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DR. N. RUDRAIAH: A BIOBIBLIOMETRIC STUDY

S.L. Sangam * and *Kiran Savanur* +

Dr. Rudraiah has worked in various fields in applied mathematics like fluid mechanics, magnetohydrodynamics, electrodynamics and smart materals of nanostructures. In his 43 years of productive life, he has collaborated with 102 colleagues and students and has published 271 papers during 1962-2004. The collaboration co-efficient is 0.54. Highest collaborations were with M. Venkatachalappa (31), and B.C. Chandrasekhara (21). The core journals publishing his papers were: Indian Journal of Pure and Applied Mathematics, Current Science, International Journal of Heat and Mass Transfer, Acta Mechanica, Journal of Fluid Machanics, Proc. Royal Cambridge Society of London, Physics of Fluid.

KEYWORDS/DESCRIPTORS: Scientometrics; Publication productivity; Collaboration coefficient; Bradford distribution.

1 INTRODUCTION

Bibliometric studies deal with the biographical study of the individual careers of scientists and researchers and correlates bibliographical analysis of publications or academic and scientific achievements. Some of the notable studies from India are by Kalyane and Sen [1] Kalyane and Kademani [2, 3, 4], Sangam and Savanur [5], Subramanyam [6], Sen and Gan [7], Sen, B. K and Bagachi [8] etc. In this paper we would like to look into the scientific work done by Prof. N. Rudraiah and his role in the advancement of science in general and in applied mathematics in particular in India and elsewhere.

Rudraiah was born on 18 August 1932 at Bellave, Tumkur Dist., Karnataka, India. His early graduation and post-gradation were at Mysore University. Later he was at the University Toronto and University of Western Ontario, Canada for his M.A. in 1960 and doctoral thesis in the Applied Mathematics department in Canada, which he successfully completed in 1964. On his return to India, he joined the Bangalore University in the Mathematics department and later as the Principal of Central college. He held important positions in various universities of national importance in Karnataka.

* Karnatak University, Pawatenagar, Dharwad 58003, INDIA. E-mail: slsangam@yahoo.com
+ Raman Research Institute Library, Bangalore 560080, INDIA. E-mail: kiran@rri.res.in

Prof. Rudraiah worked in various fields that include subjects like, Heat and Mass Transfer, Flow through and Past Porous Media, Biomechnics connected with Fluid Mechanics, Magnetohydrodynamics, Electrodynamics and techniques in Applied Mathematics. His main concern was to develop mathematical models in physics and mathematics, but was aware of the fact that certain physical problems would be solved in a finite mathematical proof. This was his basic approach of looking at things in the mathematical world.

The outcome of his work has made a remarkable impact on the various subjects he dealt with, from a new semi-circle theorem in MHD to the volve type of effect in the atmosphere. The study of flow through porous media in non-Dascy equations involving boundary and inertia effects had been used to derive a new slip boundary condition, now known as ***Bervess-Joseph-Rudraiah-condition***, Surface instabilities like Rayleigh-Taylor and Kelvin-Helmoltz type. His works on the reduction of growth rate at absorptive surface of inertial fusion energy using nanostructure porous limiting on the target by an amount of 80% compared to 45% of the Japanese schools is regarded as original and significant contribution. In chaotic motion, general numerical algorithms, codes and packages were developed to solve chaotic behavior in a highly non-linear flows. He has extensively investigated the importance of various industrial applications in the storage of nuclear waste.

He has been a visiting professor in various universities in India and aboard. In recognition of his work he was elected Fellow of the Indian National Science Academy (FNA), Fellow of Indian Academy of Sciences (FASc), United Writers' Association Fellowship (FUWA), Fellow of Institute of Mathematics and Applications (FIMA), London. He was the recipient of several awards like the FICCI – Gold Medal, V. V. Narlikar Lecture Award, distinguished service award for contribution to promoting application of mathematics by Indian Society of Information Theory. His foreign awards include, the KIT award of Japan, William Mong Award from University of Hong Kong, and Karnataka Rajyotsava Award for his contributions to higher education and so on. He was elected twice as President of the Indian Society of Theoretical and Applied Mechanics, and President of the Mathematics section of Indian Science Congress.

In recognition of his work the University Grants Commission sanctioned to him DSA with thrust area fluid mechanics during 1980–2002 and Center of Advanced Studies in Fluid Mechanics in 2002, both under Special Assistance Programme (SAP). Rudraih was the Vice-Chancellor of Gulbarga University

during 1990-1996. Presently, Prof. Rudraiah is the Director of National Research Institute for Applied Mathematics, Bangalore and (Hon) Professor, UGC-DSA Centre in Fluid Mechanics, Department of Mathematics, Bangalore University, Bangalore.

