

Citations to Popular Science Magazines: A Case of *Science Reporter*

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A general audience usually does not read peer-reviewed journals. Even the researchers in one research domain do not generally read the research journals of another research area. This often leaves a gap between the scientists and the public or the non-specialist audience. Popular science magazines bridge the gap and play a significant role in popularizing science and inculcating scientific temper in society.

The first general magazine was published in 1731 by Edward Cave (Wikipedia contributors, 2022). He coined the word "magazine" from the Arabic word 'makhazin', which meant storehouse, and brought out *The Gentleman's Magazine*. The history of science magazines dates back to the early 19th century. *Scientific American*, brought out in 1845 by Rufus Porter is the first science magazine. This is the oldest ongoing monthly magazine, although it did not become a monthly magazine until 1921(Sapru, 2020). *Popular Science* was founded in 1872 and *National Geographic* in 1888. Today it is estimated that there are 75 major English language science magazines across the globe and a few popular science magazines have crossed hundred years of publishing (Di Christina, 2015) (Table1).

According to the Office of the Registrar of Newspapers for India (RNI), there are 1,00,666 periodicals published in India as of 31 March 2018. However, we do not know the exact number of science magazines published in India. A recent study reported

that there are 60 Hindi Science magazines currently published in India (Gupta, and Mahesh, 2021). There are a few English-language Indian science magazines such as *Science Reporter*, *Invention Intelligence*, *Dream 2047*, *All About Space*, *Down to Earth*, *Scientific India*, *Science India*, *The Scitech Journal*, *OYLA*, *Science Horizon*, *Jantar Mantar*, *Shaastra*, and so on. Some leading popular science magazines like *Science Today* and *Science Age* have ceased publication (Patairiya, 2022).

Although science magazines, unlike research journals, are meant for the lay public, these magazines are read and cited by the research community as well. We found that out of 75 science magazines, six have Impact Factors IF including *Scientific American*(IF 2.142), *MIT Technology Review*(IF 2.563), *American Scientist*(IF 0.548), *Physics Today*(IF 4.000), *New Scientist*(IF 0.319), and *Nautilus* (IF 0.741). There is no Indian science magazine indexed in the Web of Science (WoS).

Although Indian science magazines are not indexed in the Web of Science, one can still find the citations, if available, using the 'Cited Reference Search' feature of the Web of Science database (Mahesh, and Wadhwa,2012). In this study, we have taken *Science Reporter*, India's leading popular science magazine to examine the citation trend as reflected through Web of Science and Google Scholar.

Science Reporter, the long-standing and oldest Indian popular science magazine is published by CSIR-National Institute of Science Communication and Policy Research (NIScPR), New Delhi, since 1964 (Anonymous, 1964). The magazine strives to bring to its readers the latest developments in the field of S&T from around the world, insights into major S&T developments from India, expert views on controversial, ethical, and complex scientific concepts, interviews with leading scientists & researchers, profiles of scientific institutions, reviews on science books, films, etc., columns with interesting facts & trivia on environment, plants & animals, technology, innovation, science fiction, science cartoons, quizzes, puzzles, and question banks.

The magazine touches every field of science, viz. life sciences, physical sciences, chemical sciences, space science, environmental science, engineering, technology, etc and is used to bring out periodic special issues based on various themes. It is

one of the very few English language popular science magazines in India that give opportunities to the public to contribute articles.

Contributors to *Science Reporter* include scientists & researchers, policymakers & heads of institutions, academicians & teachers, professionals, and even students. The magazine follows a delayed open-access model with the magazine issues becoming freely available after six months of publication of each issue.

S.No.	Name of the magazine	Frequency	Starting year	Publisher
1	<i>Scientific American</i>	Monthly	1845	Springer Nature
2	<i>Popular Science</i>	Quarterly	1872	Bonnier Corporation
3	<i>Knowledge: An Illustrated Magazine of Science</i>	the magazine started as a weekly periodical, becoming monthly in 1885	1881	W.H. Allen (1881-1891) Witherby & Co. (1891-1918)
4	<i>National Geographic (formerly the National Geographic Magazine)</i>	Monthly	1888	NG Media (National Geographic Partners/Disney Publishing Worldwide)
5	<i>MIT Technology Review</i>	monthly	1899	Elizabeth Bramson-Boudreau
5	<i>Popular Mechanics</i>	Monthly	1902	Cameron Connors
6	<i>American Scientist</i>	bimonthly	1913	Sigma Xi
7	<i>Science News</i>	Bi-weekly	1922	Maya Ajmera

As *Science Reporter* is not indexed in the Web of Science, we used the 'cited reference search' feature of the Web of Science which searches for records that have cited a published work even if the source (journals or magazines) is not indexed on the Web of Science. We also retrieved the citation data from Google Scholar using Publish or Perish software (Harzing, 2022).

We found 136 and 121 *Science Reporter* articles indexed in WoS and Google Scholar respectively. The 2006 article, ‘Biodiesel Revolution’ was the most cited article with 44 citations in Google Scholar and 17 citations in the Web of Science. The list of articles with 5 or more citations in Google Scholar is given in Table 2. The corresponding WoS citations for each of the articles are also given. The number of citations in WoS is lower than in Google Scholar. The reason for this is because of the coverage differences between the two databases. Comparing 252 subject categories, Martin-Martin *et al*(2018) found that Google Scholar consistently found the largest percentage of citations across all areas (93%-96%), far ahead of Scopus (35%-77%) and WoS (27%-73%)⁹.

Out of the 121 articles that received Google Scholar citations, 40 were multi-authored and only 3 female authors, MG Sujana, S Dutta, and P Chawla have received citations. Given the uncertain naming practices, it is difficult to precisely identify the gender by name but it seems that articles by males have received more citations than those by women.

S. No.	Authors	Title	Year	Citations in GS	Citations in WoS
1	A Bijalwan, CM Sharma, VK Kediya	Bio-diesel revolution	2006	44	17
2	TC Maiti	The dangerous acid rain	1982	36	2
3	MG Sujana, SB Rao	Unsafe chromium	1997	19	7
4	P Nammalwar	Heavy metals pollution in the marine environment	1983	17	1
5	JS Bal	Ber, the poor man's fruit	1979	13	4
6	SP Mukherji	Ocimum—a cheap source of eugenol	1987	13	4
7	DS Bhakuni	Drugs from plants	1990	13	2

8	A Haque, S Sharma	Water hyacinth to fight water pollution	1986	12	2
9	J Singh, KS Pillai	The world beneath us	1973	11	4
10	R Sengupta	Protecting our stone monuments	1979	7	0
11	AK Chhangani	Vultures the most eco-friendly bird	2002	7	0
12	CS Raghav	Medicinal plants on touchstone	2003	7	2
13	GS Roonwal	Manganese nodules in the Indian Ocean	1981	6	1
14	D Chakraborti	Arsenic Orphans	2001	6	0
15	YP Gupta	Polluting pesticides	2001	6	1
16	HPS Makkar	Tannins—bane or boon	1988	5	2

Citations give credibility and popularity to a scholarly publication. Popular science articles are not considered scholarly publications by the academic and research community. Researchers rarely write articles about their work in popular science magazines as they are not 'counted'. The results of the present study showed that popular science articles in Indian popular science magazines get cited. It may be useful to look at the citations received by other Indian popular science magazines.

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