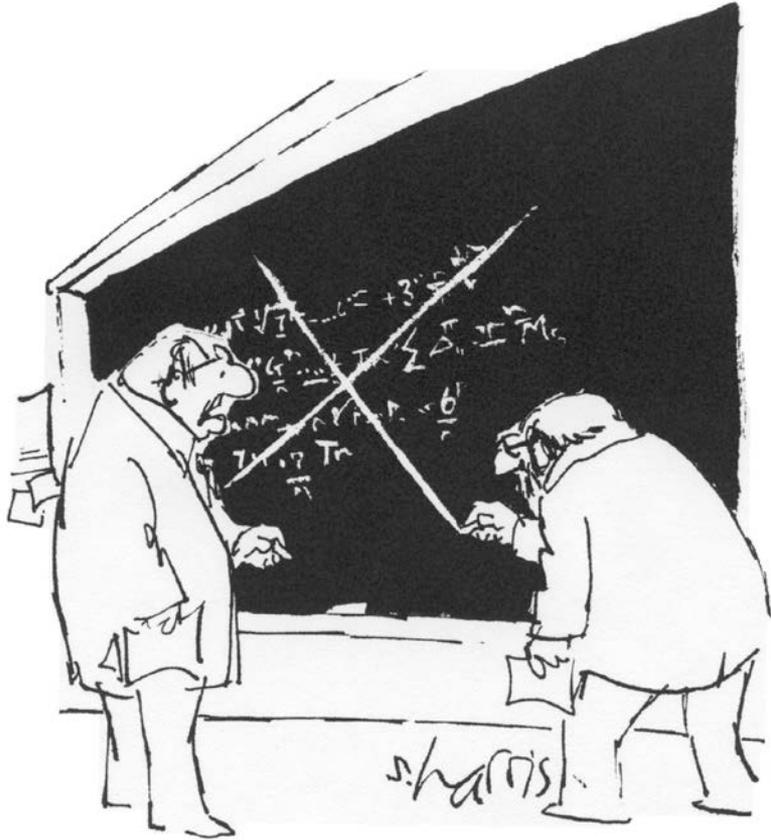


*"My question is: Are we making an impact?"*



# Is Peer Review a Game of Chance?

BRYAN D. NEFF AND JULIAN D. OLDEN



That's it? That's peer review?

## What is "quality"?



Prior probability of suitability	Suitability value (80 percent confidence interval) or probability		
	Two-of-two decision rule	Three-of-three decision rule	Four-of-four decision rule
<i>Editorial board prescreening</i>			
Mean suitability of accepted papers	85 (69–98)	87 (72–98)	88 (74–98)
Probability of wrongful acceptance	0.29	0.24	0.19
Mean suitability of rejected papers	41 (8–76)	43 (8–78)	44 (9–80)
Probability of wrongful rejection	0.07	0.09	0.10
<i>Editor prescreening</i>			
Mean suitability of accepted papers	78 (53–97)	82 (61–98)	85 (66–98)
Probability of wrongful acceptance	0.45	0.36	0.29
Mean suitability of rejected papers	45 (9–85)	46 (9–86)	47 (9–86)
Probability of wrongful rejection	0.14	0.14	0.15
<i>No prescreening</i>			
Mean suitability of accepted papers	75 (46–96)	80 (56–97)	83 (63–98)
Probability of wrongful acceptance	0.51	0.41	0.33
Mean suitability of rejected papers	38 (7–73)	40 (8–76)	42 (8–78)
Probability of wrongful rejection	0.06	0.07	0.08



# Selectivity yields “impact”

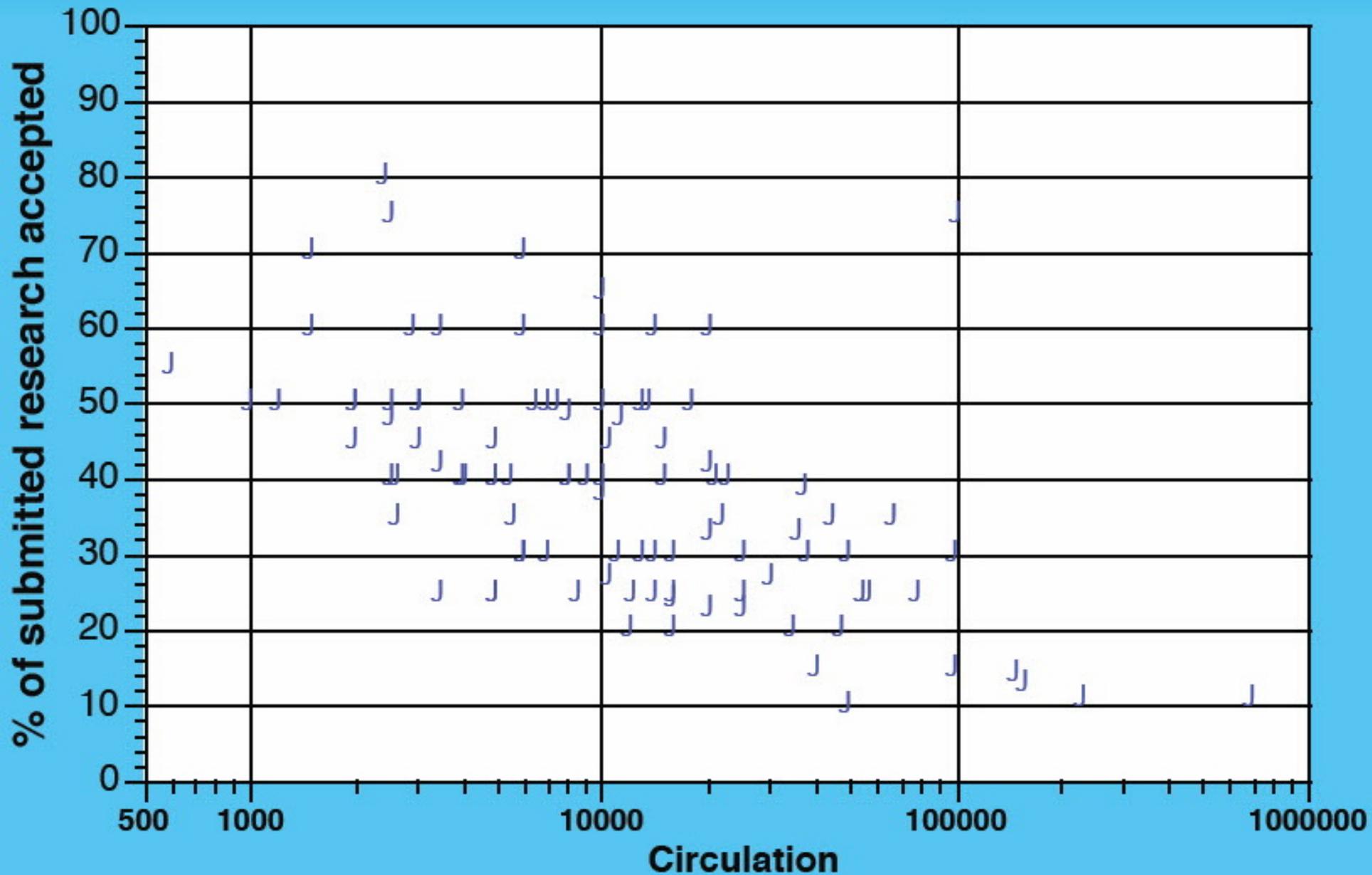
**Table 1.** Journal information, including acceptance rate, Impact Factor (2010 data) and mean and median numbers of citations in May 2012 for ecological research papers published throughout 2009 ( $N = 30$  except for *Nature* ( $N = 26$ ) and *Science* ( $N = 28$ )) according to the Web of Science database.