2 METHODOLOGY

The bibliography was taken from his collected papers and this formed the base of this study. The data obtained was analyzed and the results were obtained.

3 RESULTS AND DISCUSSION

3.1 Domainwise Contributions

Domainwise research specializations are given below:

A = MHD – Flows and Problems, Waves in MHD.
B = Flow through Past Porous Media; Waves through Porous Media.
C = Stability of Flows – Parallel flows, Surface instability.
D = Convection.
E = Review Articles.

Domainwise cumulative publication productivity: During 1962–2004, he has contributed 58 papers in the domain of MHD-flows and problems, waves in MHD (1962–2004), followed by 36 papers in the domain of Flow through past porous media (1972–2004), 43 papers in the domain of Stability of flows-parallel flows, Surface instability (1964–2004), 98 papers in the domain of Convection (1971–2003) and 36 papers as Review articles (1984–2004). This is shown in Figure1.

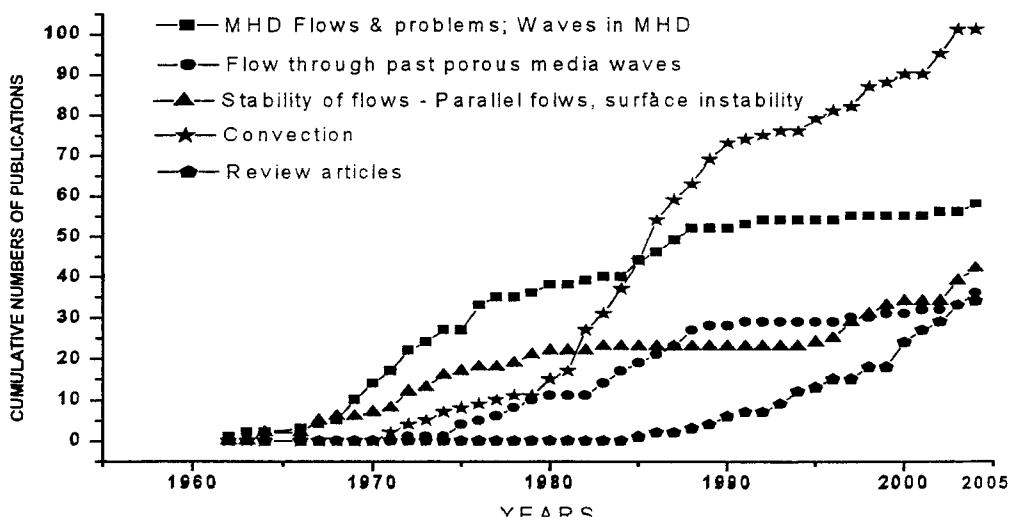

Fig. 1: Domain-wise publication productivity of Prof. N. Rudraiah

Table 1 provides information about the domain-wise authorship pattern, number of publications and authorship in each domain. In case of two-authored papers, convection papers are 39, followed by 24 papers in MHD-flows and their related problems, 10 in Stability of flows and 9 papers in Flows through past porous media and 8 papers in the Review articles domain. In the case of three-authored papers, the Convection papers are 38, followed by 26 papers in the domain of MHD-flows and their related problems, 14 papers in Flow through past porous media, 13 papers in Stability of flows and 7 papers in the domain Review articles. In the case of four-authored papers, 6 papers published in the Flow through past porous media domain, 3 papers each in the domains of Stability, Flow and Convection and Review article domain.

Table 1: Domain-wise productivity

	Domains								
No. of Authors	**A**	**B**	**C**	**D**	**E**	**Total no. of papers**	**%**	**Total no. of Author ship**	**%**
One-Author	8	7	17	18	18	68	25.09	68	11.22
Two – Author	24	9	10	39	8	90	33.21	180	29.70
Three– Author	26	14	13	38	7	98	36.16	294	48.51
Four– Author	-	6	3	3	3	15	5.54	60	9.90
Total	58	36	43	98	36	271	100	606	100
Percentage	21.4	13.2	15.8	36.1	13.2	100			
Collaboration Co-efficient	0.86	0.81	0.60	0.82	0.50				
Authorship per paper	2.31	2.53	2.05	2.27	1.86				

A = MHD – Flows and problems, waves in MHD;
B = Flow through Past Porous and Non-porous media waves through porous media;
C = Stability of Flows – Parallel flows, surface instability;
D = Convection;
E = Review Articles.

