Mapping Mathematics Research in India in 1998: An Analysis Based on *Mathsci*

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Abstract

Mathematics research in India, as reflected by papers indexed in *Mathsci* 1998, is quantified and mapped. Wherever possible, the findings are compared with mathematics research in India in 1994. Overall, compared to 1994, there were 30% fewer publications from India in 1998 - from 1391 in 1994 to 971 in 1998. Of these, 864 papers had appeared in 273 journals published from 33 countries. Among subfields, Quantum theory topped the list with 114 papers, followed by Statistics 85 papers; Economics, operations research, programming, games 55 papers; Fluid mechanics 45 papers; and Relativity and gravitational theory 45 papers. In all, researchers from 143 institutions located in 89 Indian cities/ towns belonging to 21 states/ union territories had contributed at least one paper in 1998. ISI, Calcutta, leads the list with 65 papers, followed by TIFR, Mumbai (62 papers), IISc, Bangalore (49 papers), and Institute of Mathematical Sciences, Chennai (41 papers). The decline is steep in Uttar Pradesh and to a certain extent Delhi. A welcome improvement is the considerable decrease in the number of papers published in low-impact journals. There seems to be an attempt on the part of Indian mathematicians to publish their work in *SCI*-indexed high impact journals. Even so, only a very small percent of papers has appeared in high impact factor journals. There is also a flight away from Indian journals. In ten subfields, including Statistics, Special functions, General topology, and Functions of a complex variable, India publishes more than twice the number of papers expected from the world average. Every third paper from India has resulted from inter-institutional collaboration; 212 papers (about 23%) have resulted from international collaboration.

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Introduction

India has a long tradition of excellence in mathematics. If Aryabhatta, Bhaskara and Brahmagupta led the world of mathematics in ancient times, it was left to Srinivasa Ramanujan to rekindle India's glory in the early part of the last century. In the past five or six decades, the tradition has been kept up largely through a few institutions of excellence such as the Tata Institute of Fundamental Research and the Indian Statistical Institute.[1,2]

In this report we have attempted to map mathematical (and related) research in India in 1998 using *Mathsci* (the CD-ROM version of *Mathematical Reviews*) as the source of data. We have identified institutions actively publishing in this field, journals often used and their countries of publication and impact factors, extent of international collaboration, etc. This is a macroscopic study and we have not gone beyond the institutional level in our analysis. Also, we have confined to analyzing publications and not performed a citation analysis.

This study is similar to our earlier studies on mapping agricultural research,[3] medical research,[4,5] life sciences research,[6] fish research,[7,8] and all of science.[9] It is a continuation of our earlier reports on mathematics research in India.[10,11]

Methodology

All papers originating from India and published in 1998 (PY = 1998) were downloaded from *Mathsci* CD-ROM edition for the period 1998-September 1999, using (6-* as the code for India. The fields downloaded were: Author(s), address(es), journal title, volume, year, page, document type, language, and subfield classification.

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The bibliographic data set thus collected was converted into a relational database using Visual FoxPro. For each journal in which Indian authors had published their work, the impact factor was found out from the CD-ROM edition of *Journal Citation Reports* 1997. We found out and added information on the city and state wherever these were missing.

The data set was analysed using Visual FoxPro, Java, and MS Access. In our earlier studies we had used only FoxPro.

Findings

There were 971 items including 873 journal articles, 90 proceedings (conference) papers and eight articles in books (Table 1), as against 1391 papers in 1994. Of these, 965 were in English and six in Hindi (Table 2).

Figure 1 shows the distribution of the 873 journal papers over 273 journals. Seventeen journals have carried ten or more papers; 21 journals have carried more than 5 papers but less than 10 (Table 3). At the other extreme, 117 journals were used to publish one paper in each, and 51 journals to publish two papers in each. Table 3 gives, apart from journal titles, their impact factors as seen from *Journal Citation Reports* 1997 and their country of origin. The use of journals by Indian mathematicians follows a pattern considerably different from that of Indian agricultural scientists. Of the ten journals publishing the largest number of mathematics papers from India only three are Indian journals. Of the 100 journals publishing the largest number of agricultural research papers from India in 1998 only four are foreign journals.[12] One also notices that number of journals close to the top of the list are physics journals.

