Web of science: Measuring and assessing science beyond *SCI*

Eugene Garfield's letter[1] questions the basis of the well-known assertion that the scientific community is not satisfied with the existing quantitative indices like the *SCI* and its twin publication, the *JCR*. Surprisingly, in the same breath Garfield assures that '. . . in the future *JCR* will evolve to deal with many of the objections that one can cite'. However, the intention of the letter that provoked Garfield[2] was to focus on innovative alternative as the Euro Factor being developed in the West essentially targeted to address the long-standing criticism against the IF.

The data for the *SCI* have been used for long for its secondary use, i.e. to study, 'quantify and evaluate' science, scientists, scientific journals and even institutions. While Garfield may not like to agree, the ignorance of the tool has seen the emergence of 'experts' commenting on the health of science, especially in India. In fact some of them appear to be unaware that *SCI* is published as a *SCI*-CD version and a Web version and that the coverage of the journals is significantly different in these two databases. In one such analysis, Indian science is reported to be 'declining' while there has been on an average, an increase of about 30%. What bothers us now is the fact that *SCI*-CD version provides some figures for the same year for a country like India whereas enhanced figures are provided by its other version, the *SCI* Expanded (via the Web with abstracts/*ISI Web of Science*). Interestingly, data provided by both the versions are correct! Some have concluded with this incomplete dataset that Indian science is on the decline[3].

Specifically, the 1980–2000 data for India through both the versions of *SCI* provide a very confusing picture. For example, for the year 2000, **12,127** papers (in the case of *SCI*-CD) have simply become **179,341** in the Web version, an increase of 32.38% over the CD version. Interestingly, there is a uniform increase of 30% or more since 1987 (Table 1 and Figures 1–3). The same is true for journals indexed from each country as also total journals indexed in these two versions including the *JCR*. Specifically, in the case of India for the year 2000, a total of 51 journals are indexed in the *SCI* Expanded (via the Web with abstracts [*ISI Web of Science*]) whereas only 10

Table 1. Number of papers published by India as seen from *SCI*-CD and *Web of Science* (as accessed on 21 August 2003) over two decades (1980–2000)

Year	Total papers in the *SCI*-CD	Total papers in the *Web of Science*	Increase over CD	% increase
2000	12,127	17,934	5807	32.38
1999	12,521	19,175	6654	34.70
1998	12,128	18,165	6037	33.23
1997	11,067	16,731	5664	33.85
1996	11,177	17,037	5860	34.40
1995	11,084	16,885	5801	34.36
1994	11,319	16,210	4891	30.17
1993	10,978	15,924	4946	31.06
1992	11,160	16,132	4972	30.82
1991	10,468	16,198	5730	35.37
1990	10,103	14,990	4887	32.60
1989	10,426	15,728	5302	33.71
1988	10,208	14,806	4598	31.05
1987	10,239	14,931	4692	31.42
1986	10,854	14,679	3825	26.06
1985	11,222	14,172	2950	20.82
1984	10,600	14,619	4019	27.49
1983	12,059	14,325	2266	15.82
1982	12,124	14,948	2824	18.89
1981	13,119	16,064	2945	18.33
1980	14,983	15,217	234	1.54
Total	239,966	334,870	94,904	28.34

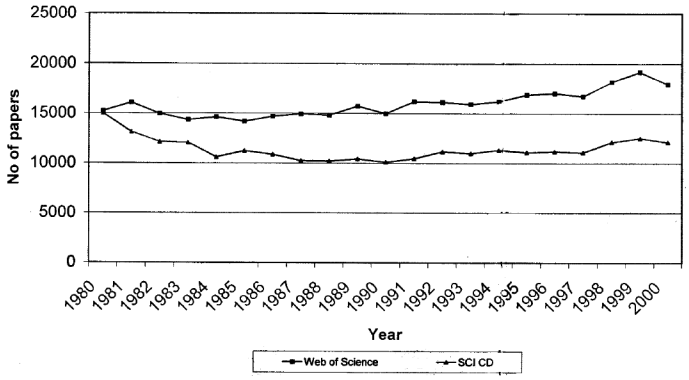

Figure 1. Number of papers published by India as seen from *SCI*-CD and *Web of Science* (as accessed on 21 August 2003) over two decades (1980–2000).

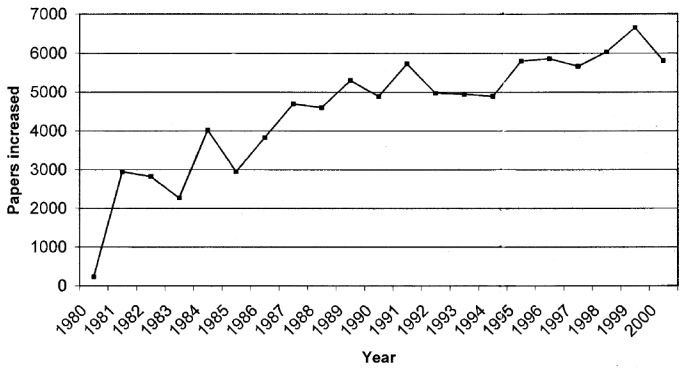

Figure 2. Number of papers increased over CD by India as seen from *SCI*-CD and *Web of Science* (as accessed on 21 August 2003) over two decades (1980–2000).