Prof. N. Rudraiah has 68 single-authored publications in various domains as Convection (18), Review Articles (18), Stability of Flows (17), MHD-Flows and Problems (8), and Flow through Past media (7). Year-wise productivity of Prof. N. Rudraiah is shown in Figure 2.

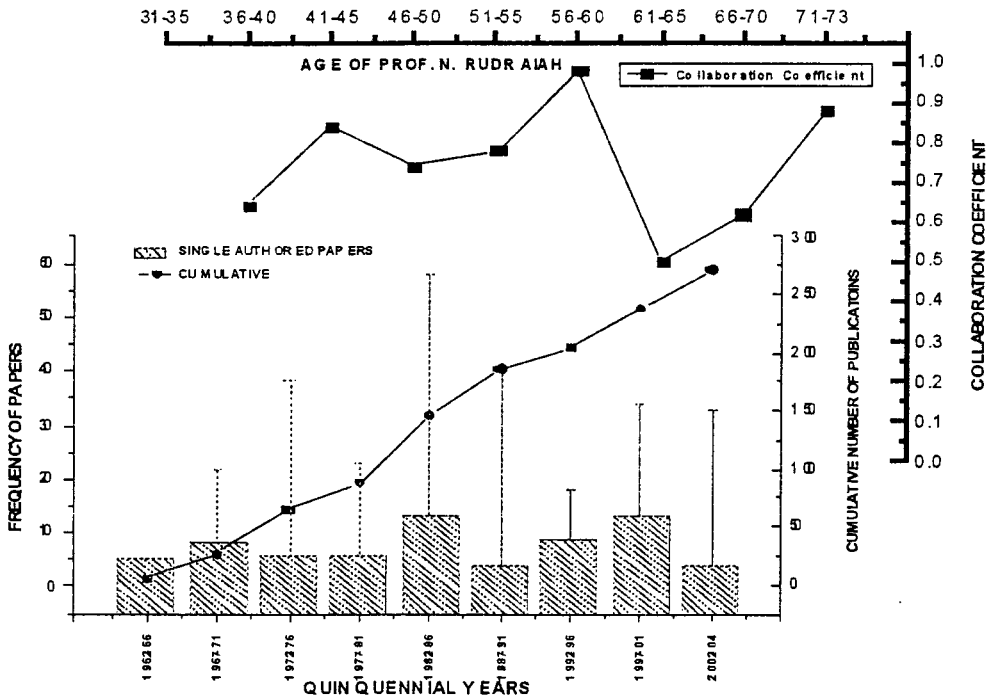

Fig. 2: Publication productivity of Prof. N. Rudraiah

3.2 Productivity

Prof. N. Rudraiah has published 68 single-authored and 203 multi-authored papers during 1962–2004. The multi-authored papers include: two-authored (90), three-authored (98) and four-authored (15). Table 2 shows that the first paper of the author was published in 1962 when he was 31 years of age.

To measure the collaborative research pattern, a simple indicator called collaboration coefficient (number of collaborative papers divided by total number of papers) is used. Highest collaboration coefficient (1.00) for Prof. N. Rudraiah is found during (1992–1996). Prof. Rudraiah has no publications during 1965, his highest productivity is in 2003 with the output of 16 publications (age 72), followed by 15 papers in 1986 (age 55), 14 papers in 1985 (age 54) and 12 papers each in 1972 and 1988 (ages 41 and 57). Thus the 53rd to 57th years of his life are most productive. These productive years saw the publication of as many as 60 (22.14%) papers. The 50-percentile productivity life was 24 at 54 years of age. The total productivity life of the author spans 44 years starting from the age 31.

Hence, productivity coefficient amounts to 0.54. This shows that Prof. Rudraiah maintained the level of research almost the same throughout his research life.

