

# Publication productivity of Prof. P.S. Narayanan: A Scientometric Portrait

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## ABSTRACT

In this study, researchers were made an attempt to analyse research output of Prof. P S Narayanan was scientists from IISc Bengaluru, under the scientometric framework. For this study data is obtained from the Web of Science database. Prof. Narayanan has published 89 research papers among these highest numbers of research papers were published in the year 1978 when he was 52 years old. 32.59% papers were authored by 3 authors. He has published 14.61 % of his research papers in Ferroelectrics during 1978-94. 120 times his research papers were cited and published in Indian Journal of Pure Applied Physics.

## 1. Introduction

Scientometrics is a science of measuring and analyzing science. In practice, scientometrics is often done using bibliometrics that is a measurement of (scientific) publications. Russians used the term 'scientometrics' is the late sixties for quantitative aspects of studies in the science of science. Hence Scientometric portrait deals with an individual's research publications, in this study Prof. Narayanan's research output been analysed by applying scientometric indicators such as authorship pattern, channels of communications, year wise distribution of articles and so on.

## 2. Prof. Narayanan, P.S. As an Iconic Scientist

Prof. P.S. Narayanan was born I 1926, Prof. Narayanan completed his master degree from Madras University in 1949 and doctoral degree from the same University in 1951. In an early sixties he has involved himself in ferroelectrics research which become even deeper when Prof. Zheludev, I. S. From USSR visited the institute for a year. In association with Prof. Zheludev, I. S. He has set-up the laboratory to study the various properties of ferroelectrics crystals. Subsequently Narayanan and his other research fellows engaged in the study of other areas of ferroelectrics crystals such as Crystal growth, Radiation damage, Domain structure, Ferroelectric switching etc...

## 3. Contribution in the Scientific Field

Prof. Narayanan joined the IISc (Indian Institute of Science) Bengaluru to work with Prof. C. V. Raman the great legend in the field of Physics from India, in his 21<sup>st</sup> young age. Initially he studied on Raman Spectra of Crystals like alkali halides, diamonds of Raman Spectra such as glycine and its addition compounds leading to a greater understanding of the role of hydrogen bonds in soft ferroelectrics. Prof. Narayanan had four decades of fruitful research and academic career, during these period he actively engage himself in research work and also he had rendered his dedicated service as a member of editorial board of the Indian Journal of Pure and Applied Physics and the Indian Journal of Physics, member of

the IMF international Advisory Academy of Sciences and Indian Physical Society. Considering his exemplar work in the field had honoured with prestigious Raman Centenary Medal in the year 1988. He passed away on 23<sup>rd</sup> October 1994. As H.L. Bhat quoted in his paper, "Narayanan's death was great loss to the international ferroelectric community".

## 4. Objectives of the study

The main objective of this study is to analyses the publications of a successful profession in Physics and creates a "Role Model" for the younger generation. Prof. P S Narayanan's publications were taken for the present study.

This study highlights Prof. P S Narayanan in terms of the following:-

1. To find out year-wise contribution of publication productivity.
2. To document authorship pattern of publication productivity.
3. To find out Time Span of Authorship Pattern
4. To know Year-wise distribution of Citation in Channels of Communication
5. To identify the type of communications channels used for their research publication.

## 5. Sources and Methods

Scientific publications seem to provide the best available basis for measuring the research output. One of the first writers to suggest scientific papers as a measure of research productivity was Nobel laureate William Shockley who was interested in measuring the research productivity among individuals within a group by analyzing their publications. A few scientometric portrait studies have been published.

The Science Citation Index (Web of Science) database was used for collecting the citations to the publications. For the present study, the data has been retrieved from the Science Citation Index (Web of Science) database.

The information activities of individual information scientists can be evaluated both quantitatively (how many publications) and qualitatively (where they are published). All

the papers of Prof. P S Narayanan were considered and normal count procedures are followed to analyse the data.