Distribution by subfield

The *Mathsci* database has classified the 971 Indian papers into 56 subfields (Table 4). Quantum theory (subfield 81 in *Mathsci*) topped the list with 114 papers, followed by Statistics (subfield 62), 85 papers; Economics, operations research, programming, games (subfield 90), 55 papers; Fluid mechanics (subfield 76), 45 papers; and Relativity and gravitational theory (subfield 83), 45 papers. In 1994, Statistics topped the list with 142 and Quantum theory was third with 97 papers, and General topology was second with

110 papers. At the other extreme, subfields 06 (Order, lattices, ordered algebraic structures), 12 (Field theory and polynomials), and 19 (K theory) were represented in 1998 by just one paper each from India. And in fields like Potential theory, Category theory and General algebraic systems, there was not a single paper from India in 1998.

Activity index for different subfields

Using data from the web version of *Mathsci*, we have calculated the activity index for each subfield (Table 5). The activity index is defined as follows[13]:

$$\frac{\text{the share of the given field in the publications of India}}{\text{the share of the given field in the world total of publications}}$$

India has recorded an activity index of 2.0 or more in the following ten fields: Statistics (2.021; 140 out of 3007 world papers); Relativity and gravitational theory (2.345; 84 out of 1555 papers), General topology (3.652; 77 out of 915 papers), Functions of a complex variable (2.084; 41 out of 854 papers), Special functions (6.993; 58 out of 360 papers), Integral equations (2.623; 11 out of 182 papers); Set theory (2.438; out of 89 papers); Integral transforms operational calculus (4.304; 12 out of 121 papers), Sequences, series, summability (6.872; 19 out of 120 papers), and Abstract harmonic analysis (2.250; 7 out of 135).

Distribution by journal country

In 1998, India had published 254 papers in 82 US journals, 166 papers in 27 Indian journals and 116 papers in 30 journals published in the Netherlands (Table 6). In 1994, however, Indian researchers had published a larger number of papers in Indian journals (475) than in US journals (271). In all, Indian mathematicians had published 864 papers in 273 journals published from 33 countries. We could not identify the country of publication for 9 journal articles. As seen from *Table 7*, of the 27 Indian journals, only five have been assigned an impact factor in *Journal Citation Reports* 1997: *Indian Journal of Pure and Applied Mathematics* (Impact factor 0.092), *Indian Academy of Sciences- Proceedings of Mathematical Sciences* (Impact factor 0.184), *Sadhana -*

Academy Proceedings in Engineering Sciences (Impact factor 0.071), *National Academy of Science Letters – A monthly Journal of Research* (Impact factor 0.078) and *Current Science* (Impact factor 0.376).

Distribution by institution

The 971 papers have come from 143 institutions (Table 8). It must be noted that the different centers of the same institution have not been clubbed. For example, Indian Statistical Institute has centres at Calcutta, New Delhi, Bangalore, and Chennai, and each is counted as a separate unit. Similarly, Tata Institute of Fundamental Research, Mumbai, has a centre at Bangalore, which is counted separately. Figure 2 is a plot of number of institutions vs. cumulative number of papers. Academic institutions accounted for 784 papers and government research institutions and organizations under central ministries were responsible for publishing 184 papers (Table 9). A private research foundation in Chennai had published three papers. The distribution of papers among different organization types is shown in Figure 3.

ISI, Calcutta, leads the list with 65 papers, followed by TIFR, Mumbai (62 papers), IISc, Bangalore (49 papers), and Institute of Mathematical Sciences, Chennai (41 papers). In 1994, the order was different: TIFR, Mumbai (77 papers), ISI, Calcutta (67 papers), IISc, Bangalore (60 papers), and University of Calcutta (56 papers). IMSc, Chennai had published only 32 papers in 1994.