Table 2: Publication productivity of Prof. N. Rudraiah in chronological order

Single and Multi-authored Publications								
APL	Year	1st Author	2nd Author	3rd Author	4th Author	MT	TP	AA
1	1962	1	–	–	–	0	1	31
2	1963	1	–	–	–	0	1	32
3	1964	2	-	-	-	0	2	33
5	1966	1	–	–	–	0	1	35
6	1967	4	–	–	–	0	4	36
7	1968	1	–	1	–	1	2	37
8	1969	–	4	1	–	5	5	38
9	1970	3	1	1	–	2	5	39
10	1971	-	5	1	–	6	6	40
11	1972	1	6	5	–	11	12	41
12	1973	-	2	2	–	4	4	42
13	1974	-	5	3	–	8	8	43
14	1975	1	2	2	–	4	5	44
15	1976	4	3	2	–	5	9	45
16	1977	-	3	1	-	4	4	46
17	1978	1	2	1	–	3	4	47
18	1979	3	2	–	–	2	5	48
19	1980	1	5	2	–	7	8	49
20	1981	1	1	–	–	1	2	50
21	1982	1	4	6	–	10	11	51
22	1983	1	4	4	–	8	9	52
23	1984	4	4	-	1	5	9	53
24	1985	2	4	8	–	12	14	54
25	1986	5	3	5	2	10	15	55
26	1987	1	1	7	1	9	10	56
27	1988	2	2	7	1	10	12	57
28	1989	1	1	5	1	7	8	58
29	1990	-	3	2	1	6	6	59
30	1991	-	1	3	–	4	4	60
31	1992	-	–	2	–	2	2	61
32	1993	1	1	1	–	2	3	62

Single and Multi-authored Publications								
APL	Year	1st Author	2nd Author	3rd Author	4th Author	MT	TP	AA
33	1994	3	-	-	-	0	3	63
34	1995	1	1	2	1	4	5	64
35	1996	4	1	-	–	1	5	65
36	1997	1	1	3	2	6	7	66
37	1998	2	4	3	1	8	10	67
38	1999	4	-	-	-	0	4	68
39	2000	2	2	4	1	7	9	69
40	2001	4	–	–	–	0	4	70
41	2002	2	3	2	1	6	8	71
42	2003	2	4	9	1	14	16	72
43	2004	-	5	3	1	9	9	73
Total		**68**	**90**	**98**	**15**	**203**	**271**	

APL- Age of Productive Life MT- Total of Multi-authored Publications.
TP- Total Publications AA- Biological Age of the Author.

3.3 Researchers and their collaboration

Prof. N. Rudraiah has collaborated with 103 researchers during 1962–2004. The publication productivity of Prof. Rudraiah's research group (collaborators) is depicted in Figure 3. From Table 3. It has been observed that M. Venkatachalappa had collaborated with Prof. Rudraiah in the production of maximum number of papers i.e. 31 published during the years 1972–2003. B. C. Chandrasekhara, follows next with 21 papers during the years 1968–1980, I. S. Shivakumara with 17 papers from the year 1984-2004, P. G. Siddesheshwar with 12 papers during the years 1985-2004 and R. Friedrich and P. N. Kaloni both with 10 papers each during the years 1973–1993 and 1989-2003 respectivily. Prof. Rudraiah has published good number of papers in collaboration with foreign colleagues R. Friedrich (1973-93), P. N. Kaloni, (1989-03), O. P. Chandana, (1985-86), D. Vortmeyer (1978-89), Vasantha, Wilfred (1980-82), T. Masuoka (1982-03), Wasaburo, Unno (1985) from Japan, Germany and Canada. Researchers collaborated with Prof. Rudraiah only in one paper number 37; two papers each number 27; three papers each number 10; four papers each number 11, five papers each in number 3. Total authorship credit for 103 authors counts 606, each collaborating author being given one authorship credit for each paper. Prof. Rudraiah to his credit has 44.71 percentage of total authorship credit.