6. Data analysis and Interpretation

Table 1: Authorship Pattern

Year	Authorship Pattern									TP	T%	CT	CP	PPA
	2	3	4	5	6	7	8	12	50					
1949	1									1	1.12	1	1.12	23
1957		1								1	1.12	2	2.25	31
1963									1	1	1.12	3	3.37	37
1964			1							1	1.12	4	4.49	38
1967	2									2	2.25	6	6.74	41
1968	2									2	2.25	8	8.99	42
1969		1								1	1.12	9	10.11	43
1970	1									1	1.12	10	11.24	44
1971	1	1								2	2.25	12	13.48	45
1972	1									1	1.12	13	14.61	46
1973	2	1								3	3.37	16	17.98	47
1975	1									1	1.12	17	19.10	49
1977				1		1				2	2.25	19	21.35	51
<b>1978</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>1</b>						<b>8</b>	<b>8.99</b>	<b>27</b>	<b>30.34</b>	<b>52</b>
1980	1	2		2						5	5.62	32	35.96	54
1981	3	1		1						5	5.62	37	41.57	55
1982	2	1								3	3.37	40	44.94	56
1983		4								4	4.49	44	49.44	57
1984		1	2							3	3.37	47	52.81	58
1985	1		2							3	3.37	50	56.18	59
1986		2	2							4	4.49	54	60.67	60
1987		3								3	3.37	57	64.04	61
1988			1	2		1				4	4.49	61	68.54	62
1989		2	2							4	4.49	65	73.03	63
1990		2	2							4	4.49	69	77.53	64
1991	1	1	2		1					5	5.62	74	83.15	65
1992		2	2				1	1		6	6.74	80	89.89	66
1993			1	1						2	2.25	82	92.13	67
1994		2	2							4	4.49	86	96.63	68
1995			1							1	1.12	87	97.75	69
1996			1							1	1.12	88	98.88	70
1998						1				1	1.12	89	100.00	72
<b>Grand Total</b>	<b>20</b>	<b>29</b>	<b>25</b>	<b>8</b>	<b>1</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>89</b>	<b>100.00</b>			
<b>%</b>	<b>22.47</b>	<b>32.58</b>	<b>28.09</b>	<b>8.99</b>	<b>1.12</b>	<b>3.37</b>	<b>1.12</b>	<b>1.12</b>	<b>1.12</b>	<b>100.00</b>				

TP= Total Number of papers, T%= Total Percentage, CT= Cumulative Total, CP= Cumulative Percentage, PPA= Publication Productivity age

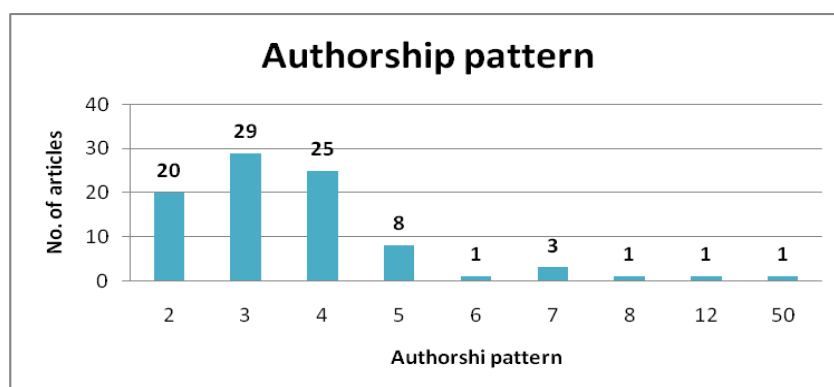


Figure 1: Authorship pattern

Table number 1 represents the authorship pattern of Prof. P S Narayanan, he has not published a single article as single author, 32.58% articles were authored by 3, 20 (22.47%) research papers were authored by two authors and

25 articles were authored by 5 authors, Prof. Narayanan started publishing his research output in the year 1949 when he was 23 years old and the highest number of the articles were published in the year 1978.