Distribution by city and state

Among cities and towns, as seen from Table 10, Calcutta leads the field with 149 papers (as against 185 in 1994), followed by Chennai (107 papers as against 126 in 1994), Mumbai (94 papers as against 106 in 1994), Delhi (86 as against 135 in 1994) and Bangalore (78 as against 96 in 1994). In all, 89 Indian cities/ towns belonging to 21 states/ union territories had contributed at least one paper in 1998 (Table 11). Among the states, West Bengal has the largest number of papers (213 as against 263 in 1994), followed by Tamil Nadu (139 as against 155 in 1994), Maharashtra (122 as against 159 in 1994), Uttar Pradesh (106 as against 237 in 1994) and Karnataka (90 as against 127 in 1994). While overall India produced a much lower number of papers in 1998 than in

1994, the steep fall in the number of papers from Uttar Pradesh is striking. Only ten states have published more than 20 papers in 1998.

Journal use by leading institutions

Where do leading institutions publish their work? Tata Institute of Fundamental Research, Mumbai, had published five papers in *Nuclear Physics B* in 1998. Institute of Mathematical Sciences, Chennai, and University of Hyderabad had published 4 papers each in *Modern Physics Letters A*. Indian Institute of Science, Bangalore, had published 4 papers in *Differential Equations and Dynamical Theories* and Indian Statistical Institute, Calcutta, had published 4 papers in *Physics Letters A* (Table 12). In general, many leading institutions had published most of their papers in journals with impact factor less than 1.0. But a few of them had published in journals with impact factor more than 3.5 (Table 13). Jadavpur University, Calcutta, has published two papers and University of Poona, Pune, one paper in journals with impact factor between 6.0 and 6.5. TIFR, Mumbai, had published 6 papers in journals with impact factor between 3.5 and 4.0. IMSc, Chennai (2 papers), Mehta Research Institute, Allahabad (3 papers) and University of Poona, Pune (1 paper) have also published a few papers in journals in this impact factor range.

Areas of strength of leading institutions

Different institutions concentrate on different subfields (Table 14). Indian Statistical Institute, Calcutta, is strong in Statistics (23 papers as against 29 in 1994), Quantum theory (15 papers as against 9 in 1994) and Computer science (10 papers as against 6 in 1994). TIFR, Mumbai, had published a large number of papers in Number theory (16 papers as against 15 in 1994), Algebraic geometry (10 papers as against 12 in 1994) and Quantum theory (8 papers as against 14 in 1994). Mehta Research Institute, Allahabad, had published 13 papers in Quantum theory in 1998. Institute of Mathematical Sciences, Chennai, is strong in Quantum theory (12 papers as against 16 in 1994) and Special functions (6 papers as against 1 in 1994). Indian Institute of Technology, Kharagpur, had published eight papers in Computer science (as against 4 in 1994) and six papers in Economics, operations research, programming, games (as against 8 in 1994). Jadavpur

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University, Calcutta, had published eight papers in Relativity and gravitational theory (as against 5 in 1994). Thus, many institutions continue to publish in their areas of strength, displaying continuity of interest.

Distribution of papers by journal impact factor

Very few papers from India have appeared in high impact factor journals. While saying this, one should remember that most journals in mathematics are low impact factor journals. In all, Indian researchers had published six papers in journals with impact factor between 6 and 6.5, three of them in the subfield Relativity and gravitational theory, two in Quantum theory and one in Statistical mechanics, structure of matter (Table 15). 23 papers had appeared in journals with impact factor 3.5 – 4.0, fifteen of them in Quantum theory and eight in Relativity and gravitational theory. At the other end 42 papers in Statistics, 33 papers in Economics, operations research, programming, games, 28 papers in Quantum theory and 24 papers in General topology had appeared in non-*SCI* journals (impact factor 0.0). 35 papers in Statistics and 25 papers in Computer science had appeared in journals with impact factor 0.0-0.5. 43 papers in Quantum theory had appeared in journals with impact factor 1-1.5.