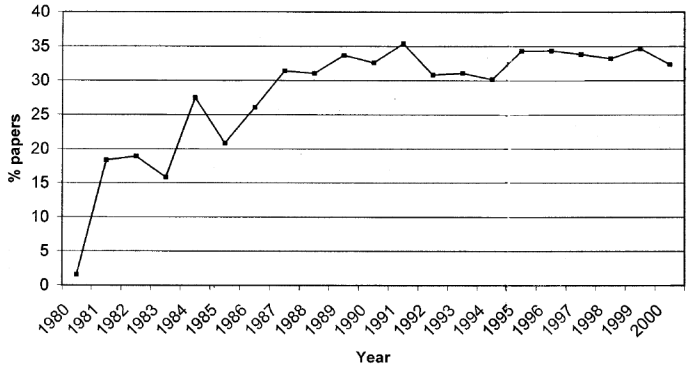

Figure 3. Percentage papers increased over CD by India as seen from *SCI*-CD and *Web of Science* (as accessed on 21 August 2003) over two decades (1980–2000).

Table 2. Coverage of Indian journals in the *SCI*-CD version, and *SCI* Expanded (via the Web with abstracts [*ISI Web of Science*] and *JCR/SCI*-CD version during 2000)

Journal in the *SCI* Expanded (via the Web with abstracts [*ISI Web of Science*] (n = 51) and *SCI*-CD version (n = 10))*	Impact Factor 2000 JCR/SCI (n = 47)
1. *Allelopathy Journal*	
2. *Annals of Arid Zone*	0.200
3. *Asian Journal of Chemistry*	0.219
4. *Asian Journal of Spectroscopy*	0.389
5. *Bulletin of Electrochemistry*	0.098
6. *Bulletin of Materials Science*	0.393
7. *Current Science**	0.512
8. *Defence Science Journal*	0.060
9. *Electronics Information and Planning*	0.000
10. *ICID Journal*	
11. *IETE Journal of Research*	0.023
12. *Indian Journal of Agricultural Sciences*	0.050
13. *Indian Journal of Agronomy*	0.026
14. *Indian Journal of Animal Sciences*	0.084
15. *Indian Journal Biochemistry and Biophysics*	0.256
16. *Indian Journal Chemical Technology*	0.296
17. *Indian Journal Chemistry Section A – Inorganic Bio-Inorganic Physical Theoretical and Analytical Chemistry**	0.313
18. *Indian Journal Chemistry Section B – Organic Chemistry including Medicinal Chemistry**	0.421
19. *Indian Journal of Engineering and Materials Sciences*	0.116
20. *Indian Journal of Fibre and Textile Research*	0.157
21. *Indian Journal of Heterocyclic Chemistry*	0.185
22. *Indian Journal of Marine Science*	0.127
23. *Indian Journal of Medical Research**	0.383
24. *Indian Journal of Pure and Applied Mathematics*	0.062
25. *Indian Journal of Pure and Applied Physics*	0.214
26. *Indian Veterinary Journal*	0.044
27. *Journal of Advanced Zoology*	0.058
28. *Journal of Applied Animal Research*	0.144
29. *Journal of Astrophysics and Astronomy**	0.625
30. *Journal of Biosciences**	0.404
31. *Journal of Camel Practice and Research*	0.034
32. *Journal of Environmental Biology*	0.103
33. *Journal of Food Science and Technology Mysore*	0.151
34. *Journal of Genetics**	0.588
35. *Journal of Plant Biochemistry and Biotechnology*	0.430
36. *Journal of Polymer Materials*	0.495
37. *Journal of Scientific and Industrial Research*	0.208
38. *Journal of the Geological Society of India*	0.390
39. *Journal of the Indian Chemical Society*	0.248
40. *National Academy of Science Letter-India*	0.059
41. *National Medical Journal of India**	0.333
42. *Neurology India*	0.092
43. *Nimhans Journal*	
44. *Oriental Insects*	0.216
45. *Pramana – Journal of Physics**	0.314
46. *Proceedings of the Indian Academy of Sciences – Chemical Sciences**	0.254
47. *Proceedings of the Indian Academy of Sciences – Earth and Planetary Sciences*	0.412
48. *Proceedings of the Indian Academy of Sciences – Mathematical Sciences*	0.061
49. *Sadhana – Academy Proceedings in Engineering Sciences*	0.171
50. *Transactions of the Indian Institute of Metals*	0.049
51. *Transactions of the Metal Finishers Association of India*	

are indexed in the *SCI*-CD version. However, the *JCR* covered 47 journals from India during 2000 (Table 2).