Journal	Manuscript acceptance rate (%)	Impact factor (Web of Science)	Number of citations for ecological research papers	
			Mean	Median
<i>PLoS ONE</i>	69	4.4	11.6	8.0
<i>Ecology</i>	20	5.1	11.3	9.0
<i>Oikos</i>	15	3.4	7.8	6.5
<i>Functional Ecology</i>	15	4.6	10.7	9.0
<i>Ecology Letters</i>	<11	15.2	20.9	16.0
<i>Science</i>	<7	31.3	66.9	44.0
<i>Nature</i>	8	36.1	64.7	58.5

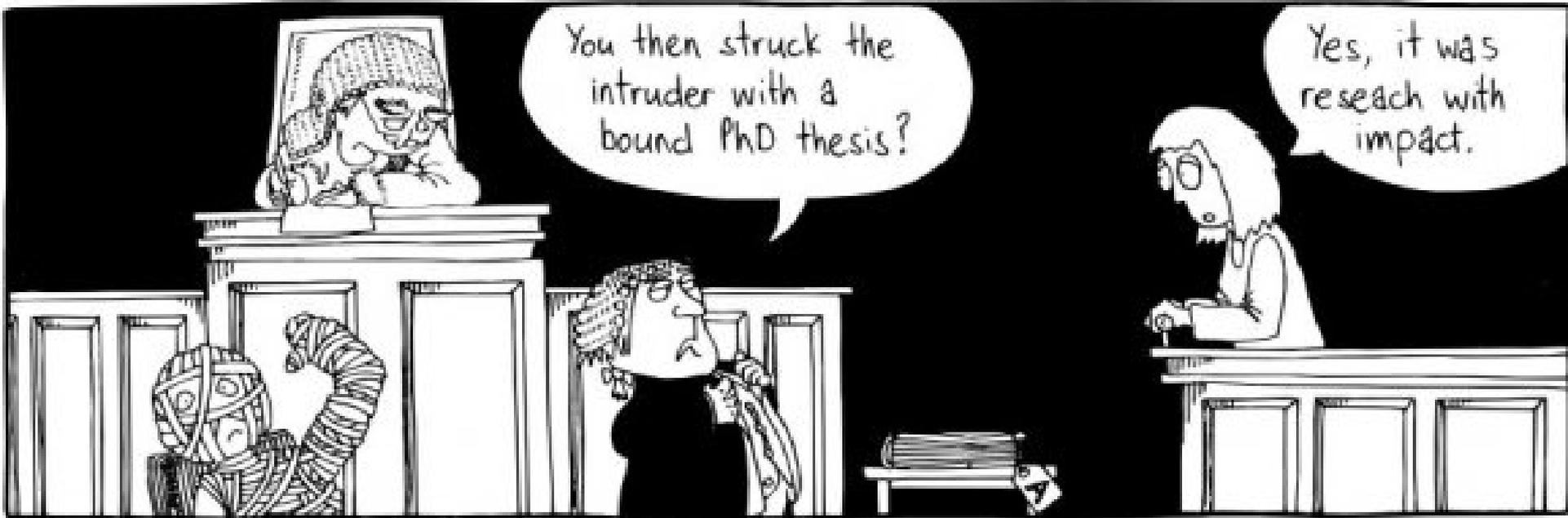
## Editorial screening for “impact”

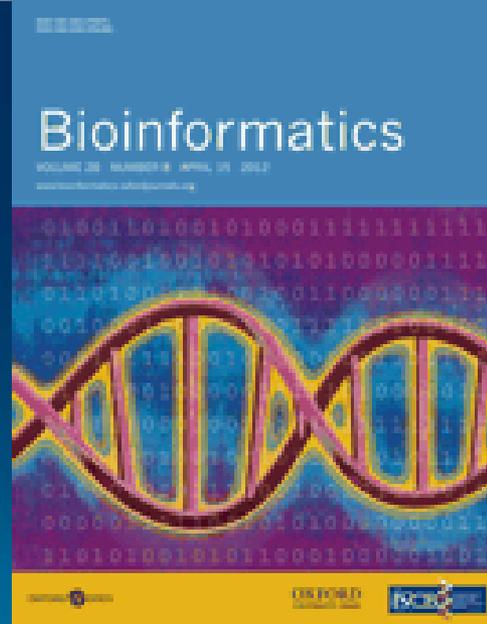
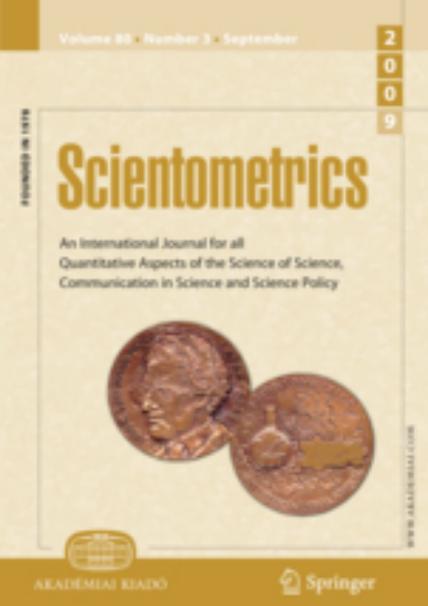


# Selectivity yields profit

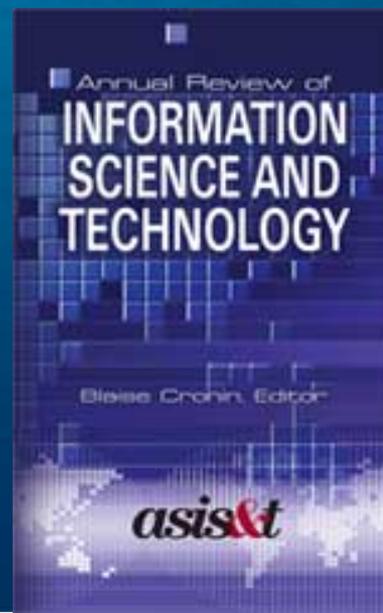


# Can a number based on counts of citations (or something else) be used to assess "impact"?

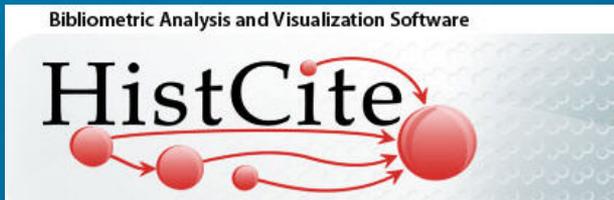




# The development and study of metrics



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Counting Online Usage of Networked Electronic Resources