**Table 2: Channels of Communication, used by Prof. Narayanan PS**

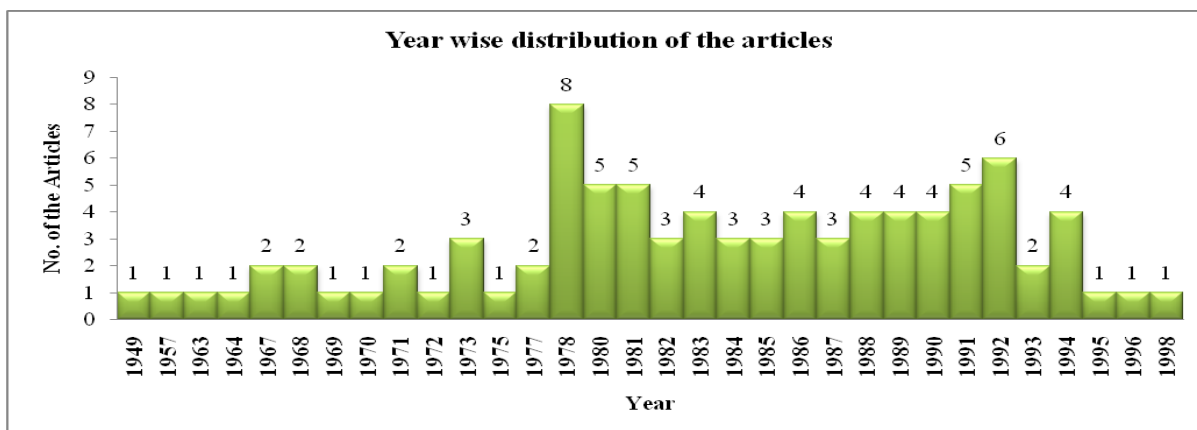
S. No.	Channels of Communication, used by Prof. Narayanan PS	Grand Total	Percentage	FPY LPY
1	1990 IEEE 7TH INTERNATIONAL SYMPOSIUM ON APPLICATIONS OF FERROELECTRICS	1	1.12	1991-1991
2	ACTA CRYSTALLOGRAPHICA SECTION A	1	1.12	1978-1978
3	APPLIED OPTICS	1	1.12	1992-1992
4	APPLIED PHYSICS A-MATERIALS SCIENCE & PROCESSING	1	1.12	1992-1992
5	BRITISH JOURNAL OF ANAESTHESIA	2	2.25	1971-1973
6	CHEST	1	1.12	1984-1984
7	CURRENT SCIENCE	7	7.87	1978-1994
8	EMERGING OPTOELECTRONIC TECHNOLOGIES	1	1.12	1992-1992
9	<b>FERROELECTRICS</b>	<b>13</b>	<b>14.61</b>	<b>1978-1994</b>
10	FERROELECTRICS LETTERS SECTION	1	1.12	1989-1989
11	INDIAN JOURNAL OF CHEMISTRY	1	1.12	1964-1964
12	INDIAN JOURNAL OF ENGINEERING AND MATERIALS SCIENCES	1	1.12	1998-1998
13	INDIAN JOURNAL OF PHYSICS AND PROCEEDINGS OF THE INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE-PART A	1	1.12	1978-1978
14	<b>INDIAN JOURNAL OF PURE &amp; APPLIED PHYSICS</b>	<b>12</b>	<b>13.48</b>	<b>1967-1988</b>
15	INDIAN JOURNAL OF TECHNOLOGY	1	1.12	1986-1986
16	INDIAN PEDIATRICS	1	1.12	1977-1977
17	INTERNATIONAL JOURNAL OF CARDIOLOGY	1	1.12	1987-1987
18	INTERNATIONAL JOURNAL OF ENGINEERING SCIENCE	2	2.25	1987-1989
19	JAPANESE JOURNAL OF APPLIED PHYSICS PART 1-REGULAR PAPERS SHORT NOTES & REVIEW PAPERS	1	1.12	1986-1986
20	JOURNAL OF CARDIOVASCULAR SURGERY	1	1.12	1980-1980
21	JOURNAL OF LARYNGOLOGY AND OTOTOLOGY	1	1.12	1988-1988
22	JOURNAL OF MATERIALS SCIENCE	2	2.25	1975-1980
23	JOURNAL OF MATERIALS SCIENCE LETTERS	1	1.12	1985-1985
24	JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS	1	1.12	1990-1990
25	JOURNAL OF PHYSICS AND CHEMISTRY OF SOLIDS	1	1.12	1992-1992
26	JOURNAL OF PHYSICS D-APPLIED PHYSICS	3	3.37	1980-1984
27	JOURNAL OF PHYSICS E-SCIENTIFIC INSTRUMENTS	1	1.12	1980-1980
28	JOURNAL OF PHYSICS-CONDENSED MATTER	1	1.12	1990-1990
29	JOURNAL OF RAMAN SPECTROSCOPY	5	5.62	1983-1991
30	JOURNAL OF SCIENTIFIC & INDUSTRIAL RESEARCH	1	1.12	1963-1963
31	JOURNAL OF THE INDIAN INSTITUTE OF SCIENCE	1	1.12	1970-1970
32	MICROPROCESSORS AND MICROSYSTEMS	1	1.12	1987-1987
33	NATURE	2	2.25	1949-1957
34	NUMERICAL METHODS IN THERMAL PROBLEMS, VOL VIII, PTS 1 AND 2	1	1.12	1991-1991
35	OPTICS COMMUNICATIONS	2	2.25	1994-1995
36	PHYSICA STATUS SOLIDI A-APPLIED RESEARCH	1	1.12	1991-1991
37	PRAMANA	4	4.49	1978-1985
38	PRAMANA-JOURNAL OF PHYSICS	1	1.12	1990-1990
39	PROCEEDINGS OF THE INDIAN ACADEMY OF SCIENCES-CHEMICAL SCIENCES	2	2.25	1985-1990
40	RESPIRATORY MEDICINE	1	1.12	1991-1991
41	SUPERCOMPUTER	1	1.12	1996-1996
42	THIRD INTERNATIONAL CONFERENCE ON CANDU FUEL : CONFERENCE PROCEEDINGS	2	2.25	1992-1992
43	THORAX	1	1.12	1982-1982
44	WASTE MANAGEMENT	1	1.12	1994-1994
	<b>Grand Total</b>	<b>89</b>	<b>100</b>	