With this backdrop, one of us (NCJ) while presenting the paper in the IX International Conference on Scientometrics and Informetrics held at Beijing, the People's Republic of China during 25–29 August 2003, appealed to fellow participants to use *Web of Science* data while reporting the country data as it gives a 'true' picture of papers published as seen from the ISI database. There is a need to exercise utmost care to use appropriate dataset before making generalizations.

1. Garfield, E., *Curr. Sci.*, 2003, **85**, 425.
2. Jain, N. C., *Curr. Sci.*, 2003, **84**, 863.
3. Arunachalam, S., *Curr. Sci.*, 2003, **83**, 107–108.

K. SATYANARAYANA
N. C. JAIN*

Division of Publication and Information,
Indian Council of Medical Research,
V. Ramalingaswami Bhawan,
Ansari Nagar,
New Delhi 110 029, India
**For correspondence*
e-mail: jainnc@vsnl.net

Response:

I would be the last to criticize anyone for recommending caution in the use of these databases and the need to educate users in the significance of the differences in the various forms of *SCI*.

The objections to various aspects of the *JCR* data and other derivatives of the *SCI* come mainly from bibliometricians and not from general users. This does not mean that *ISI* should not seek to improve the data in one way or another. I have worked towards that end and I am confident that future versions of *JCR* and *SCI* or *WOS* will reflect the many improvements that can be made in such a large database. Various normalization techniques have been proposed in utilizing these data. Indian users, like all others, should not hesitate to make their constructive suggestions directly to *ISI*. I myself, like the authors, am just an observer and have often published warnings about the uninformed use of *JCR* or other data.

EUGENE GARFIELD

e-mail: Garfield@codex.iu.upenn.edu

On publication indicators

According to Satyanarayana and Jain[1] 'the scientific community is not satisfied with the existing quantitative indices like the *SCI* and its twin publication, the *JCR*'. I wonder how many scientists they polled to arrive at this conclusion. If this were the case, Thomson-ISI would have gone out of business long ago; in reality though the company is thriving and the revenue brought in by citation index databases and their derivatives is on the rise. Since the early 1990s, *SCI* has spawned half a dozen field-specific citation index databases (for neurosciences, biotechnology, materials science, etc.) and Thomson-ISI is now extending their database back to 1900 so one can trace the evolution of ideas over a much longer period. The idea that the cognitive link between citing and cited documents provides a far better handle for retrieving related documents than mere keywords was originally exploited by Gene Garfield in the early 1960s. It has since been picked up by other database producers and new services such as *CrossRef* have come up. If scientists were unhappy with *SCI*, these developments would not have taken place. The citation databases of ISI are used widely by scientists in many countries, as evidenced by the large number of subscribers. I myself subscribe to CD versions of three citation databases from the early 1990s. Besides, as *SCI* is a truly interdisciplinary database – which covers a wide range of fields spanning science, engineering and technology, agriculture and medicine, unlike subject-specific databases – it has gained wide acceptance among the science policy and indicators communities as well.

Satyanarayana and Jain[1] have expressed their dissatisfaction with the use of publication counts obtained from the CD-ROM version of *SCI* for measuring the publication output of nations. As pointed out in an earlier paper[2], both Robert May[3], a former President of the Royal Society and Chief Scientific Advisor to the Government of UK, and Noble Laureate Ahmed Zewail[4] have used publication data from the restricted-coverage version of *SCI* while making international comparisons of scientific research in the not-so-distant past, and both the *Science and Engineering Indicators* of the US National Science Board and the *European Report on Science & Technology Indicators* of the European Commission use *SCI* fixed journal set data regularly. These are not the only examples. Many other eminent scientists and well-known national and international organizations also use publication counts obtained from the restricted-coverage version of *SCI* to get a rough idea of the research output of nations.

Satyanarayana and Jain wonder which version of the database should be used – the CD version of *SCI* or the larger *Web of Science* (*WoS*) – when counting the number of papers originating from a country. How can both be right, they wonder. As Garfield and others, including yours truly, have pointed out time and time again, one has to use such indicators with caution. One must be clear what one is measuring and state how the measurement is made. After all, it is impossible to measure 'the research output of a nation as a whole' accurately. What we measure is usually a surrogate, viz. research papers published in professional journals. There are two definitional problems here, one pertaining to journals and the other pertaining to papers:

(1) How many journals are there? Do all serial publications count as professional journals? Can we count the science page in *The Hindu* and *The New York Times* or magazines like *Computers Today* and *PC Quest* as journals? Journals clearly differ in quality, and in the perception of a majority of scientists, including Indian scientists, *Nature* and *Science* are way