

# Bibliometric Analysis of a Research Institute: S N Bose National Centre for Basic Sciences

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## Abstract

Bibliometric study reflects the performance of any research institute and helps identify ways to improve research work. Monthly data has been collected from citation databases, 'web of science' and 'nature index' for the last six years analyzed to understand the progress of the research institute.

**Keywords:** Bibliometric Analysis, Citation Analysis, Citation Report, Research Institute

## 1. Introduction

Any research institute is an organization where researchers work to achieve specific objectives. The research is published in different national and international journals. Members of research communities around the globe go through these papers and carry forward research. The papers are also cited. Thus bibliometric study of any research institute can be useful in assessing the progress of that institute.

## 2. Review of Literature

Ram (2015) tried to analyze research output on liquorice and useful plant for foods, beverages. Nagarkar and others (2015) did citation analysis to assess the research productivity in the life sciences by faculty members at the Savitribai Phule Pune University, Maharashtra, India. Saraswathi and Raghavendra (2005) conducted bibliometric analysis and found that citations received by periodical literature were widely scattered among different micro subject areas. Garg and Bebi (2014) conducted bibliometric analysis on two journals, DESIDOC Journal of Library and Information Technology (DJLIT) and

Annals of Library and Information Studies (ALIS). Lawson and others (1980) reported bibliometric study on energy literature. Khanna (2014) discussed about different parameters used for citation analysis. He suggested proper scaling of the discipline-dependence h-index. Sujatha and Padmini (2015) did bibliometric analysis of the journal, *IEEE Transactions on Antennas and Propagation*. Kumbar and Akhtary (1998) took up the 'American Journal of Ophthalmology' for bibliometric Analysis. Das (2013) analyzed *Journal of Informetrics*. Biradar and Mathad (2000) conducted bibliometric study on the *Journal of Annual Review of Ecology and Systematics*. Sommer (2005) talked about Bibliometric analysis to assess the output of private research funding. Macias-Chapula and Mijangos-Nolasco (2002) did bibliometric analysis of AIDS research.

## 3. The Institute

Satyendra Nath Bose National Centre for Basic Sciences, established in 1986 ([http://newweb.bose.res.in/index\\_bk.jsp](http://newweb.bose.res.in/index_bk.jsp)) is an autonomous research organization under the Department of Science and Technology, Government of India. Although the Centre was established with the

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objective to conduct research in basic sciences including challenging areas in theoretical and mathematical sciences, in the past few years the Centre has also carried out application oriented research.

The Centre has four departments: Astrophysics and Cosmology, Chemical, Biological and Macro-Molecular Sciences, Condensed Matter Physics and Material Sciences and Theoretical Sciences.

## 4. Methodology

Monthly bibliometric data of S N Bose Centre for the last 6 years (2013-2018) was collected from web of Sciences using the address search option using all three abbreviations used for the institute. To compare S N Bose Centre with other institutes ten years data has been collected from 2008 to 2017 from Nature Index.

## 5. Indexing Databases (Web of Science and Nature Index)

Web of science is an online database maintained by Clarivate Analytics providing online citation indexing service.

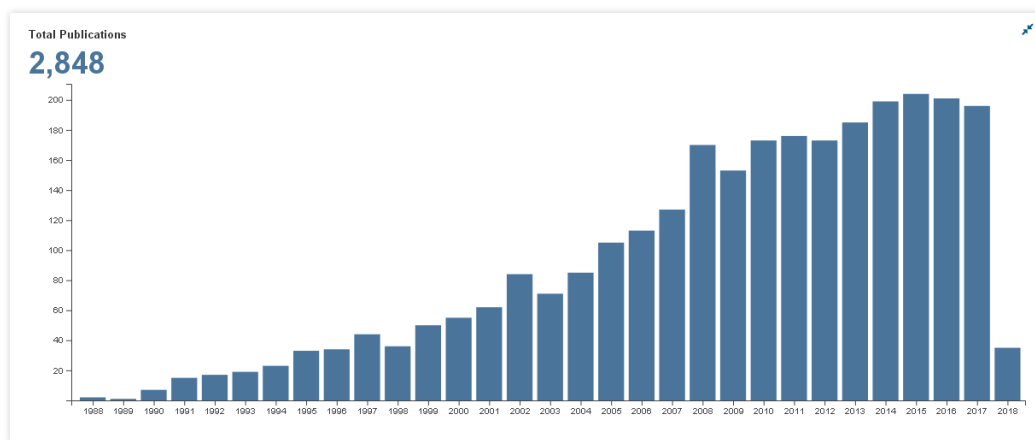
Nature Index is another indexing database maintained by Nature Publishing Group (NGP).