Table No. 2 reveals that, channels of communications were used by Prof. P.S. Narayanan to publish his research output. He has used 44 different channels to publish his research papers and the channels well recognized worldwide in the field of life sciences. Among his 89 papers 13 (14.61%)

research papers were published in *Ferroelectrics* during 1978-1994, where as 12 papers were published in the *Indian Journal of Pure & Applied Physics* during 1967-1988, and he has published 7(7.78%) research papers in *Current Science* during 1978-1994.

**Table 3: Year wise distribution of the articles**

Year wise distribution of the articles				
S. No.	Year	No. of the articles	%	PPA
1	1949	1	1.12	23
2	1957	1	1.12	31
3	1963	1	1.12	37
4	1964	1	1.12	38
5	1967	2	2.25	41
6	1968	2	2.25	42
7	1969	1	1.12	43
8	1970	1	1.12	44
9	1971	2	2.25	45
10	1972	1	1.12	46
11	1973	3	3.37	47
12	1975	1	1.12	49
13	1977	2	2.25	51
14	1978	8	8.99	52
15	1980	5	5.62	54
16	1981	5	5.62	55
17	1982	3	3.37	56
18	1983	4	4.49	57
19	1984	3	3.37	58
20	1985	3	3.37	59
21	1986	4	4.49	60
22	1987	3	3.37	61
23	1988	4	4.49	62
24	1989	4	4.49	63
25	1990	4	4.49	64
26	1991	5	5.62	65
27	1992	6	6.74	66
28	1993	2	2.25	67
29	1994	4	4.49	68
30	1995	1	1.12	69
31	1996	1	1.12	70
32	1998	1	1.12	72
<b>Grand Total</b>		<b>89</b>	100.00	