More than 43% (383) papers had appeared in 124 journals with impact factor less than 1.0 but greater than 0.0 in 1998 (Table 16), as against 36% (488) papers from 135 journals in 1994, not counting journals with zero impact factor. There is a distinct shift towards publishing in journals indexed in *SCI* with higher impact factor. About 37% (325) papers had appeared in 112 non-*SCI* journals (impact factor 0.0) in 1998 as against 54% (713) papers from 192 journals in 1994.

Domestic and international collaboration

Unlike many other subject-specific databases, *Mathsci* provides addresses of all authors in every paper it indexes. Thus it is possible to find out papers resulting from collaboration involving more than one institution. Of the 971 papers in our data set, 647 were from single institutions, 275 have two institutions in the byline, 43 have authors from three institutions, and six have authors from three institutions (Table 17). 274 papers are by single authors, 475 papers have two authors, 183 have three authors, 37

have four authors and two papers have five authors (Table 18). The numbers of papers in which researchers from different nations have collaborated with Indian researchers are listed in Table 19. In all, India has collaborated with 36 countries. Notable among them are USA (in 80 papers), France (21 papers), Germany (17 papers), Canada (15 papers) and Great Britain (11 papers). In some papers more than one nation has collaborated with India (Table 20). Thus while the number of internationally collaborated papers is 212, the total number of links is 234.

In Table 21 we have classified all Indian papers published with and without domestic and foreign collaboration by institution. Of the 143 Indian institutions that have published at least one paper in 1998, 40 have published only single-institution papers. While 45 institutions have collaborated with other Indian institutions, 28 have collaborated only with foreign institutions. Thirty institutions have collaborated with both Indian and foreign institutions. In particular, we have looked at collaboration, both domestic and international, involving six leading institutions. Papers resulting from collaboration are generally expected to appear in journals of higher impact factor than papers written by authors from a single institution. This is indeed the case with Tata Institute of Fundamental Research, Mumbai, and Indian Institute of Technology, Chennai (Table 22). However, we find that in the case of Indian Statistical Institute, Calcutta, and Indian Institute of Technology, Kharagpur, while the average impact factor of journals in which internationally coauthored papers have appeared is higher than the overall average impact factor, domestically collaborated papers have appeared in lower impact factor journals (Figure 4). In contrast, in the case of Indian Institute of Science, Bangalore, internationally coauthored papers have appeared in lower impact journals and domestically collaborated papers have appeared in higher impact factor journals. In the case of Institute of Mathematical Sciences, papers published without a collaborating author from outside the institute have appeared in journals of higher impact factor than either domestically or internationally coauthored articles (Table 22).

ISI, Calcutta, has collaborated with USA in six papers, with Germany in four papers and with Canada and Great Britain in one paper each (Table 23). TIFR, Mumbai, has collaborated with France in six papers, and with Germany and USA in three papers each. IISc, Bangalore, has collaborated with USA in 11 papers. IIT, Kharagpur, has

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collaborated with USA in five papers and with the UK in three papers. While each of the six institutions has collaborated with USA, only two or three institutions have collaborated with the other countries. We have also provided the average impact factors for these collaborated papers, although one should not give too much importance to them.

Indian statistical Institute has collaborated in 29 papers (13 international and 16 domestic). Institute of Mathematical Sciences has collaborated in 26 papers (15 international and 11 domestic). The distribution of collaborated papers from six important institutions by impact factor range of journals is given in Table 24. We see a large majority of papers are published in journals of impact factor less than or equal to 1.0.