## 6. Bibliometric Analysis

As per oxford dictionary “Bibliometrics is a statistical analysis of books, articles, or other publications” (<https://en.oxforddictionaries.com/definition/bibliometrics>). Bibliometric Analysis is a quantitative method used for qualitative examination of progress of research based on different parameters such as citations received, citing article, impact factor, h-index, immediacy index, i-10 index, etc.

## 7. Bibliometric Analysis of ‘S N Bose National Centre for Basic Sciences’

The Satyendra Nath Bose National Centre for Basic Sciences was established in the last quarter of 1986. The Centre started publishing papers in 1987 and started receiving citations in 1988. Since the institute is not very old, an attempt is made to see how the S N Bose Centre has progressed in its research domain. After that bibliometric data of S N Bose Centre is compared with some other similar institutes. As it is an institute for basic sciences, patenting activity of the centre is not given much emphasis here (Figure 1a and 1b).



Publications as on 12th March 2018)  
Database : SCI-EXPANDED, CPCI-S, CPCI-SSH, CCR-EXPANDED, IC

**Figure 1a.** Year wise publication of the S N Bose Centre.

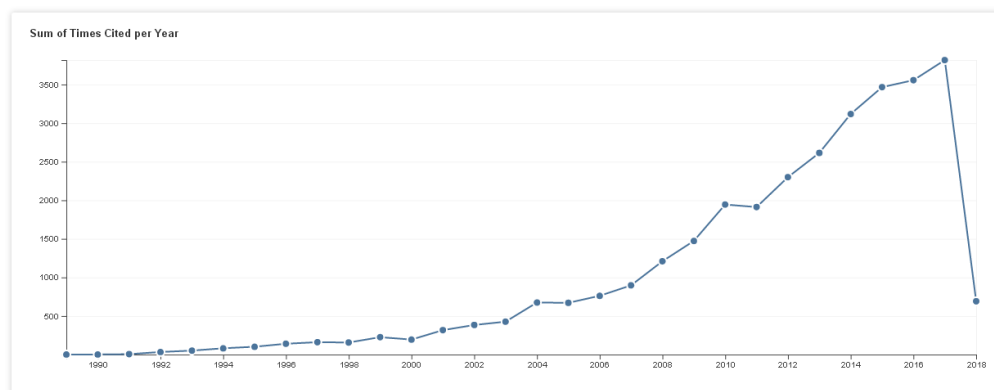


Figure 1b. Year wise total citation received by the S N Bose Centre.

No. of Publications	: 2848
No. of citations	: 31396
No. of citations excluding self-citations	: 24429
Citing Articles	: 20089
Citing Articles without self-citations	: 18145
Citation per year*	: 1012.77
Citations per paper	: 11.02
h-index	: 63

\* Year of establishment of the Centre is 1986. Citations received from 1988 to 2018 = 31 years

The 2848 publications of the institute have received 31396 citations. Again, when self-citations are left out the number of citations received by the 2848 publications is 24429. The average number of citations per paper works out to about 11 (Figure 2).

Following are the average citations received per paper, h-index, and average citations received per year (Table 1). Last month of every year is considered for calculating the data. Just four months data of the year 2018 is there so it is not considered (Figure 3).