Metrics from scholarly usage of resources



# Dubious indices of impact

**Table 1. Some websites that provide impact factors of dubious validity**

Name	Website	Number of journals	Method of IF calculation	Processing fee per journal indexed
Scientific Journal Impact Factor	<a href="http://www.sjifactor.inno-space.net/">http://www.sjifactor.inno-space.net/</a>	>18,000	Not described	USD 50
CiteFactor	<a href="http://www.citefactor.org">http://www.citefactor.org</a>	11,649	Not described	NA
International Scientific Institute	<a href="http://www.scijournal.org">http://www.scijournal.org</a>	9,000	Not described	NA
Institute for Science Information	<a href="http://isi-thomsonreuters.com">http://isi-thomsonreuters.com</a>	8,282	Similar to JCR	NA
Global Impact Factor (GIF)	<a href="http://globalimpactfactor.com">http://globalimpactfactor.com</a>	1,800	Not described	USD 100
Scientific Indexing Services	<a href="http://sindexs.org">http://sindexs.org</a>	1,401	Similar to JCR	NA
Open Academic Journals Index	<a href="http://oaji.net">http://oaji.net</a>	1,300	Not described	USD 100
Advanced Science Index	<a href="http://journal-index.org">http://journal-index.org</a>	1,092	Similar to JCR	NA
International Impact Factor Services	<a href="http://impactfactorservice.com">http://impactfactorservice.com</a>	1,040	Similar to JCR	NA
Journals Impact Factor (JIFACTOR)	<a href="http://www.jifactor.org">http://www.jifactor.org</a> <a href="http://www.jifactor.com/">http://www.jifactor.com/</a>	542	Similar to JCR	USD 25
ISRA Journal Impact Factor	<a href="http://www.israjif.org">http://www.israjif.org</a>	514	Similar to JCR	USD 16
Journal Influence Factor	<a href="http://www.journalsconsortium.org">http://www.journalsconsortium.org</a>	235	Not described	NA
Directory of Indexing and IF	<a href="http://www.diif.org">http://www.diif.org</a>	223	Similar to JCR	NA
Journal Impact Factor (JIF)	<a href="http://www.jifactor.com">http://www.jifactor.com</a>	200	Similar to JCR	NA
International Scientific Indexing ISI	<a href="http://isindexing.com">http://isindexing.com</a>	69	Not described	USD 100
Einstein Inst. for Scientific Information	<a href="http://journalimpactfactor.co.in">http://journalimpactfactor.co.in</a>	43	Not described	USD 41
General Impact Factor (GIF)	<a href="http://generalimpactfactor.com">http://generalimpactfactor.com</a>	30	Not described	NA
Council for Innovative Research	<a href="http://cirworld.org">http://cirworld.org</a>	16	Not described	NA
Universal Impact Factor	<a href="http://www.uifactor.org">http://www.uifactor.org</a>	NA	Not described	NA
Impact Factor (JCC)	<a href="http://www.journal-metrics.com">http://www.journal-metrics.com</a>	NA	Not described	NA
Impact Factor Journals	<a href="http://www.impactfactorjournals.com">http://www.impactfactorjournals.com</a>	NA	Not described	NA



# Alternative metrics



## Score in context

Is one of the highest ever scores in this journal (ranked #1 of 260)

show more...

## Mentioned by



## Readers on



## Track this article

- Get email updates when

## Managing fisheries from space: Google Earth improves estimates of distant fish catches

News

Blogs

Twitter

Facebook

Reddit

Score

Demographics

Help

So far Altmetric has seen 23 stories from 22 outlets.

**EarthSky**

### Google Earth reveals untold fish catches

EarthSky

Large fish traps in the Persian Gulf could be catching up to six times more fish than whats being officially reported. ...

2013-11-26T18:22:03+00:00

**QUARTZ**

### How Google Earth is busting Persian Gulf nations for overfishing

Quartz

Weapons-grade uranium isnt the only thing Iran may be hiding. The country does not report its fishing catch to the United Nation ..

2013-11-26T20:07:38+00:00

**NATURE WORLD NEWS**

### Persian Gulf Fisheries Underreport Catch Figures, Researchers Use Google Earth Images to Make a Case

Nature World News

University of British Columbia scientists used Google Earth satellite images to assess fishing practices in the Persian Gulf, re ...

2013-11-26T21:58:11+00:00

**NBCNEWS.com**

### Google Earth spies unreported fish traps, study reveals

NBC News

# Scholarly

Involving or relating to **SERIOUS**  
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**All bibliometric indices/factors/ranking algorithms have their own inherent biases and limitations. These can be categorized as**