Conclusion

Overall, compared to 1994, there were 30% fewer publications from India in 1998. The decline is steep in Uttar Pradesh and to a certain extent Delhi. A welcome improvement is the considerable decrease in the number of papers published in low-impact journals. There seems to be an attempt on the part of Indian mathematicians to publish their work in *SCI*-indexed high impact journals. There is also a flight away from Indian journals. In ten subfields, including Statistics, Special functions, General topology, and Functions of a complex variable, India publishes more than twice the number of papers expected from the world average. Every third paper from India has resulted from inter-institutional collaboration; 212 papers (about 23%) have resulted from international collaboration.

Acknowledgement

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TABLES

Table 1. India's contribution classified by document type
Source: *MATHSCI* 1998

No.	Document type	No. of papers
1	Journal	873
2	Proceedings-paper	90
3	Book	8
	Total	**971**

Table 2. Indian papers covered by *MATHSCI 1998*
classified by language

No.	Language	No. of papers
1	English	965
2	Hindi	6
	Total	**971**

Table 3. Journals used by Indian researchers for publishing their papers as seen from *MATHSCI 1998*
[arranged by number of papers]

No.	Journal title	No. of papers	Journal country	IF (*JCR* 1997)
1	Indian Journal of Pure and Applied Mathematics	30	IN	0.092
2	Journal of Physics. A. Mathematical and General	21	GB	1.480
3	Journal of Mathematical Analysis and Applications	18	US	0.339
4	Indian Academy of Sciences. Proceedings. Mathematical Sciences	17	IN	0.184
5	Fuzzy Sets and Systems. International Journal of Soft Computing and Intelligence	16	NL	0.346
6	Modern Physics Letters A. Particles and Fields, Gravitation, Cosmology, Nuclear Physics	16	SG	1.208
7	Differential Equations and Dynamical Systems. An International Journal for Theory and Applications	15	IN	0.000
8	Journal of Mathematical Physics	13	US	1.102
9	Physics Letters. A	13	NL	1.267
10	Physics Letters. B	13	NL	3.581
11	Computers and Mathematics with Applications. An International Journal	12	GB	0.313
12	International Journal of Modern Physics A. Particles and Fields. Gravitation. Cosmology. Nuclear Physics	12	SG	1.586
13	Communications in Statistics. Theory and Methods	11	US	0.194
14	International Journal of Mathematics and Mathematical Sciences	11	US	0.000
15	Journal of Fuzzy Mathematics	11	US	0.000
16	Nuclear Physics. B	10	NL	3.531
17	The Mathematics Education	10	IN	0.000
18	Ganita	9	IN	0.000
19	Opsearch	9	IN	0.000
20	Statistics and Probability Letters	9	NL	0.203
21	Information Processing Letters	8	NL	0.249
22	Information Sciences. An International Journal	8	US	0.174
23	Tamkang Journal of Mathematics	8	TW	0.000
24	The Journal of High Energy Physics	8	IT	0.000
25	The Korean Journal of Computational and Applied Mathematics	8	KR	0.000