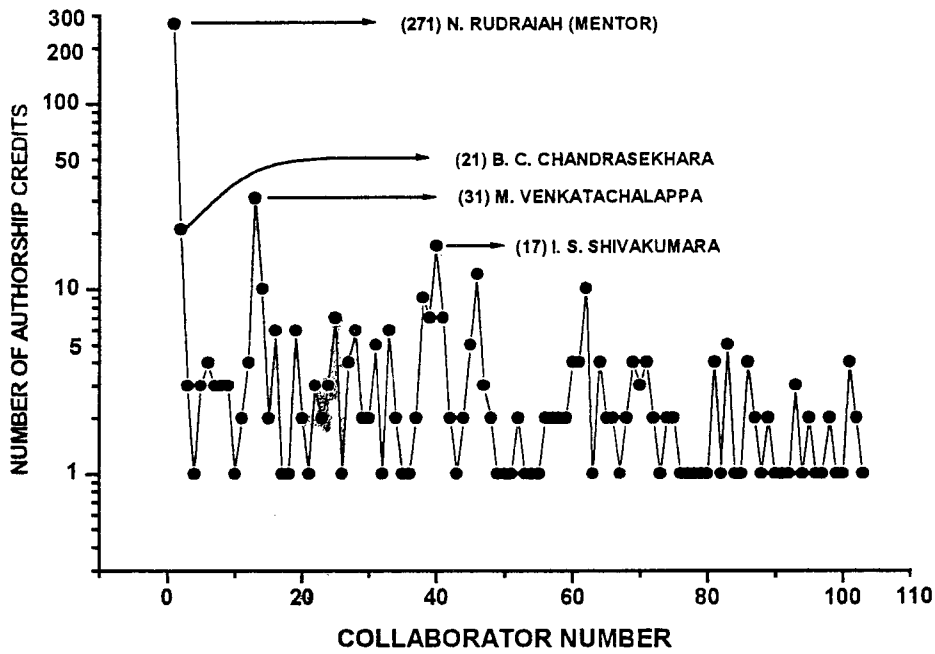

Fig. 3. Authorship credits to collaborators with Prof. N.Rudraiah

Table 3: Domain-wise authorship credit of researchers collaborating with Prof. Rudraiah in chronological order

Sl. No.	Name	A	B	C	D	E	Period of Association	Tl. Yrs.	No. of Authorship
1.	Rudraiah, N.	58	36	43	98	36	1962-2004	43	271
2.	Chandrasekhara, B.C.	15	2	3	1	–	1968–80	13	21
3.	Kuchela, K. N.	3	–	–	–	–	1968–71	4	3
4.	Geetha, M. G.	1	–	–	–	–	1969	1	1
5.	Janakamma, C.	2	–	-	1	–	1971–74	4	3
6.	Narasimha Murthy, S.	1	-	3	-	–	1971–75	5	4
7.	Rajesekhara, B. M.	–	2	–	1	–	1971–74	4	3
8.	Ramaiah, B. K.	–	2	–	1	–	1971–75	5	3
9.	Mariyappa, B. V.	–	–	3	–	–	1972	1	3
10	Khan, A. M.	-	1	-	-	-	1972	1	1
11.	Narayana, C. L.	1	–	1	–	–	1972	1	2
12.	Shanthakumar, M.	–	–	4	–	–	1972–74	3	4
13.	Venkatachalappa, M.	17	1	3	5	5	1972–03	32	31

Sl. No.	Name	A	B	C	D	E	Period of Association	Tl. Yrs.	No. of Authorship
14.	Friedrich, R.	–	1	1	7	1	1973–93	21	10
15.	Lalsangi, S. B.	2	-	-	-	-	1973	1	2
16.	Patil, Prabhamani, R.	–	–	–	6	–	1973–00	28	6
17.	Ramaiah, K.	–	1	–	–	–	1975	1	1
18.	Rohini, G.	–	–	–	1	–	1975	1	1
19.	Veerabhadraiah, R.	–	6	–	–	–	1975–86	12	6
20.	Basavaraju, T.	1	–	–	–	1	1976–00	25	2
21.	Devaraju, N.	1	–	–	–	–	1976	1	1
22.	Kandaswamy, P.	3	–	–	–	–	1976–77	2	3
23.	Parameshwarappa, G.	1	–	–	–	1	1976	1	2
24.	Nagaraj, S. T.	–	1	–	2	–	1977–80	4	3
25.	Vortmeyer, D.	2	2	–	3	–	1978–89	12	7
26.	Rajani Kantha	–	1	–	–	–	1978	1	1
27.	Balachandra Rao, S.	–	–	–	4	–	1980–83	4	4
28.	Srimani, P. K.	–	–	–	6	–	1980–82	3	6
29.	Veerappa, B.	–	–	–	2	–	1980–82	3	2
30.	Wilfred, Vasantha	–	–	–	2	–	1980–82	3	2
31.	Malashetty, M. S.	–	–	–	5	–	1982–90	9	5
32	Ramegouda, S.	-	-	-	1	-	1982	1	1
33.	Masuoka, T.	–	–	1	4	1	1982–03	22	6
34.	Sekhar, R.	1	1	–	–	–	1982–03	22	2
35.	Channabasappa, M. N.	–	1	–	–	–	1983	1	1
36.	Ranganna, G.	–	1	–	–	–	1983	1	1
37.	Shivaraya, E. S.	–	–	1	1	–	1983–85	3	2
38.	Pal, Dulal	2	6	–	–	1	1984–88	5	9
39.	Shivakumar, P. N.	2	4	1	–	–	1984–88	5	7
40.	Shivakumara, I. S.	–	2	2	12	1	1984–03	24	17
41.	Chandana, O. P.	3	–	–	4	–	1985–86	2	7
42.	Kumudini, Vyasamurthy	–	–	–	2	–	1985	1	2
43.	Narayanan, R.	–	–	–	1	–	1985	1	1
44.	Ramachandramurthy, V.	–	–	–	2	–	1985–86	2	2
45.	Siddalingappa, B.	4	1	–	–	–	1985	1	5
46.	Siddesheshwar, P. G.	1	3	–	5	3	1985–04	18	12
47.	Unno, Wasaburo	–	–	–	3	–	1985	1	3
48.	Garg, M. R.	–	1	–	1	–	1986–89	4	2
49.	Nagaraj, S.	–	1	–	–	–	1986	1	1
50.	Somaraju, V.	1	–	–	–	–	1986	1	1

