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## COMMENTARY

## A statistically valid definition of bias is needed to determine whether the *Science Citation Index*<sup>®</sup> discriminates against third world journals

Eugene Garfield

From the inception of the *Science Citation Index*<sup>®</sup> in the sixties, the question of journal coverage has been widely, and often emotionally, discussed. Imagine the hubris of my suggesting in 1964, that 'only' a few hundred core journals would satisfy the needs of most readers. Since then, I have regularly published data demonstrating this concentration effect<sup>1</sup>. These periodic reports illustrate the well-known Law of Scattering<sup>2</sup> and the less known Law of Concentration, which I first discussed in 1971 (ref. 3).

Samuel Bradford's Law of Scattering was first developed to explain the dispersion of journal articles within specific fields. Later, I discovered this was true for science journals as a whole. In other fields of human endeavour, these phenomena are sometimes referred to as the 80/20 rule, Zipf's Law, Pareto effect, etc. Derek J. deSolla Price was well aware of these distributions which

have been studied by B. C. Brookes<sup>4</sup> and many other bibliometricians<sup>5</sup>.

Figure 1, reprinted from *The Scientist* article cited above, is important to the

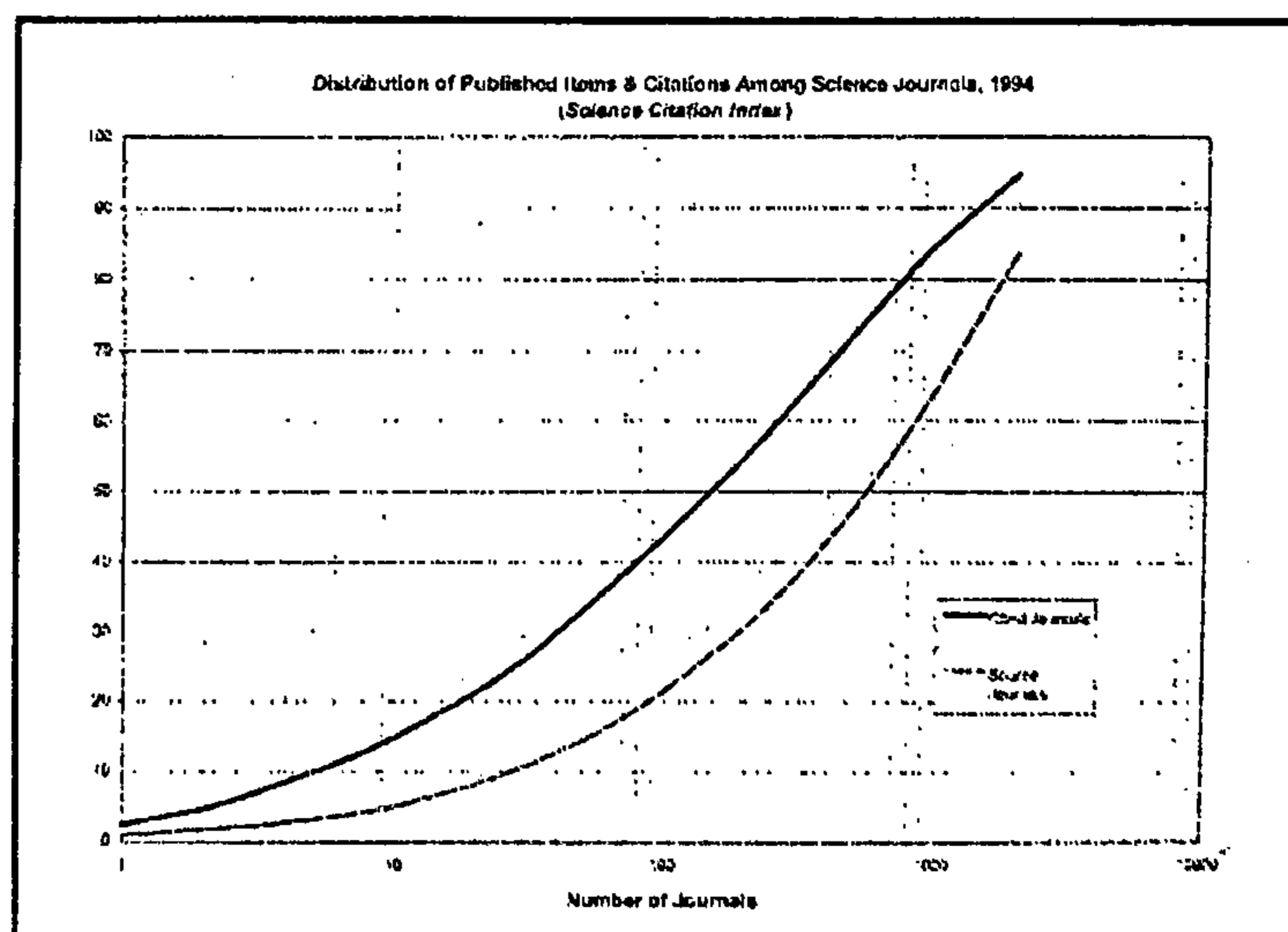


Figure 1.