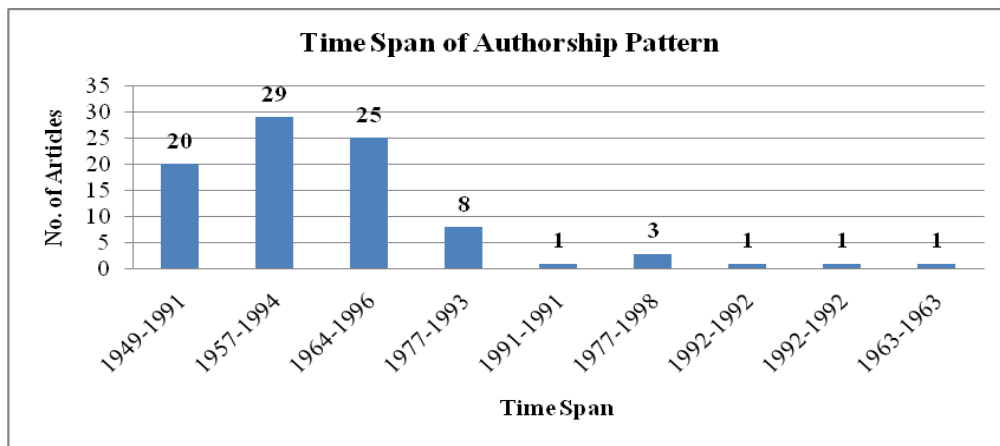
**Figure 2: Year-wise distribution of the articles**

Table No. 4 replicates that, year wise distribution of the articles of Prof. Narayanan P.S. among his 89 research output. Highest numbers of papers were published in the year 1978, and 6 research papers were published in the year

1992, during 1980, 1981 and 1991 he has published 5 (5.62%) articles each. In 1983, 1986, 1988. 1989, 1990 and 1994 he has published 4 articles each.

**Table 4: Time Span of Authorship Pattern**

Authors	Time Span of Authorship Pattern									Total
	2	3	4	5	6	7	8	12	50	
Time Span	1949-1991	1957-1994	1964-1996	1977-1993	1991-1991	1977-1998	1992-1992	1992-1992	1963-1963	
No. Of Papers	20	29	25	8	1	3	1	1	1	89
Time span in Years	43	38	33	17	1	22	1	1	1	
%	22.47	32.58	28.09	8.99	1.12	3.37	1.12	1.12	1.12	100.00



**Figure 3:- Time Span of Authorship Pattern**

Table No 4 reveals that, time spent by the author to publish his research output. Prof. Narayanan has published 32.58% (29) research papers during 1957-1994(38 years) with three authors. 28.09%(25) research papers were published during 1964-1996 with four authors, whereas author has taken 43 years (during 1949-1991) to publish 20

(22.47%) research papers with two authors, and 3 research papers were published during 1977-1998 with seven authors. During 1992 Prof. Narayanan has published two research papers with eight and twelve authors respectively. Author has contributed one article with fifty authors during 1963.

**Table 5: Year-wise distribution of Citation in Channels of Communication**

Year wise distribution of Citation in Channels of Communication					
S. No.	Channels Of Communication	No. Of Citations	FCY - LCY	Time Span in Years	%
1	Acta Crystallogr A	1	1978-1978	1	0.16
2	Ferroelectrics Lett	1	1989-1989	1	0.16
3	Indian Pediatr	1	1977-1977	1	0.16
4	Microprocess Microsy	1	1987-1987	1	0.16
5	Waste Manage	1	1994-1994	1	0.16
6	Chest	2	1984-1984	1	0.33
7	Indian J Eng Mater S	2	1998-1998	1	0.33
8	Int J Cardiol	2	1989-1989	1	0.33
9	Resp Med	2	1991-1991	1	0.33
10	Indian J Phys Pt-A	3	1978-1978	1	0.49
11	P Indian As-Chem Sci	3	1985-1985	1	0.49
12	Phys Status Solidi A	3	1991-1991	1	0.49
13	J Phys E Sci Instrum	4	1980-1980	1	0.66
14	Jpn J Appl Phys 1	4	1986-1986	1	0.66
15	Opt Commun	4	1995-1995	1	0.66
16	Int J Eng Sci	5	1987-1989	3	0.82
17	J Phys-Condens Mat	6	1990-1990	1	0.98
18	Indian J Chem	7	1964-1964	1	1.15
19	Curr Sci India	9	1978-1984	7	1.48