***internal* (technical/empirical; based upon false premises or assumptions)**

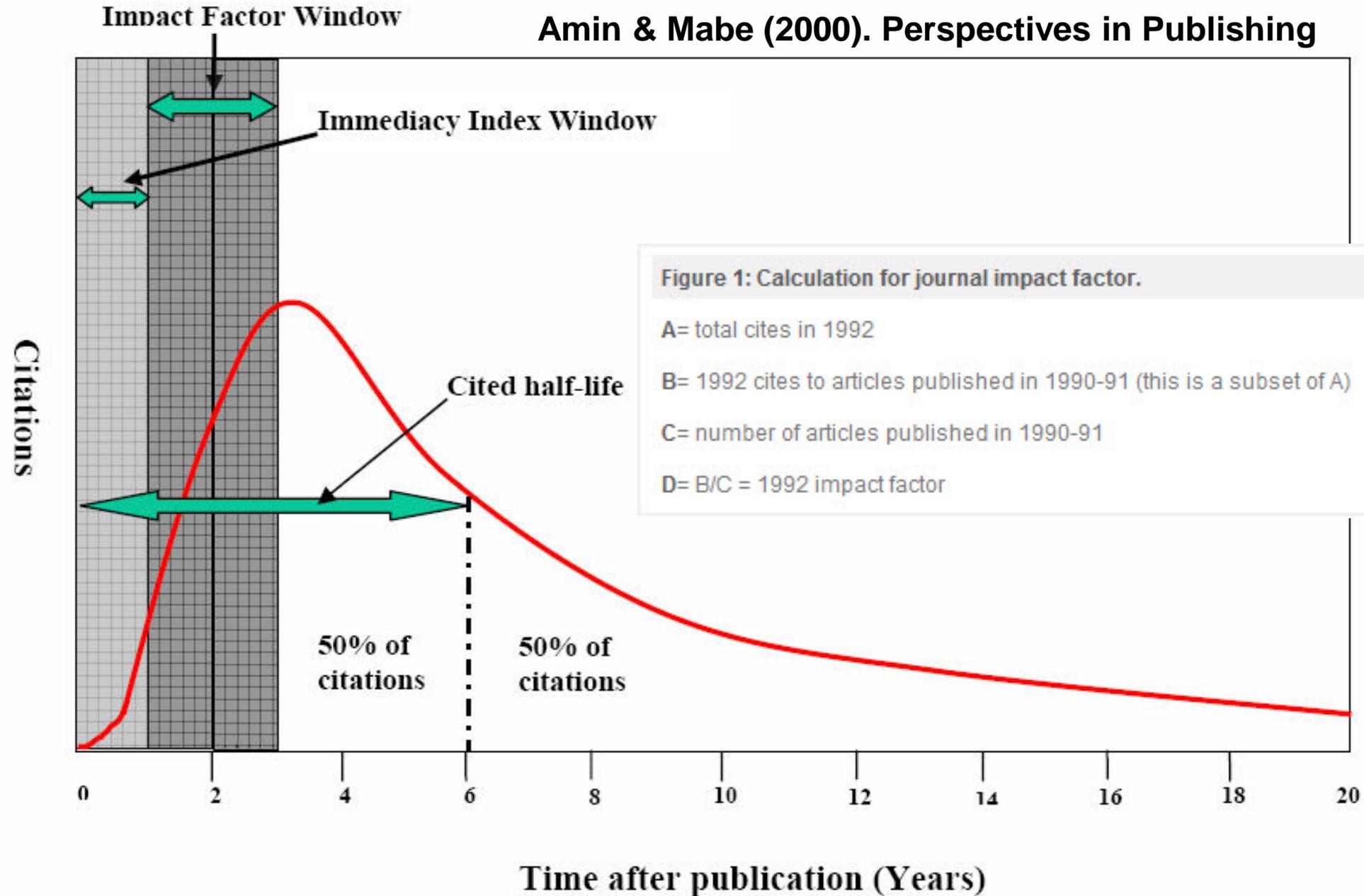
**and**

***external* (misinterpretation; misbehaviour of those being evaluated).**

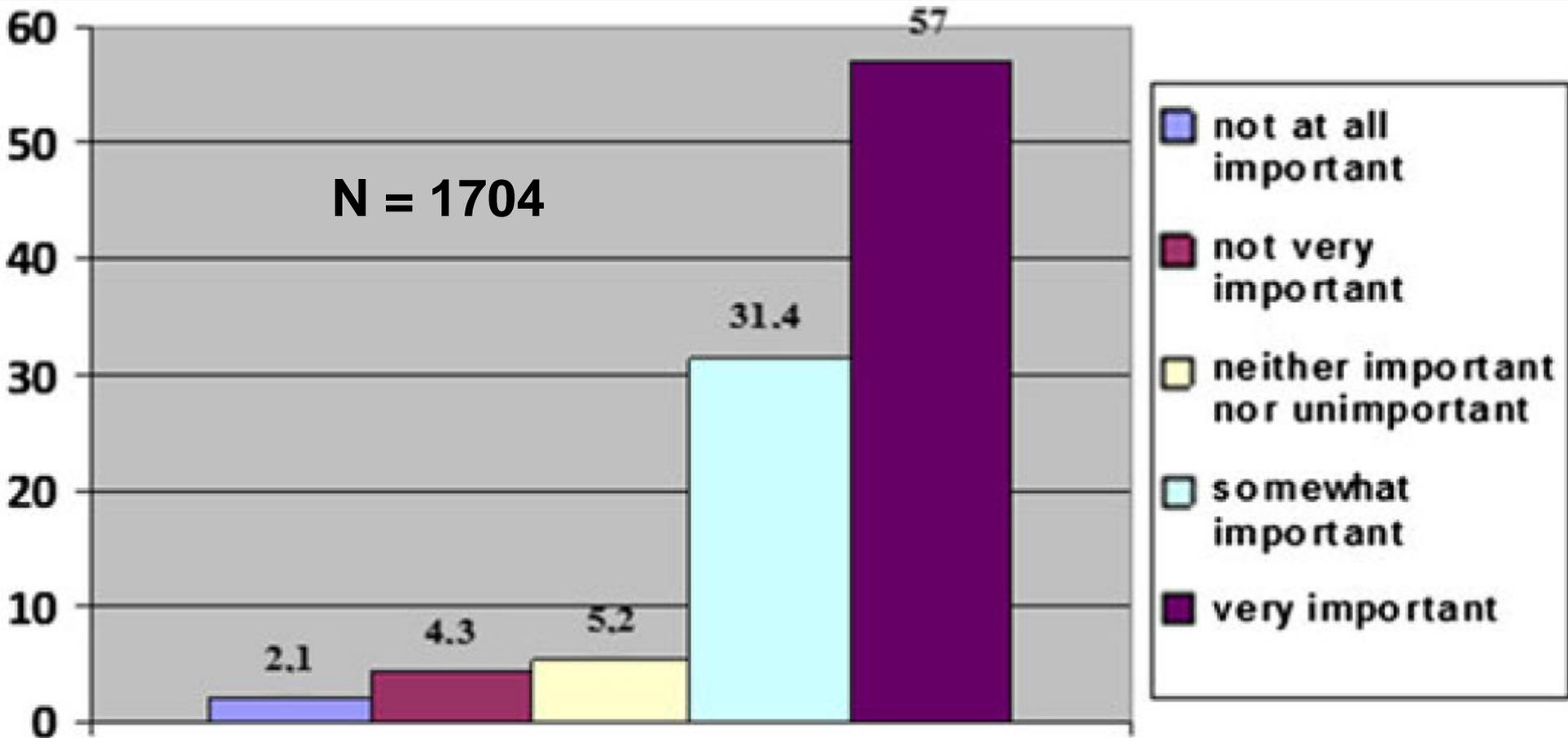


# Impact Factor and associated metrics

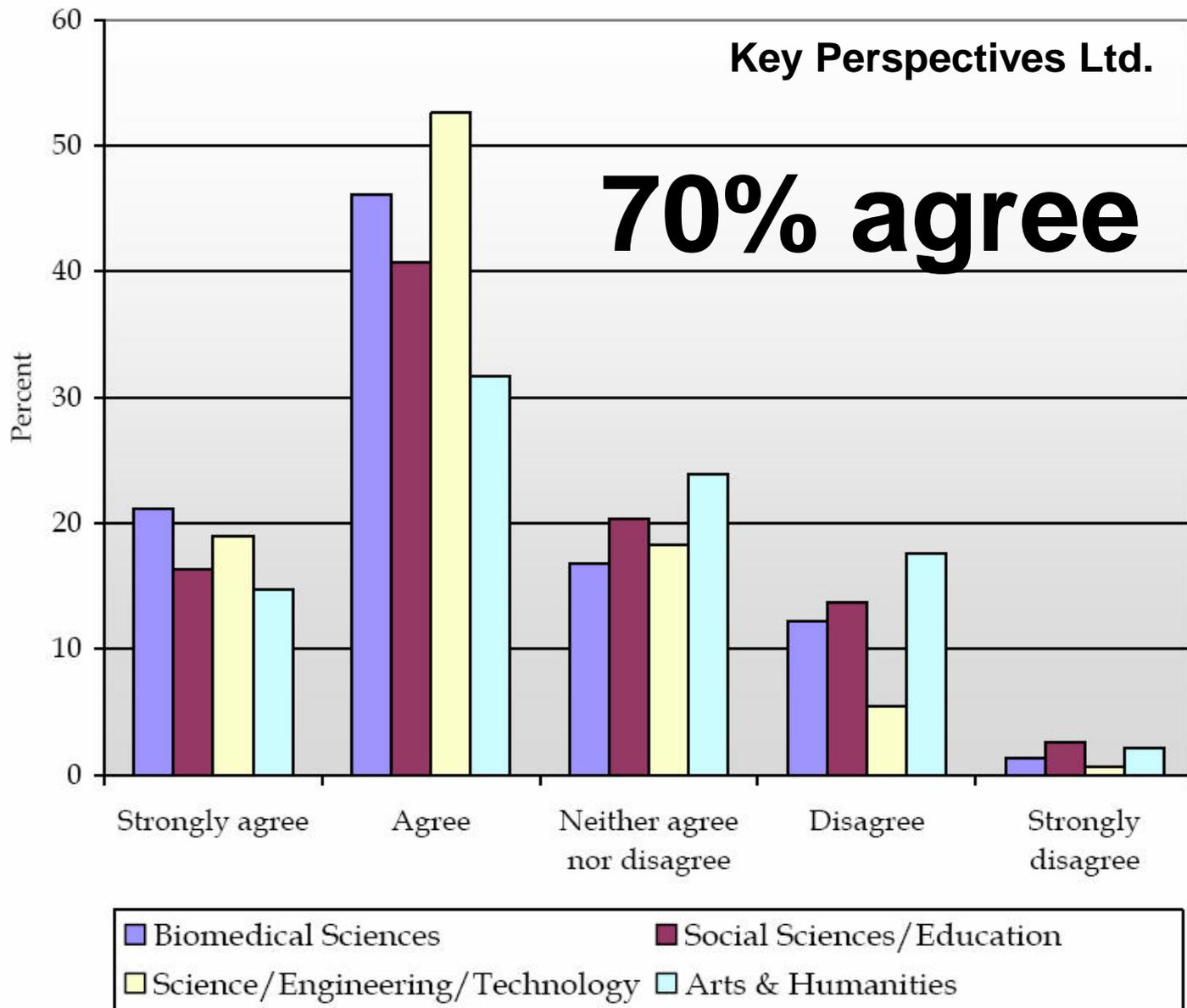
Amin & Mabe (2000). Perspectives in Publishing