No.	Journal title	No. of papers	Journal country	IF (*JCR* 1997)
26	Australian Mathematical Society. Journal. Series B. Applied Mathematics	7	AU	0.000
27	Mathematics Today (Ahmedabad)	7	IN	0.000
28	Classical and Quantum Gravity	6	GB	1.500
29	Discrete Mathematics	6	NL	0.231
30	Duke Mathematical Journal	6	US	0.701
31	Far East Journal of Mathematical Sciences	6	IN	0.000
32	General Relativity and Gravitation	6	US	0.954
33	Indian Academy of Mathematics. Journal	6	IN	0.000
34	Indian Journal of Mathematics	6	IN	0.000
35	International Journal of Information and Management Sciences	6	TW	0.000
				0.000
36	Journal of Optimization Theory and Applications	6	US	0.537
37	Physical Review Letters	6	US	6.140
38	Vijnana Parishad Anusandhan Patrika. The Research Journal of the Hindi Science Academy	6	IN	0.000
39	Analysis Mathematica	5	HU	0.000
40	Annals of Physics	5	US	1.957
41	Chaos, Solitons and Fractals. Applications in Science and Engineering.	5	GB	0.698
42	Il Nuovo Cimento della Societa Italiana di Fisica. B. Serie 12	5	IT	0.000
43	International Journal of Modern Physics. D. Gravitation, Astrophysics, Cosmology	5	SG	0.764
44	International Journal of Theoretical Physics	5	US	0.448
45	Journal of Algebra	5	US	0.365
46	Journal of Statistical Planning and Inference	5	US	0.263
47	Journal of Theoretical Probability	5	BE	0.398
48	Journal of the Indian Society of Agricultural Statistics	5	IN	0.000
49	Journal of the Ramanujan Mathematical Society	5	IN	0.000
50	Kyungpook National University. Kyungpook Mathematical Journal	5	KR	0.000
51	Linear Algebra and its Applications	5	US	0.329
52	Numerical Functional Analysis and Optimization. An International Journal	5	US	0.246
53	Physical Review. A. Third Series	5	US	0.764
54	Physics of Plasmas	5	US	1.994
55	Acta Arithmetica	4	PL	0.471
56	Bulletin of the Institute of Mathematics. Academia Sinica	4	TW	0.000

No.	Journal title	No. of papers	Journal country	IF (*JCR* 1997)
57	Communications in Algebra	4	US	0.267
58	Computer Methods in Applied Mechanics and Engineering	4	NL	0.727
59	*Discrete Applied Mathematics. Combinatorial Algorithms, Optimization and Computer Science*	4	NL	0.339
60	Discrete and Computational Geometry. An International Journal of Mathematics and Computer Science	4	US	0.513
61	Indian Institute of Science. Journal	4	IN	0.000
62	Infinite Dimensional Analysis, Quantum Probability and Related Topics	4	SG	0.000
63	Institute of Electrical and Electronics Engineers. Transactions on Automatic Control	4	US	0.819
64	International Journal of Computer Mathematics	4	GB	0.180
65	International Journal of Engineering Science	4	GB	0.528
66	*Journal of Applied Statistical Science*	4	US	*0.000*
67	Journal of Nonlinear Mathematical Physics	4	SE	0.000
68	Journal of Sound and Vibration	4	US	0.681
69	Mathematical Inequalities and Applications	4	HR	0.000
70	Mathematical Sciences Research Hot Line	4	US	0.000
71	Mechanics Research Communications	4	GB	0.310
72	Mechanism and Machine Theory. Dynamics of Machine Systems, Gears and Power Transmissions, Robots and Manipulator Systems, Computer Aided Design Method	4		
73	Optimization. A Journal of Mathematical Programming and Operations Research	4	CZ	0.000
74	Proceedings of the American Mathematical Society	4	US	0.273
75	Pure and Applied Mathematika Sciences	4	IN	0.000
76	Sadhana. Academy Proceedings in Engineering Sciences	4	IN	0.071
77	Statistical Papers	4	DE	0.164
78	Ultra Scientist of Physical Sciences. International Journal of Physical Sciences	4	IN	0.000
79	ZAMM. Zeitschrift fur Angewandte Mathematik und Mechanik. Applied Mathematics and Mechanics	4	DE	0.128
80	Acta Mathematica Hungarica	3	HU	0.069
81	Applied Mathematics and Computation	3	US	0.231
82	Ars Combinatoria	3	CA	0.092