20	Appl Optics	10	1992-1992	1	1.64
21	Nature	10	1949-1957	9	1.64
22	J Mater Sci Lett	12	1985-1985	1	1.97
23	J Mater Sci	18	1975-1980	6	2.95
24	Ferroelectrics	33	1978-1989	12	5.41
25	Pramana	33	1978-1985	8	5.41
26	J Phys D Appl Phys	51	1980-1984	5	8.36
27	J Raman Spectrosc	60	1983-1990	8	9.84
28	J Laryngol Otol	62	1988-1988	1	10.16
29	Indian J Pure Ap Phy	120	1967-1988	22	19.67
30	Brit J Anaesth	140	1971-1973	3	22.95
<b>Grand Total</b>		<b>610</b>			<b>100.00</b>

(Note: - FCY-LCY= First Cited Year and Last cited year)

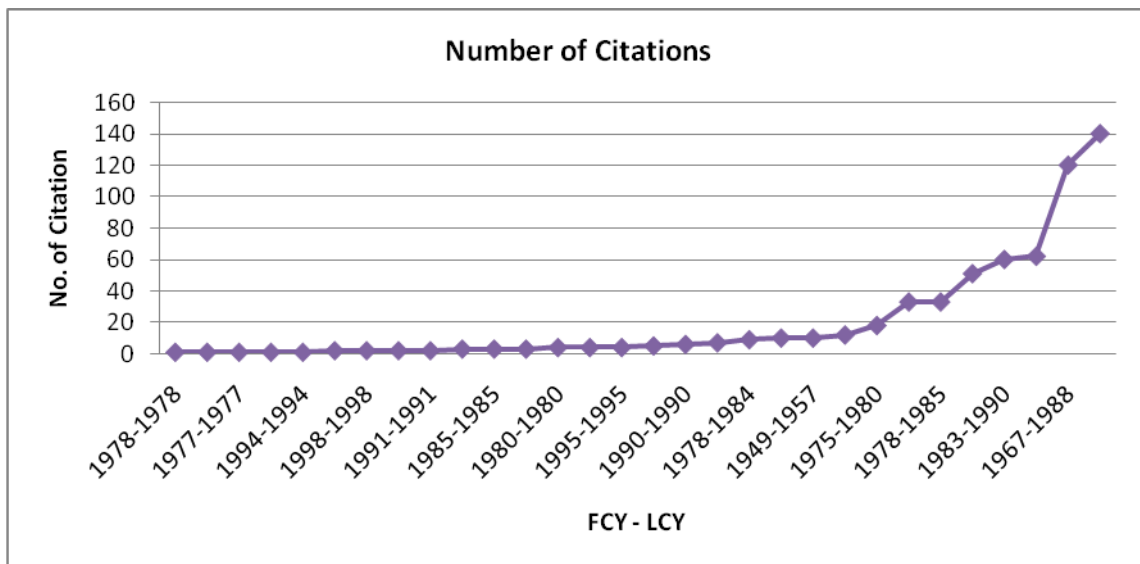


Figure 4: Number of Citations

Table no 5 discloses that, number of times research papers published by Prof. Narayanan PS were cited by the others. 610 times articles were cited by another author, among these research papers, 140 times were cited during 1971-1973(3 years) which were published in British Journal of Anaesthesiology, 120 (19.67%) times articles were cited

during 1967-88 (22 Years) which were published in Indian Journal Pure and Applied Physics. The figure number 4 reflects the data obtained from the table number 5, it shows that first and last cited year and number of times articles were cited.