# How important is the JIF for the evaluation of science?



Authors were asked: To what extent do you agree or disagree with the following statement?  
*Too much weight is given to journal Impact Factors in the assessment of scholars' published work.*



- The 2-year citation window is too short for most fields – annual citation rates for articles typically peak after three to five years (see e.g. [IMU, 2008](#), p. 7).
- There are wide variations with journal and field in the proportion of published items not included in the JIF denominator, while the process by which Thomson Reuters classifies published items as ‘substantive’ has been characterised as “unscientific and arbitrary” ([PLoS Medicine, 2006](#), p. 707).
- There are variations with type of paper, so review journals often emerge at the top of IIF rankings ([Rogers, 2002](#), p. 541).
- The articles contributing to JIF exhibit a highly skewed distribution,<sup>8</sup> so it is statistically invalid to use an arithmetic mean in calculating JIF ([Metze, 2010](#), p. 937; [Vanclay, 2012](#), p. 227).<sup>9</sup>
- Thomson Reuters insist on quoting JIF to 3 decimal places (i.e. 4 significant figures for many journals), even though the number of papers and citations involved means that most JIF values are not reliable to more than two significant figures ([Hicks et al., 2015](#)).<sup>10</sup>
- Independent efforts to replicate individual JIF values have failed, Thomson Reuters apparently using data that no-one else is allowed to see ([Rossner et al., 2007, 2008](#)).<sup>11</sup>





**Fig. 1** Exponential increase in documents found with a Scopus search for ‘journal impact factor’, showing all documents (*dotted line, circles*), editorial comment (*solid line, squares*) and critical documents (*dashed line, triangles*; with the words ‘bias’, ‘limitation’, ‘problem’, ‘manipulate’, ‘misuse’ or ‘flaw’ in the abstract)



# **Aberrant/unethical behaviour – "Gaming" citations**

**Honorary authorship; gift authorship; ghost authorship; authorship exchanges**

**Citation exchanging**

**Cross-citing within journals**

**Frequent editorials**



# **Aberrant/unethical behaviour – "Gaming" citations**

## **Self-citation**

**Editors/reviewers suggesting that you cite  
their work or articles from  
their journals (= coercion)**

**Long publication queues**



## 5. The 'online queue' stratagem

A new stratagem for inflating one's JIF has more recently come to light, although it has apparently been operating for several years.<sup>23</sup> A leading management journal (at least in terms of its JIF) was observed to have an unusually long queue of papers that are available online but yet to be fully published (i.e. with an issue and page number). Such an online queue has several considerable benefits with respect to the JIF.

1. If the online queue is, say, around two years long, then this doubles the number of papers that can be cited during the two-year JIF citation window without affecting the denominator.<sup>24</sup> Then, when an online paper is finally published two years later, it counts again for a further two years towards the JIF. Thus, a paper made available online towards the end of 2010 counts in the 2011 and 2012 JIF calculations (but not in the denominator); if it is then published at the start of 2013, it counts towards the 2014 and 2015 JIF. The net effect is thus to potentially double the JIF *the JIF doubler effect*.



2. Citations to a paper tend to build up slowly in Years 1 and 2 and then accumulate at a much faster rate in Years 3 and 4. By holding a paper in the online queue for two years, when it is finally published, it is then earning citations at the Year 3 rate. Papers in Year 3 typically earn about the same number of citations as in Years 1 and 2 combined, and the Year 4 figure is broadly similar.<sup>25</sup> Hence, the net effect of this is to add a further 50% or so to the doubling effect described above (*the JIF accelerator effect*).
3. The astute editor, when deciding which papers in the online queue should be chosen to publish in the next issue, can 'cherry pick' those accruing citations at a faster rate. Conversely, those online papers still earning few citations can be left in the online queue where, because they do not count in the JIF denominator, they do not 'dilute' the JIF. If the editor has an available queue, say, of two years-worth of papers from which those to be published in a given year are to be chosen, and if the top 50% most cited papers are indeed chosen, then for a typical journal<sup>26</sup> these earn approximately twice as many citations per year as the bottom 50% (least cited) papers (i.e. a third more than the overall average). Hence, this stratagem offers the possibility for a further 30% increase of the JIF (*the JIF cherry-picking effect*).



4. Finally, a really smart editor might leave some of the highest cited papers in the online queue until he/she is ready to compile the January issue at the start of the calendar year. That way, these papers would have the longest possible time to accrue citations before the JIF window closes. Since papers published in the first of the two years included in the JIF 'window' tend to predominate in contributing to the JIF calculation, the effect is to give the most cited papers 23 months to contribute rather than an average of around 17 months. Hence, if an editor was able to implement this strategy successfully, it could add up to another 30% or so to the JIF (*the JIF front-loading effect*).