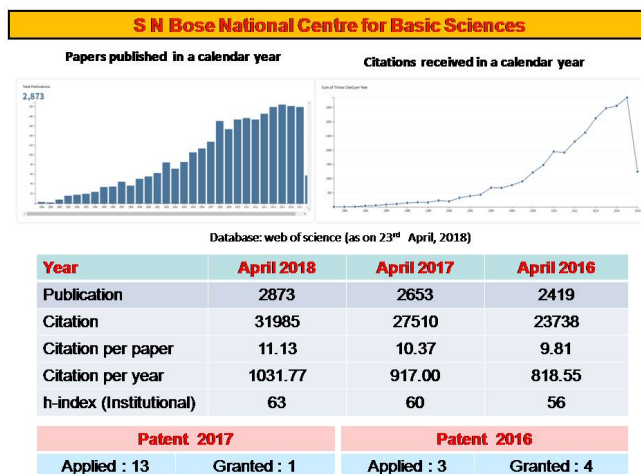
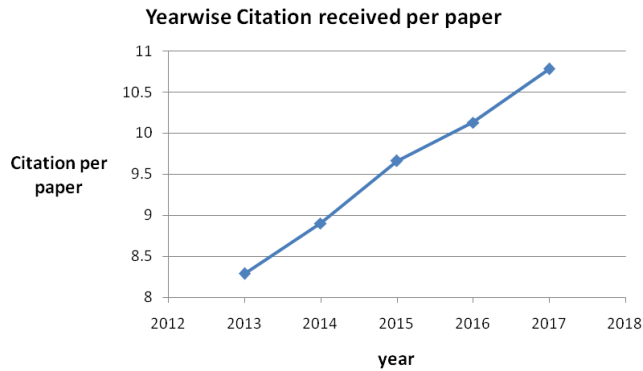


Figure 2. Performance comparison in three years.

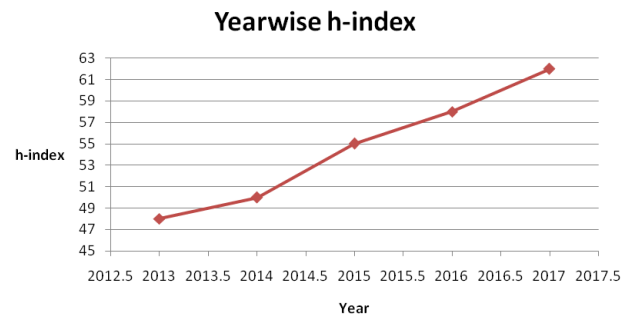
Table 1. Average citations received per paper, h-index and per year

Year	Citations per paper	h-index	Citations per year
2013	8.29	48	624.96
2014	8.90	50	709.15
2015	9.66	55	808.36
2016	10.13	58	894.10
2017	10.78	62	1007.03

Clearly there is a steady increase in ‘h-index’, ‘citations per paper’ and ‘average citations received per year’ indicating progress of research in the Centre (Figure 4).



**Figure 3.** Average citation received per paper in last five years.



**Figure 4.** h-Index in last five years

Table 2 is the comparative view of S N Bose Centre vis-a-vis some other research institutes in India (Table 2).

**Table 2.** 10 years (2008 - 2017) comparative study among DST Institutes (Institutes are ranked as per h-index)

Sl. No.	Institute	Year of Estd.	Publication	Citations	Citation per paper	h-index	No. of Faculty	Publication per faculty	Citation per faculty
1.	IISc	1909	24727	267387	10.81	121	450	54.95	594.19
2.	TIFR, Mumbai	1945	7396	121919	16.48	110	109	67.85	1118.52
3.	JNCASR	1989	2962	59150	19.97	93	33	89.76	1792.42
4.	SINP	1949	3946	55997	14.19	89	92	42.89	608.66
5.	IACS	1876	4958	68278	13.77	84	78	63.56	812.83
6.	BI	1917	1827	21755	11.91	55	69	26.48	395.54
7.	SNBNCBS	1986	1833	17757	9.69	53	31	59.12	572.8
8.	RRI	1948	1418	18048	12.73	51	41	34.59	440.19
9.	IISER-Kolkata	2006	1450	17893	12.34	49	103	14.08	173.71
10.	IISER-Pune	2006	1164	12484	10.73	46	123	9.46	101.49
11.	HRI, Allahabad	1965	1104	12943	11.72	46	31	54.94	594.19333
12.	JNCASR	1989	2962	59150	19.97	93	33	89.76	1792.42
13.	IACS	1876	4958	68278	13.77	84	78	63.56	875.36
14.	Bose Inst.	1917	1827	21755	11.91	55	69	26.48	315.29
15.	SNBNCBS	1986	1833	17757	9.69	53	31	52.37	572.80
16.	RRI, Bangalore	1948	1418	18048	12.73	51	41	34.59	440.20
17.	IIA	1786	1164	12484	10.73	46	123	9.46	101.50
18.	ARCI, Hyderabad	1997	679	8070	11.89	37	66	10.29	122.27
19.	ARIES, Nainital	1954	662	6624	10.01	35	19	34.84	348.63
20.	ARI, Pune	1946	509	5656	11.11	31	44	11.57	128.55