Sl. No.	Name	A	B	C	D	E	Period of Association	Tl. Yrs.	No. of Authorship
51.	Toews, H.	1	–	–	–	–	1986	1	1
52	Potluri, Geetavani	-	-	-	2	-	1986-89	4	2
53	Mudagall, I. F.	-	-	-	1	-	1987	1	1
54	Murthy, C. R.	-	-	-	1	-	1987	1	1
55	Williams, J. J.	1	-	-	-	-	1987	1	1
56.	Sheela, R.	–	1	–	1	–	1987	1	2
57.	Shivashankara Murthy, J. K.	–	1	–	1	–	1987	1	2
58.	Kamiyama, S.	–	–	–	2	–	1988–92	5	2
59.	Ratna, Devnathan	–	2	–	–	–	1988	1	2
60.	Sekhar, G. N.	–	–	–	4	–	1988–92	5	4
61.	Veena, B. H.	2	1	–	–	1	1988–89	2	4
62.	Kaloni, P. N.	–	1	–	7	2	1989–03	15	10
63.	Premalatha, C.	–	1	–	–	–	1989	1	1
64.	Radhadevi, P. V.	–	–	–	4	–	1989–90	2	4
65.	Sasikumar, T. P.	–	–	–	2	–	1989	1	2
66	Zang, S.	-	-	-	2	-	1990-91	2	2
67.	Kasi-viswanathan, S. R.	–	1	–	–	–	1991	1	1
68.	Sachdev, P. L.	2	–	–	–	–	1991–92	2	2
69.	Barron, R. M.	–	–	–	2	2	1995	1	4
70.	Subbaraya, C. K.	–	–	–	3	–	1995	1	3
71.	Krishnamurthy, B. S.	–	–	4	–	–	1996–04	9	4
72.	Mathad, R. D.	–	–	2	–	–	1996–97	2	2
73.	Betegeri, Hameeda	–	–	1	–	–	1997	1	1
74.	Chandrasekhar, D. V.	-	2	-	–	–	1997-04	8	2
75.	Khan, Sujit Kumar	1	–	–	–	1	1997	1	2
76.	Palaniappan, D.	–	1	–	–	–	1997	1	1
77	Shivakumara, B. S.	-	-	-	1	-	1998	1	1
78.	Evans, G. S.	–	-	1	–	–	1998	1	1
79.	Kantha, S.	–	–	–	–	1	1998	1	1
80.	Manonmani, M. N.	–	–	–	–	1	1998	1	1
81.	Nanjundappa, C. E.	–	–	–	4	–	1998–04	9	4
82.	Prasad, V.	–	–	–	1	–	1998	1	1
83.	Sridharan, Prema	–	–	5	–	–	1998–03	8	5
84.	Wagner, C.	–	–	1	–	–	1998	1	1
85.	Bhargava, S.	–	-	1	–	–	2000	1	1
86.	Dinesh, P. A.	2	1	–	1	–	2000–04	5	4
87.	Natarajan, A. A.	1	–	–	–	1	2000	1	2