= quadrupled JiF



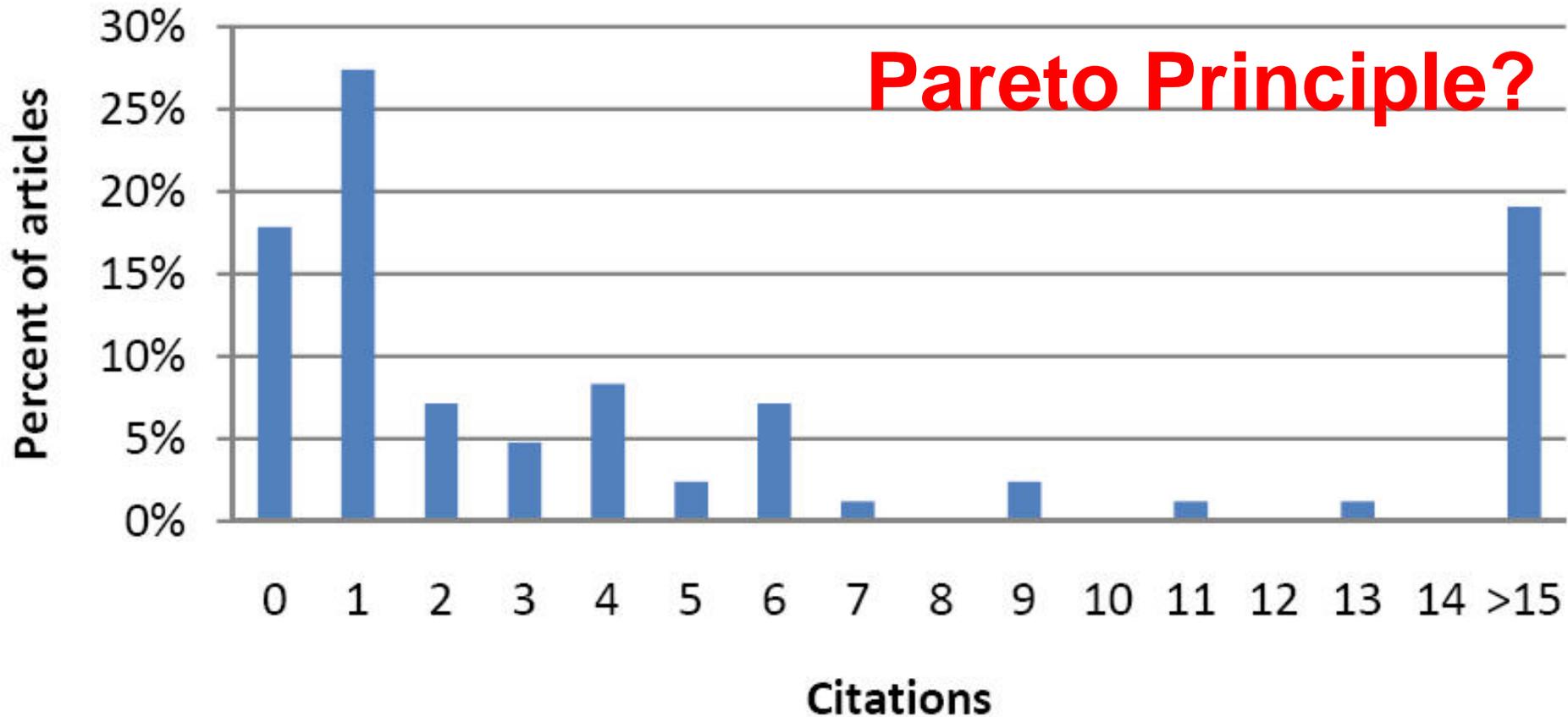
# The Pareto principle

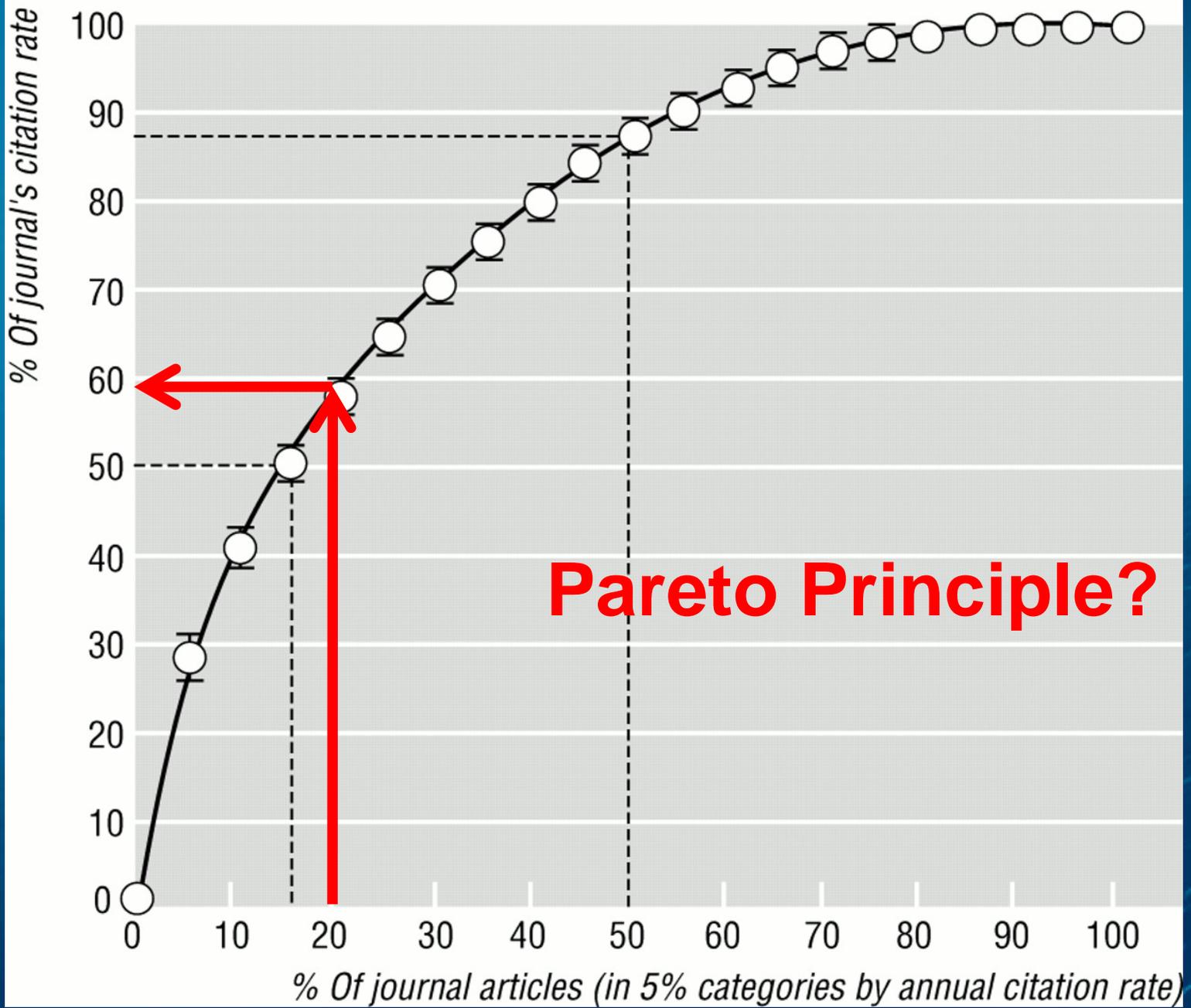
(also known as the **80-20 rule**, the **law of the vital few** and the **principle of factor sparsity**)

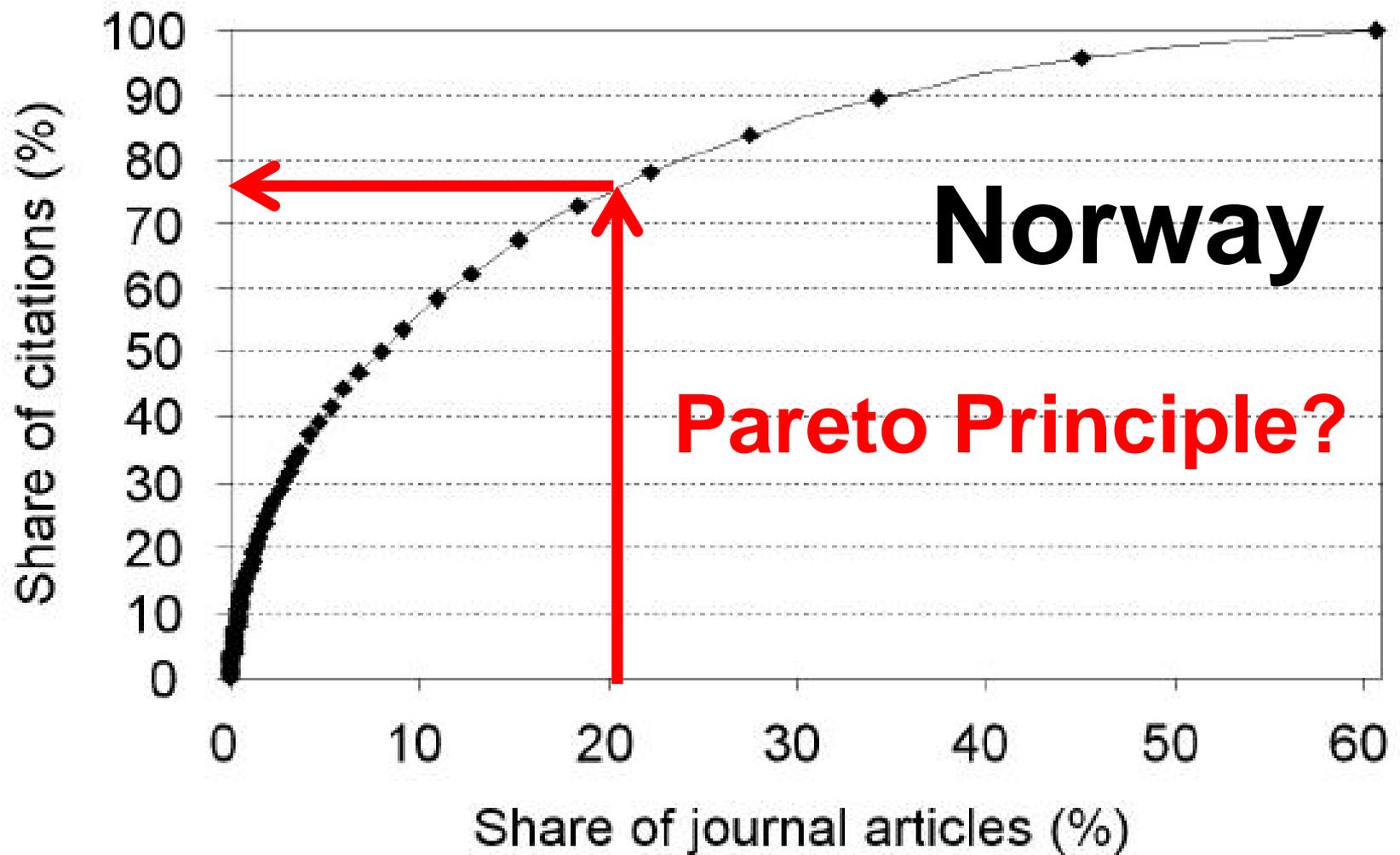
states that, for many events, 80% of the effects come from 20% of the causes.