\*Source : Web of Science database (Thomson Reuters) dated on 10/04/2018

The Indian Institute of Science (IISc), Tata Institute of Fundamental Research (TIFR), Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR), Indian Association for the Cultivation of Science (IACS), Bose Institute (BI), Saha Institute of Nuclear Physics (SINP), S N Bose National Centre for Basic Sciences (SNBNCBS), Raman Research Institute (RRI), Indian Institute of Science Education and Research Kolkata (IISER Kolkata), Indian Institute of Science Education and Research Pune (IISER Pune), Indian Institute of Astrophysics (IIA), International Advanced Research Centre for powder metallurgy and new materials (ARCI), Aryabhata Research Institute of Observational Sciences (ARIES), Agharkar Research

Institute (ARI), Harishchandra Research Institute (HRI).

A comparative bibliometric study among some DST institutes is given below. 10 years data has been considered from 2008 to 2017. DST institutes are ranked as per h-index. Other DST institutes are not considered because of very low citation and h-index. It is found that S N Bose Centre is ranked at 4th place. It is worth to mention that SNBNCBS is not a very old institute compared (Year of establishment 1986) to other institutes.

Table 3 provides a comparative view of Bose Institute vis-à-vis some other DST supported institutions which have Physics as their principal area of focus.

**Table 3.** Ranking of Physical Science DST Institutes (Institutes are arranged according to their rank and WFC)

Sl. No.	Institute	Estd.	Rank	WFC 2015	WFC 2016	AC 2016	Change in WFC 2015-2016
1.	JNCASR	1989	15	8.2	6.94	12	-15.4 ↓
2.	Indian Inst. of Astrophysics (IIAP)	1786	17	5.13	5.59	71	9.0% ↑
3.	SNBNCBS	1986	26	3.51	4.04	18	15.2% ↑
4.	IACS	1876	28	9.36	3.94	22	-57.9% ↓
5.	RRI, Bangalore	1948	31	3.29	3.52	44	6.9% ↑
6.	ARIES, Nainital	1954	40	1.18	2.15	36	81.3% ↑
7.	Bose Inst.	1917	61	0.81	1.07	20	32.7% ↑

(Based on Weighted Fractional Count of Nature Index – 2017. Data taken on 18/04/2018)  
(AC = Article Count; FC = Fractional Count; WFC = Weighted Fractional Count)

An institution is given:

AC = 1 - for each article that has one author from that institute.

FC = 0.1 - if a paper is having 10 authors each author will have FC 0.1 and total FC of the paper is 1. Contributions of authors are shared among themselves.

WFC (if FC = 1, WFC will be 0.2) - is a mechanism to adjust the over-representation of papers in subject like astronomy and astrophysics. It has been found that in Nature Index four journals in the said discipline publish approximately 50% of all papers. It is five times the corresponding figure for other subjects. So papers from these journals are assigned one-fifth the weight of other papers (WFC = 1/5 of FC).

## 8. Conclusion

Progress of an institute can be analyzed through the study of citation report. It shows where the institute stands compared to other organizations. Being a young research institute under DST, 'S N Bose National Centre for Basic Sciences' has made substantial progress. The objective of the Centre is to nurture basic sciences but with the change of time considering the need of the society the Centre has engaged itself with application oriented research also. Presently the Centre is doing cutting edge basic research in chosen areas of sciences including areas having application potential.

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