**Box. Clarifications and errata**

(Reproduced from Letters to the Editor Section, *Scientific American*, October 1995, p. 10.)

The article 'Lost Science in the Third World' (*Scientific American*, August) reported several assertions made during interviews and later confirmed by Luis Benitez-Bribiesca, editor in chief of the journal *Archives of Medical Research*, regarding the *Science Citation Index*, a database produced by the *Institute for Scientific Information (ISI)*. According to the *ISI*, it has never required that any journal, person or institution purchase an *ISI* product to qualify for inclusion in its indexes.

Furthermore, the *ISI* notes that it has never made a decision about indexing a journal until after at least three issues have appeared. No statement in the article is meant to imply that the extent to which a journal's articles are cited is the sole criterion for inclusion in an *ISI* product. Also, the \$10,000 subscription price mentioned for the index is the approximate current price, not the price during the 1970s. The editors regret any misunderstanding resulting from ambiguities or misstatements in the article.

following discussion of alleged bias in *ISI* or other databases. All such discussions are essentially concerned with the tail of a long hyperbolic curve. Once the core journals are selected, the remainder of one's effort is spent selecting from thousands of relatively small and low-impact journals published, both in the advanced as well as in the developing countries.

Allegations of bias in *ISI* journal coverage are not new but an August 1995 article in *Scientific American*<sup>6</sup> (pp. 92-99) precipitated the discussion once again. The article raised some important questions about the treatment of Third World material in the West, but at the same time made unsubstantiated statements about *ISI*'s selection policies.

A 'clarification' published in the October 1995 issue<sup>7</sup> is reprinted in the Box. The editor of the journal involved also wrote to me apologizing and explaining the source of the error.

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7. 'Clarification and errata', *Sci. Am.*, October 1995, p. 10.

After the original *Scientific American* article appeared, I drafted a letter commenting upon the main thrust of the article. However, when the apology was

published, I decided to withhold the letter. Then, due to a recent discussion with Subbiah Arunachalam, I decided to submit the letter to *Scientific American* which has declined to publish it, since two years have passed. I can understand that viewpoint since *Scientific American* is a popular magazine and most readers will have forgotten the original article. However, the editors of *Current Science* asked me to publish the information for the benefit of Third World readers, in particular. What follows is the text of the letter originally addressed to the editor of *Scientific American*. The references in that letter are listed separately from those cited above.

'I was glad to see your clarification note (*Sci. Am.*, October 1995, p. 10) for the article by W. W. Gibbs, *Sci. Am.* (August 1995, pp. 92-99). His article gave the impression that indexing services discriminate against Third World journals. And he used extensive *Science Citation Index*<sup>®</sup> data to support this *a priori* position.

As the former Chairman and founder of the Institute for Scientific Information, I have devoted 40 years to espousing the cause of scientists in the Third World. The suggestion that the *Science Citation Index* is the reason for the failure of any journal, institution, or individual to achieve international peer acceptance is unwarranted. Undoubtedly, coverage of any journal in *Current Contents*<sup>®</sup> or *SCI*<sup>®</sup> helps to make a journal's articles better known, but that by itself is not sufficient to induce citation by other scientists. A variety of factors account for citation not the least of which is quality, timing, and/or relevance to the current work of other scientists.

The history of science is replete with examples of delayed recognition<sup>1</sup>, including the classic example of Gregor Mendel, but none of these cases was due to coverage by abstracting services. The work of Mendel was known and first quoted in the *Encyclopedia Britannica* in 1880 (ref. 2) but its significance was not appreciated until this century. I have also documented the case of the Indian scientist Shambu Nath De<sup>3</sup>. His classic works on cholera were published in the *Journal of Pathology and Bacteriology* in the fifties. Even that did not guarantee full recognition in his lifetime. The fact is that thousands of articles published in leading journals are rarely cited for many reasons. Undoubtedly an important factor is mobility and frequency of contact with peers outside the Third World.