Sl. No.	Name	A	B	C	D	E	Period of Association	Tl. Yrs.	No. of Authorship
88.	Ranganatha, T. R.	–	–	–	–	1	2000	1	1
89.	Desai, T.	–	–	2	–	–	2003–04	2	2
90	Hemalatha, K.	-	1	-	-	-	2003	1	1
91	Nagashree, K	-	-	-	1	-	2003	1	1
92	Radhakrishna, D.	-	-	-	1	-	2003	1	1
93	Nagaraj, C.	1	-	-	-	2	2003-04	2	3
94	Lakshminarayanachari.	-	-	-	-	1	2003	1	1
95	Siddalingaprasad, M.	-	-	2	-	-	2003-04	2	2
96	Gayatri, M. S.	-	-	-	1	-	2003	1	1
97	Nair, Prema	-	-	-	1	-	2003	1	1
98.	Prasanna, B. M. R.	–	–	–	2	–	2003	1	2
99	Chavaraddi, K. B.	-	-	1	-	-	2004	1	1
100	Chandrasekhar, D. V.	1	-	-	-	-	2004	1	1
101.	Chiu-on, N. G.	1	–	–	–	3	2004	1	4
102.	Jalaja, A. S.	–	–	2	–	–	2004	1	2
103.	Vinay, C. V.	–	1	–	–	–	2004	1	1
	Total	**135**	**91**	**88**	**143**	**30**			**606**

A = MHD – Flows and problems, waves in MHD.
B = Flow through Past Porous and media waves through porous media.
C = Stability of Flows – Parallel flows, surface instability.
D = Convection.
E = Review Articles.

3.4 Domainwise Authorship

The publication productivity and distribution of authors in various domains are shown in Table 4. The research group of Prof. N. Rudraiah has the credits as number of authorship in various domains: MHD – Flows and Problems (135); Flow through Past Porous Media (91); Stability of Flows (88); Convection (226) and Review Articles (66).

Table 4. Publication productivity of Prof. N. Rudraiah and his collaborators (1962–2004)

No. of papers (P)	A	B	C	D	E	No. of Authors (n)	Total no. of Authorship (n × p)	Prominent collaborators
1	6	11	5	11	4	37	37	
2	10	8	10	22	4	27	54	
3	9	5	3	11	2	10	30	

No. of papers (P)	A	B	C	D	E	No. of Authors (n)	Total no. of Authorship (n × p)	Prominent collaborators
4	6	2	11	19	6	11	44	
5	4	1	5	5	0	3	15	
6	0	6	1	16	1	4	24	
7	7	6	1	7	0	3	21	
9	2	6	0	0	1	1	9	
10	0	2	1	14	3	2	20	
12	1	3	0	5	3	1	12	
17	0	2	2	12	1	1	17	I. S. Shivakumara
21	15	2	3	1	0	1	21	B. C. Chandrasekhar
31	17	1	3	5	5	1	31	M. Venkatachalappa
271	58	36	43	98	36	1	271	N. Rudraiah
Total	**135**	**91**	**88**	**226**	**66**	**103**	**606**	

A = MHD – Flows and problems, waves in MHD.
B = Flow through Past Porous media waves through porous media.
C = Stability of Flows – Parallel flows, surface instability.
D = Convection.
E = Review Articles.

4 CHANNELS OF COMMUNICATION

Distribution of Prof. N. Rudraiah's 271 publications were in 64 journals, 56 papers in various national and international conferences, seminars, symposiums etc., 32 books and book chapters. Journal-wise scattering of publications of Prof. Rudraiah is provided in Table 5 and depicted in Figure 4. Top ranking journals with a number of publications are: Indian Journal of Pure and Applied Mathematics (12), Vignana Bharati (11), Current Science (10), International Journal of Heat and Mass Transfer (9), Acta Mechanica (8), Applied Science Research (8), Journal of Fluid Mechanics (8), International Journal of Engineering Science (8).

Table 5: Dissemination of the channels of communication used by Prof. N. Rudraiah

Sl. No.	Channel of communication	No. of papers	Cumu-lative	Period	Impact Factor	Country of publi-cation
1.	Indian Journal of Pure & Applied Math.	12	12	1972-98	0.085	India
2.	Vignana Bharati	11	23	1975-88	-	India