# Scientist's Citation Record (84 articles)







Aksnes & Sivertsen (2004). *Scientometrics* 59: 213-224.

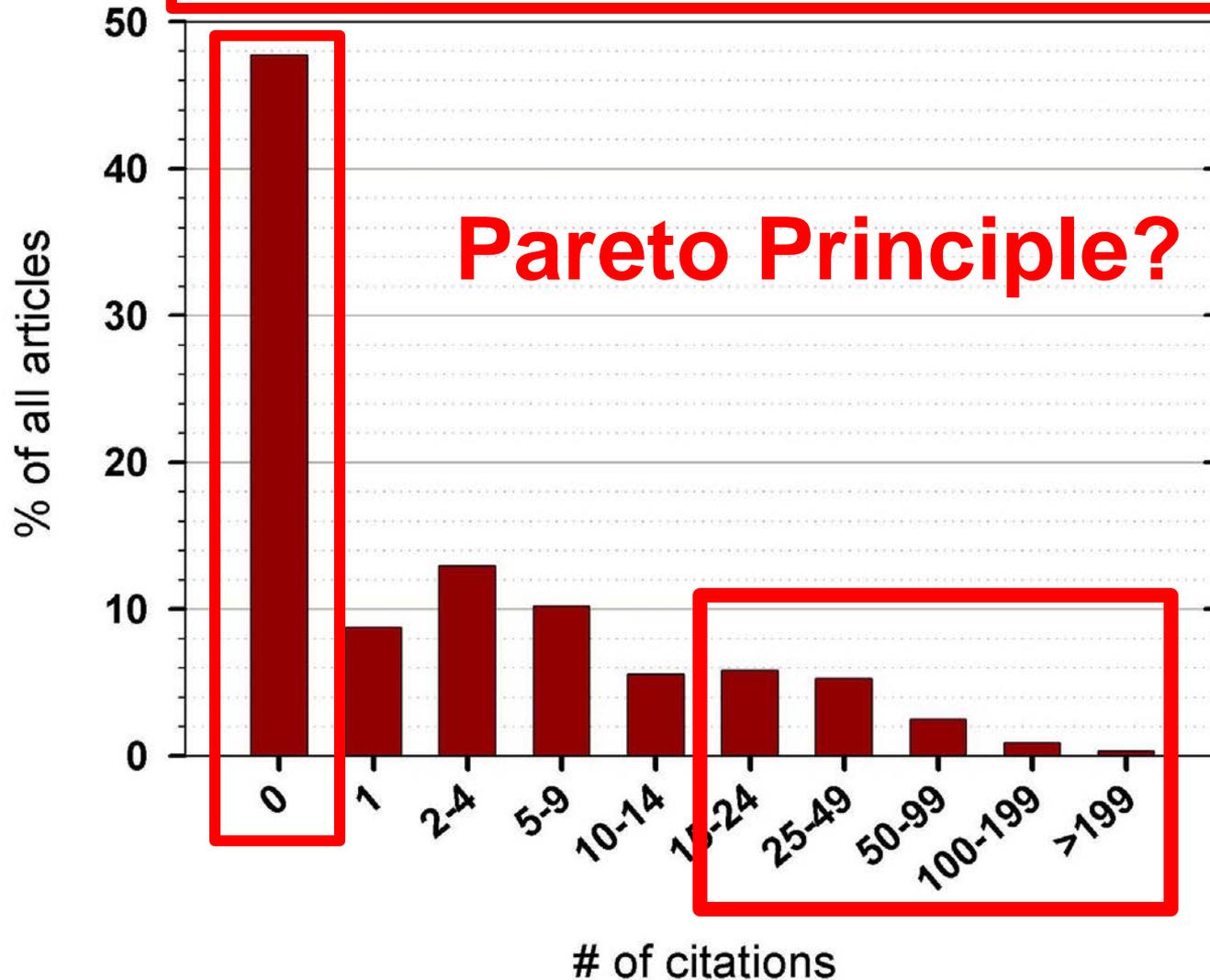


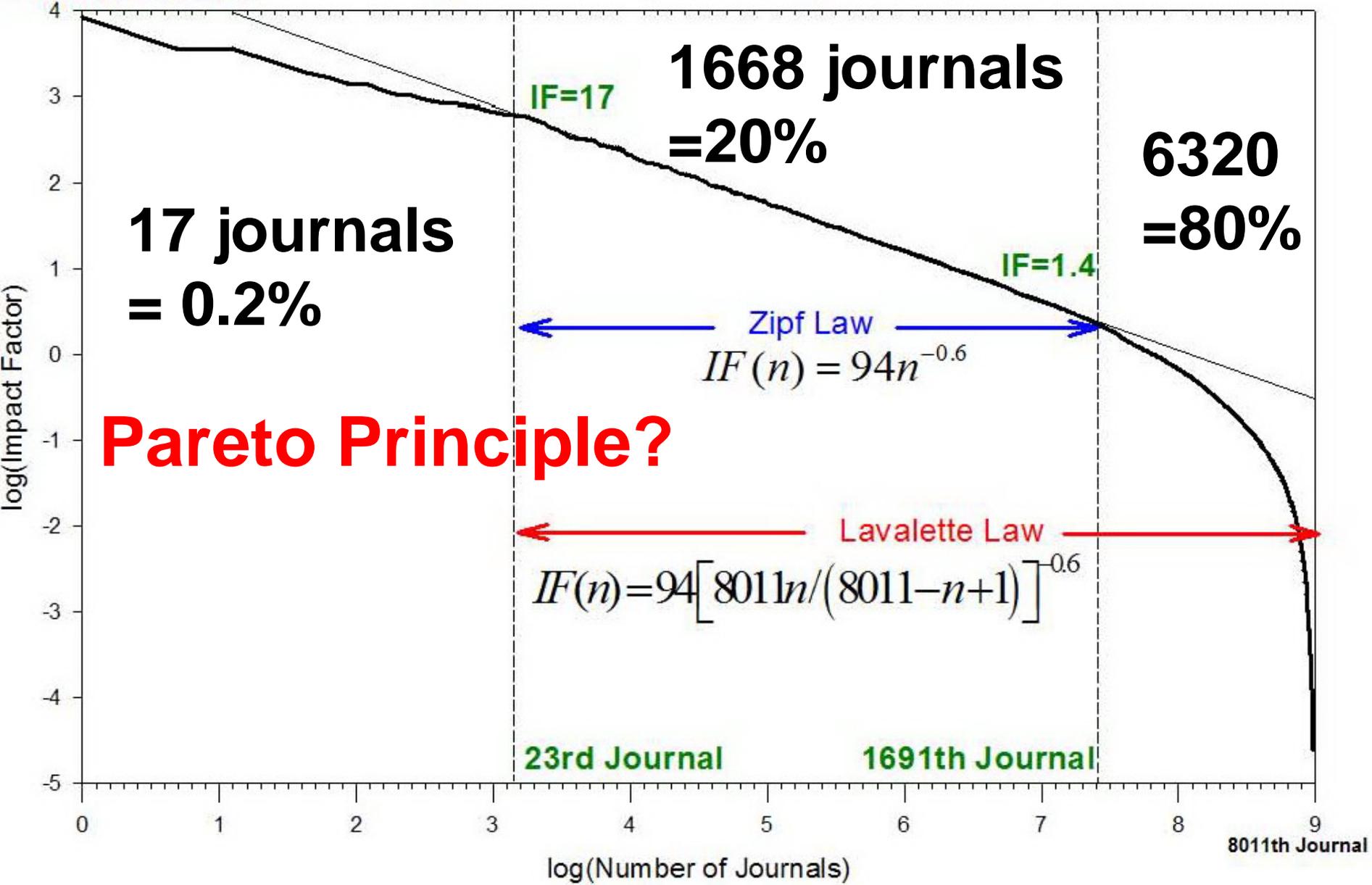
# Citations from 1900 to 08/2005

Total items = 38,163,319

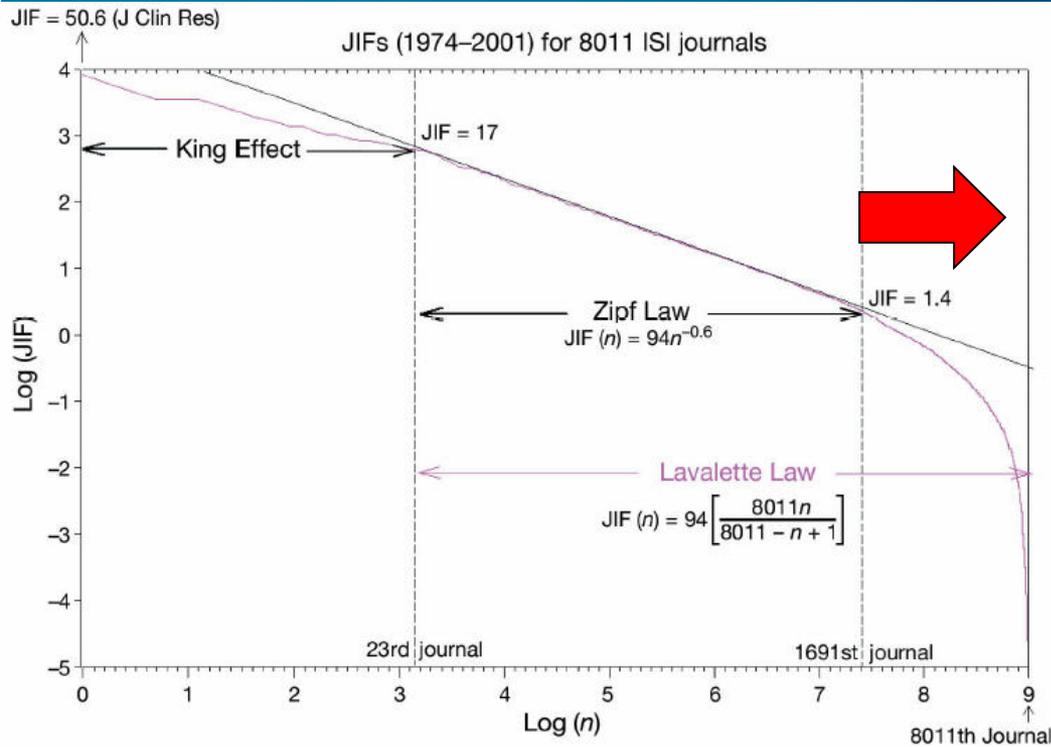
Drawn from Garfield (2005)

**Interpretation.** 48% of all scholarly articles published are never cited at all. If your article has been cited > 25 times, it is in the top 10%.





# Is >90% of all published scholarly output of low quality and without impact?

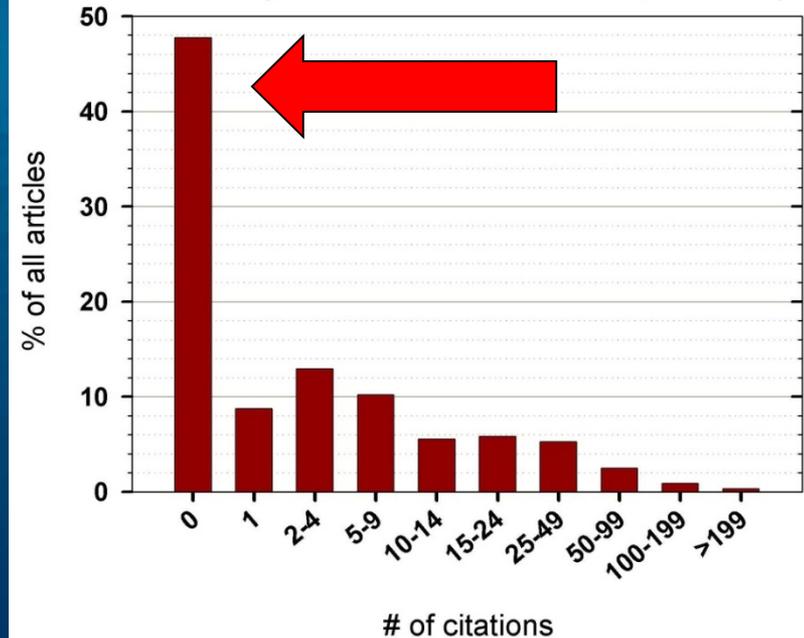


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IF mania continues despite broad condemnation because it is useful to certain elite investigators, journals and funding organizations (2). As long as resources and positions remain scarce, the perverse competitive cycle driven by IF mania will continue despite the overall damage that it causes to the scientific enterprise. The possibility that a focus on impact over importance is distorting the course of science should be of tremendous concern to all scientists, even those who benefit from the status quo. A renewed effort is needed to return science to an emphasis on rigor, reproducibility, and responsibility while encouraging scientific curiosity in all its forms. Together we can disimpact science. (In clinical medicine, the procedure of disimpaction involves the manual removal of feces from the rectum of an impacted individual to relieve constipation. The patient feels much better afterwards.)



## Impacted Science: Impact Is Not Importance

Arturo Casadevall,<sup>a</sup> Founding Editor in Chief, *mBio*, Ferric C. Fang,<sup>b</sup> Editor in Chief, *Infection*



INSTITUTE OF MARINE RESEARCH  
HAVFORSKNINGSINSTITUTTET



<http://fishlarvae.org>

San Francisco

**DORA**

**Declaration on Research Assessment**

<http://am.ascb.org/dora/>



# Recommendations

**Compare your publication record against peers in your own field, and with the same number of years experience**

**Compare the citations of your articles to those published on the same topic in the same year in a journal of equivalent rank**

**Accept the 80/20 rule and expect to have many articles with few or no cites**

**View publishing in "high impact" journals, or having a highly cited article, as a rare event, not a main career objective**