Over 30 years ago, *ISI* developed the journal impact factor as just one method of supplementing the subjective appraisal of small journals by objective unobtrusive means. Thousands of new and established journals which were not originally covered in *Current Contents*<sup>®</sup> or the *Science Citation Index* eventually were selected in part because their articles somehow attracted the attention of scientists publishing in *ISI*-covered journals. Third World scientists routinely send reprints to colleagues in other countries. And relevant or significant material will eventually be cited in research or review articles.

The procedures for selecting journals in *CC*<sup>®</sup>, *SCI*<sup>®</sup>, and the *Social Sciences Citation Index*<sup>®</sup> are meticulous and well documented<sup>4</sup>. Citation impact is but one of many criteria used to select journals. Thousands of small journals are included from countries and institutions around the world.

One of the many criteria for selection is the use of English which has become the *lingua franca* of science. Any journal which claims international significance will at minimum include English titles and abstracts.

The Gibbs article characterizes *SCI* coverage of Third World science as declining simply because the coverage of some local journals has discontinued. In fact, total article coverage has increased substantially because Third World scientists increasingly publish in the international peer reviewed journals, where their work is seen and read by peers worldwide. We have documented these trends at numerous conferences<sup>5</sup>.

In 1981 *SCI* indexed 904 articles from Mexican authors. In 1994, coverage increased to 2478 articles. However, the impact of Mexican research relative to the rest of the world has remained stable during this 14-year period. Its impact on average is 50% below the world average. These and other data demonstrate that *SCI*'s coverage of 3300 journals goes far beyond the needs of most of its subscribers. Indeed, the reality today, as it was 50 years ago, is that a small percentage of journals accounts for a major share of papers published and an even greater share of citations. 100 journals account for over 20% of the articles published and over 40% of the citations. 1000 journals account for 70% of papers and 85% of the citations (see Figure 1).

Any journal or indexing service has economic limitations. Even *Medline*, a government-subsidized enterprise, has limited resources and must limit coverage. To an outsider, selection decisions

may seem as arbitrary as peer review of research grant applications does to some researchers.

The Zelinski quotation, featured in your article, implies that population should determine the number of journal articles to be covered by indexing services. On that basis, journals published in China, India, and Russia would receive the highest priority regardless of the quality or relevance of the material.

*SCI* is an index which already includes 650,000 source articles per year and over 15,000,000 cited references appearing in 3300 journals.

Many Third World countries suffer by publishing dozens of marginal journals whose reason for being is questionable. I have urged them to combine the best material into larger regional journals to achieve a critical mass. In addition, their local funding sources need to adopt stringent criteria for publication including international peer review. The precedents for this are to be seen in the numerous European journals which have made many national journals essentially obsolete. Nevertheless, many local journals published in vernacular languages serve a useful purpose for reviewing the clinical and applied literature to the benefit of local physicians and industry. These serve a purpose similar to thousands of American trade or state medical journals which have little impact on research but they too are not covered in *SCI*<sup>6</sup>.

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3. Garfield, E., *Current Contents*, 7 April, 1986, 3-11, reprinted in *Essays of an Information Scientist* (1986), 1988, 9, 103-111.
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## Conclusion

In correspondence with numerous scholars, I have indicated that there has never been an objective definition of 'bias' or discrimination with respect to secondary databases. The difficulty can be characterized as a chicken and egg situation. If all the world's journals were included in the *ISI* citation indexes, then we could more easily decide which should be given the highest priority of coverage. Since this is not possible, considering the economic limitations, my recommended solution is that scientists in each country or region should gather whatever data is needed to evaluate their journals and give *ISI* and other database publishers prioritized lists of journals they would recommend. Local citation indexes can be compiled if necessary to facilitate such evaluations.

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## SCIENTIFIC CORRESPONDENCE

### Flowering in *Bambusa vulgaris* var. *vittata*

The peculiar behaviour of many woody bamboos, of flowering (and seeding) only at very long intervals, followed by the death of the flowered clumps<sup>1</sup>, has intrigued mankind for long<sup>2</sup>, and still remains a mystery<sup>3</sup>.

The information available on this interesting natural phenomenon is somewhat confusing because of difficulties in the correct identification of the species and varieties of bamboos, and the many synonyms in vogue. Like

many other aspects of bamboo biology, bamboo taxonomy also suffers from their peculiar flowering behaviour, because of the non-availability of flowering specimens for routine identifications.