Sl. No.	Channel of communication	No. of papers	Cumu-lative	Period	Impact Factor	Country of publi-cation
3.	Current Science	10	33	1968-04	0.6	India
4.	Int. J. of Heat and Mass Transfer	9	42	1982-89		
5.	Acta Mechanica	8	50	1972-03	0.484	Vienna
6.	Applied Science Research	8	58	1970-85		The Hague
7.	Journal of Fluid Mechanics	8	66	1974-95	1.912	UK
8.	Int. Journal of Engineering Science	8	74	1974-95	0.799	UK
9.	Journal of Math. and Physical Sciences	6	80	1973-03	-	USA
10.	Canadian Journal of Physics	6	86	1985-90	0.623	Canada
11.	Publ. of Astronomical Society of Japan	5	91	1970-85	1.97	Japan
12.	The Arabian Journal of Science & Engg.	5	96	1984-87	-	
13.	J. of Heat Transfer – Transactions of ASME	4	100	1980-91	1.059	
14.	Int. Comm. of Heat Mass Transfer	3	103	1985-87	0.415	USA
15.	Biorheology	3	106	1986-91	1.016	UK
16.	Indian Journal of Physics	3	109	1972-04	-	India
17.	Journal of Porous Media	3	112	2001-03	1.2	
18.	Post-Graduate Studies in Appl. Math.	3	115	1976	-	India
19.	Proc. of the Thy. and Applied Mathematics	3	118	1967-69	-	
20.	Proc. Indian Academy of Sciences (Math Sc.)	3	121	1982-97	-	India
21.	Journal of Applied Mechanics & Engg.	3	124	2000-04	-	
22.	Journal of Fluid Engg. – Transactions of ASME	3	127	1983-85	0.576	
23-33	Two-articles each in 11 Journals	22	149	-	-	-

Sl. No.	Channel of communication	No. of papers	Cumu-lative	Period	Impact Factor	Country of publi-cation
34-64	Single-article each in 31 Journals	34	183	-	-	-
65-95	Conferences, Symposiums, Key-notes, Talks	56	239	-	-	-
96	Books, Chapters in books.	32	271	-	-	-

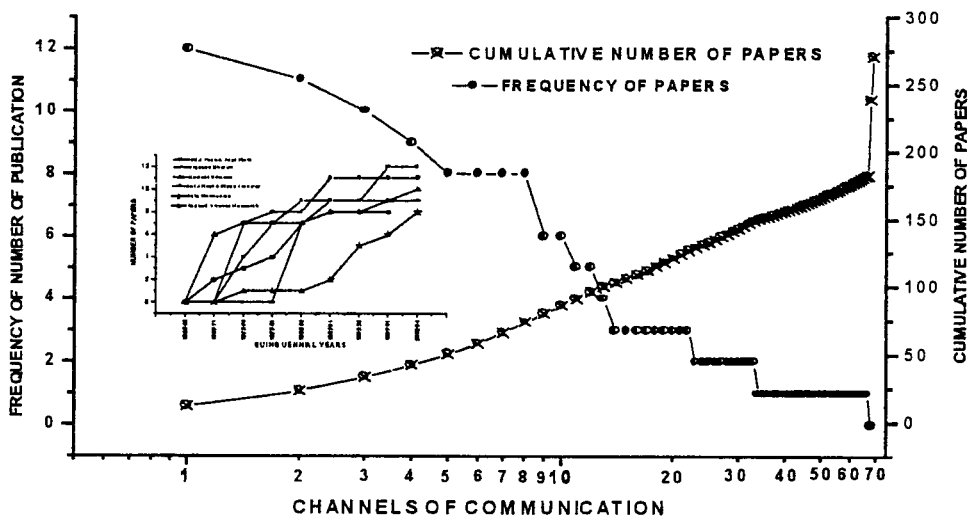

Fig. 4: Bradford-Zipf bibliograph for Prof. N. Rudraiah and inset publications growth in six core journals

5 BRADFORD–ZIPF GRAPH

Bradford's law is one of several statistical expressions that tries to describe the working of science by mathematical means [9]. Bradford–Zipf graph was obtained by plotting the paper frequency and cumulative publications against the number of journals on semilog scale. The graph is shown in Figure 4. The mean Bradford Multiplier is 2.65. The seven journals in the first zone are ***Indian Journal of Pure and Applied Mathematics, Vignana Bharati, Current Science, International Journal of Heat and Mass Transfer, Acta Mechanica, Applied Scientific Research, and Journal of Fluid Mechanics.***

Table 6: Distribution of papers and journals according to zones

Zone	No. of journals	No. of papers	Bradford Multiplier
First	7	66	–
Second	13	56	1.85
Third	44	61	3.38

6 CONCLUSION

The above scientometric study on his collected works undoubtedly proves the usefulness of his work to the field of applied mathematics. The large amount of papers written in his field along with a large number of collaborators gives us an indication about the inspiration to young mathematicians in the field of interest throughout the world. His passion to reach out to various people in different countries has been proved beyond doubt.

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