

Which Journals Attract the Most Frequently Cited Articles?  
Here's a List of the Top Fifteen

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Most readers of *Current Contents*® must be aware that we are using citation analysis to evaluate journals. It adds objectivity to the evaluation process. However, I have repeatedly cautioned that neither men nor journals can be judged on the basis of citation data alone. But citation analysis itself offers more than one way of looking at a journal.

In using citation data to evaluate a journal for ISI® coverage, we can look at the data in several ways. How frequently is the journal cited? How frequently is the *average article* in the journal cited? How often does the journal publish articles that become citation superstars?

In the first case, a journal may be highly cited because it publishes a lot of articles, that is, the journal has a high absolute citation count. In the second case, the journal's absolute citation count may be much lower, but the few articles it publishes may, individually, be cited much more frequently than those published in journals cited more often. In this second case, we say the less-cited journal has a higher "impact factor." For example, the most highly cited journal of all is *Journal of the American Chemical Society*. Furthermore, the average *JACS* article is cited 5 to 6 times a year, that is, its impact factor is 5.6. But the *Journal of Experimental Medicine*, which ranks only 36th in terms of total citations, has an impact factor of 8.3. Its average article is cited more often than the average article in *JACS*. On the impact factor scale *JEM* ranks 13th, while *JACS* ranks 22nd.

In the third case, we ask how often the journal has attracted citation superstars—those articles that for one reason or another are cited with extraordinary frequency. In 1969, for example, only about 150 journals were cited as frequently as Lowry's single paper on protein determination.<sup>1</sup> One may wonder to what extent such citation block-

busters influence the impact factor of the journals in which they appeared.

I have recently examined a list of the 1000 papers most frequently cited during the past decade. About 200 journals accounted for those 1000 articles, but 500 of the articles were published in only 15 journals.<sup>2</sup> Thus, if a citation blockbuster like Lowry's paper is atypical of most scientific papers, it is not so atypical in relation to other papers published in *Journal of Biological Chemistry*. *JBC* alone published 109 of the 1000 papers most cited during the decade. I will discuss these highly cited papers in a future editorial.

One of the surprising discoveries in our study of citation data has been the relatively low impact of articles published in most journals, including journals that seem almost universally accepted as preeminent. Because of our citation analysis we can assure you that we cover every journal whose average article is cited at least twice during a one-year period.<sup>3</sup> Such sweeping assurance may surprise you, but the number of journals that achieve that level of impact—an impact factor of 2 or more—is small. There are only about 150 journals with impact factors greater than 2, and fewer than 500 with impact factors greater than 1!

This kind of numbers game can be confusing, no doubt, but the implications are far from trivial. It is, as I have called it elsewhere, "a formidable challenge to statistical analysis."<sup>3</sup> In less stilted prose, it offers ample opportunity for statistical carping. That notwithstanding, these numerical exercises allow us to look at journals in a way that we have not been able, or were not willing to do before.

When dealing with journals of low impact and size, obviously we must consider other factors in justifying coverage. With a new journal, we can't use citation frequency

or impact immediately, but we can certainly judge the quality of the journals being cited in inaugural issues, and take into account other editorial factors as well.

It's probably safe to say that, given two otherwise equivalent journals, we would choose one that publishes articles in English rather than one that doesn't. All CC® readers can handle English; relatively few are competent to deal with Slavic and Oriental languages. But one could argue that any non-English journal that achieves a near-average impact factor must have "something special" going for it. It must, considering how many English-language journals don't achieve the average. It remains within our special competence to discover just what that "something special" may be. We can use our *ISI Journal Citation Reports*™<sup>4</sup> to determine whether the journal is cited mainly by itself and other vernacular journals; or whether its citation pattern is international. It may provide a sort of "lingual interface," being used routinely by scientists in other countries as a bridge across the language barrier into the research of its country of origin. *JCR*™ can also tell us what journals that journal is citing. Many foreign journals whose titles appear provincial are by no means provincial in their citation patterns. This is true of many Indian journals.

Provinciality in citation patterns is not necessarily to be taken as an indictment of a journal. It may be due to geography, as in tropical medicine or geology. But the value of such a journal for a service like CC must be studied carefully, if we are to give priority to journals of international appeal. Similarly in the social sciences, such a journal may be of great value in area studies, but have limited interest otherwise.

Many years ago, I noticed that the *Acta Societatis Medicorum Upsaliensis* had published a highly cited article.<sup>5</sup> Being pressed at the time to add a few new journals, I decided that any journal that could attract such an important article was worth adding. Since that time, I don't know that this journal has produced another such heavily cited paper, but its quality has been as consistent as many other journals added for different reasons. It is certainly better than many other local medical journals. We recently dropped a few of the latter. That they couldn't even meet a quarterly publication schedule reinforced a preliminary decision based on a poor citation record.

We also know that some presumably famous journals still covered do not have im-

pressive citation records. Except for public relations and alumni satisfaction, one wonders why such local journals are needed. Even considering the world's plethora of journals, it is still difficult to argue with pride-of-ownership. Someone must feel that these journals produce a return for their high cost. One might regard them as the medical profession's subsidy to the always shaky printing industry. But the cost to the scientific community in journal pollution is not trivial, and we are trying to do something about it.

Returning to my main point—it is remarkable that of the 1000 or more most heavily cited articles in the literature, not one appeared in an "obscure" journal. One wonders how some organizations can justify the heavy cost involved in providing "total" abstracting and indexing coverage of the thousands of marginal journals properly classified as "obscure." Government subsidies tend to encourage this non-selectivity on the grounds that the information may be useful to someone somewhere sometime. Now that we have operating SDI and on-line information systems, such attempts at "total" coverage can perhaps be reduced in cost, if still not justified. Depository systems help in this respect. But for any printed publication like *Current Contents*, a prime objective must be to spare the user the cost and effort of dealing with the marginal. Citation analysis is helping us do that.

1. Garfield, E. Citation frequency as a measure of research activity and performance. *Current Contents* No. 5, 31 January 73, p. 5-7.
2. The fifteen journals, and the number of the citation superstars they've published are: *J. Biol. Chem.* (109); *Biochem. J.* (48); *Phys. Rev.* (45); *JACS* (41); *J. Chem. Phys.* (40); *Proc. Nat. Acad. Sci. US* (38); *Nature* (28); *J. Mol. Biol.* (24); *Analyt. Chem.* (20); *J. Exp. Med.* (20); *Science* (20); *Arch. Biochem. Biophys.* (17); *J. Cell Biol.* (17); *J. Clin. Invest.* (17); *Biochim. Biophys. Acta* (16).
3. Garfield, E. Citation analysis as a tool in journal evaluation. *Science* 178:471-79, 1972. Reprinted in: *Current Contents* No. 6, 7 February 73, p. 7-24. This paper gives a detailed explanation of the calculation of impact factors. The impact factors discussed here were calculated on the basis of 1969 citations to articles published in 1967 and 1968.
4. ———. The new *ISI Journal Citation Reports* should significantly affect the future course of scientific publication. *Current Contents* No. 33, 15 August 73, p. 7-8.
5. Werner, I. & Odin, L. On the presence of sialic acid in certain glycoproteins and gangliosides. *Acta Soc. Med. Upsal.* 57: 230-41, 1952.