

# Letters

## The importance of being cited

Researchers who cite a previous paper are not only acknowledging a transfer of information that has benefited them in their work but are also giving the cited authors a receipt that they can use for credit. The prestige of a medical journal and the academic careers of its authors depend to a great extent on the frequency with which their articles are cited by other authors and journals. Eugene Garfield, president of the Institute for Scientific Information, uses his *Citation Index* to produce an impact factor that shows how many times per published article a given journal is cited and also a count of how many citations an author's work garners in a given time.<sup>1</sup> Although, as might be expected, self-citation is frequent, averaging about 10% for individual authors and for the rate at which general medical journals refer to their own articles, it is citation by others that counts.

Citations establish links between articles, authors and journals that can be displayed as networks and topographic maps.<sup>2</sup> Widely cited authors are seen as mountain peaks surrounded by the hillocks of their followers, although these mountains rise and fall with nongeologic rapidity. To evaluate an author's "scientific activity" fairly, citation counts may have to be adjusted for the "popularity" of the author's field, the multiplicative effect of working with a group and the importance of the citing journals.<sup>3</sup> For journals the impact factor shows that publications of high prestige are cited more frequently than those of low pres-

tige. One has only to examine the reference lists of some of the more obscure medical journals and compare them with the best known: they are quite similar in that both cite the latter much more than the former.

Although the quality of an author's work is positively related to the number of papers he or she publishes,<sup>4</sup> individual researchers should not be judged purely by quantitative citation analysis. Articles of similar merit will be cited more if they appear in journals of high prestige. Some worthwhile contributions are "obliterated" because they are soon followed by a more definitive or more widely circulated work in the same field. A few papers are ahead of their time and cannot be cited until other research catches up with them. Review articles and editorials are less likely to be cited. Finally, a grim probabilistic model appears to govern the frequency of citation: at least 25% of all scientific papers are never cited even once, and the mean annual rate of citation of the papers that are cited in a given year is only 1.7, meaning that the modal rate is only once per year.<sup>5</sup>

According to Price,<sup>6</sup> each time a paper is cited its chance of being cited again increases. He calls this "cumulative advantage", although it is referred to less scientifically as the "Matthew effect". (For unto everyone that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath. [Matthew 25:29].) Whatever it is called, this statistical avalanche is related to Bradford's Law, which states that the distribution of recorded knowledge is highly skewed into a few sources. For example, if

ranked in order of value, 0.1% of all books on a subject will contain 50% of the useful knowledge in a field, and a quarter will contain 90%.<sup>6</sup>

Being cited is the third filter (after grant proposal review and editorial review) through which a scientific contribution must pass before it can be completely accredited as useful knowledge. Like the other two filters, its pores are not all the same size, and it is more permeable to some materials. The recent appearance of three sets of "twins" — similar articles appearing synchronously in *CMAJ* and other journals — will allow us to evaluate *CMAJ*'s citation patterns in a few years. In future letters on the medical literature I will examine citation patterns of specific medical journals and "good" and "bad" citation patterns in articles.

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## References

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