Table 6: Authorship position of Prof. Narayanan PS

Authorship position of Prof. Narayanan PS.									
Year	1st Author	2nd Author	3rd Author	4th Author	5th Author	6th Author	31st Author	Total	%
1949		1						1	1.12
1957		1						1	1.12
1963							1	1	1.12
1964				1				1	1.12
1967		2						2	2.25
1968		2						2	2.25
1969			1					1	1.12
1970		1						1	1.12
1971		2						2	2.25
1972		1						1	1.12
1973		3						3	3.37
1975		1						1	1.12
1977					1	1		2	2.25
1978		1	2	4	1			8	8.99
1980		1	2	2				5	5.62
1981		3	1		1			5	5.62
1982		2	1					3	3.37

1983			4					4	4.49
1984			1	2				3	3.37
1985		1		2				3	3.37
1986			2	2				4	4.49
1987		1	2					3	3.37
1988			3	1				4	4.49
1989			2	2				4	4.49
1990		1	1	2				4	4.49
1991	1	1	2	1				5	5.62
1992		1	3	1	1			6	6.74
1993			1		1			2	2.25
1994	1		2	1				4	4.49
1995				1				1	1.12
1996			1					1	1.12
1998					1			1	1.12
<b>Total</b>	<b>2</b>	<b>26</b>	<b>31</b>	<b>22</b>	<b>6</b>	<b>1</b>	<b>1</b>	<b>89</b>	<b>100.00</b>

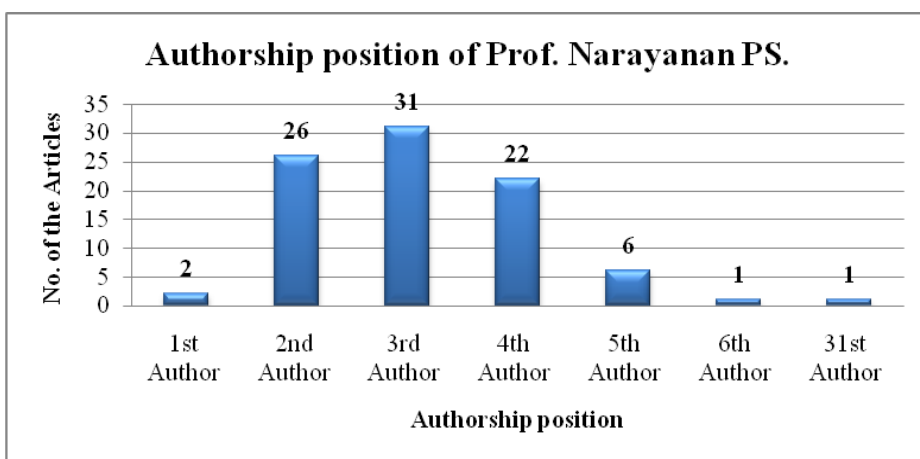


Figure 5:- Authorship position of Prof. Narayanan PS

Table number 6 shows that, authorship position of Prof. Narayanan PS with this table researcher trying to find out authorship position of prolific authors Prof. Narayanan PS. He has published a highest number of articles as a third author during 1969-96, and 26 and research papers were published as a second author, Prof. Narayanan PS has published 22 articles as a fourth author, whereas 6 papers were published as a 5<sup>th</sup> author. Author has published only 2 research papers as a first author, also contributed one each article in the position of 6<sup>th</sup> and 31<sup>st</sup>.

**7. Conclusion**

The study of Scientometrics going to helps us to know the qualitative and quantitative approaches of the research publication were published by the author. With this researchers made an attempt to analyse research output of

Prof. Narayanan PS an eminent scientist from IISc Bengaluru. It also helps upcoming generations in the field of Physics to know about what are researches were happened, by providing a basement for their study.

Thus this paper analyzed 89 research papers of Prof. Narayanan which were appeared in the Web of Science database under the scientometric framework i.e. Authorship pattern, Channels of Communication were used by the author, year wise distribution of the articles, authorship position and alike.

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