No.	Journal title	No. of papers	Journal country	IF (*JCR* 1997)
83	Comptes Rendus de l'Academie des Sciences. Serie I. Mathematique	3	FR	0.000
84	Demonstratio Mathematica	3	PL	0.000
85	Designs, Codes and Cryptography. An International Journal	3	NL	0.000
86	Graphs and Combinatorics	3	JP	0.183
87	IAPQR Transactions. Journal of the Indian Association for Productivity, Quality and Reliability	3	IN	0.000
88	Institute of Electrical and Electronics Engineers. Transactions on Information Theory	3	US	0 .000
89	International Journal of Mathematical and Statistical Sciences	3	US	0.000
90	International Journal of Modern Physics B. Condensed Matter Physics. Statistical Physics. Applied Physics	3	SG	1.071
91	Journal of Computational and Applied Mathematics	3	NL	0.402
92	Journal of Economic Theory	3	US	0 .000
93	Journal of Engineering Mathematics	3	NL	0.342
94	Journal of Fluid Mechanics	3	GB	1.609
95	Journal of Fractional Calculus	3	JP	0.000
96	Journal of Functional Analysis	3	US	0.896
97	Journal of the Optical Society of America A	3	US	1.658
98	Mathematical and Computer Modelling	3	GB	0.279
99	Metrika. International Journal for Theoretical and Applied Statistics	3	DE	0.000
100	Nuclear Physics B. Proceedings Supplement	3	NL	0.000
101	Octogon Mathematical Magazine	3	RO	0.000
102	Physics of Fluids	3	US	1.630
103	Proceedings of the National Academy of Sciences, India. Section A	3	IN	0.000
104	Stochastic Analysis and Applications	3	US	0.229
105	The Royal Society of London. Proceedings. Series A. Mathematical, Physical and Engineering Sciences	3	GB	1.371
106	K Theory. An Interdisciplinary Journal for the Development, Application, and Influence of K Theory in the Mathematical Sciences	2	NL	0.000
107	Acta Mechanica	2	AT	0.380
108	American Journal of Mathematics	2	US	0.440
109	Annals of Mathematics. Second Series	2	US	2.071

No.	Journal title	No. of papers	Journal country	IF (*JCR* 1997)
110	Applied Mathematics and Optimization. An International Journal with Applications to Stochastics	2	US	0.426
111	BIT. Numerical Mathematics	2	DK	0.474
112	Biometrical Journal. Journal of Mathematical Methods in Biosciences	2	DE	0.260
113	Canadian Mathematical Bulletin. Bulletin Canadien de Mathematiques	2	CA	0.146
114	Communications in Applied Analysis. An International Journal for Theory and Applications	2	US	0.000
115	Communications in Mathematical Physics	2	DE	1.651
116	Computational Geometry. Theory and Applications	2	NL	0.000
117	Computers and Operations Research and their Application to Problems of World Concern. An International Journal	2	GB	0.417
118	Current Science	2	IN	0.376
119	Czechoslovak Mathematical Journal	2	CZ	0.078
120	Gurukula Kangri Vijnana Patrika Aryabhata	2	IN	0.000
121	Indian Journal of History of Science	2	IN	0.000
122	International Journal of Applied Science and Computations	2	US	0.000
123	International Journal of Approximate Reasoning	2	US	0.542
124	International Journal of Mathematical Education in Science and Technology	2	GB	0.000
125	International Mathematics Research Notices	2	US	0.000
126	Japan Society of Fluid Mechanics. Fluid Dynamics Research. An International Journal	2	JP	0.000
127	Journal of Algorithms	2	US	0.446
128	Journal of Applied Probability	2	GB	0.387
129	Journal of Discrete Mathematical Sciences and Cryptography	2	PL	
130	Journal of Modern Optics	2	GB	1.063
131	Journal of Multivariate Analysis	2	US	0.301
132	Journal of Statistical Physics	2	US	1.674
133	Journal of the American Statistical Association	2	US	1.851
134	Journal of the Franklin Institute. B. Engineering and Applied Mathematics	2	GB	0.000
135	Kochi University. Faculty of Science. Memoirs. Series A. Mathematics	2	IN	0.000
136	Kybernetika	2	CZ	0.149
137	Matematichki Vesnik	2	YU	0.000

No.	Journal title	No. of papers	Journal country	IF (*JCR* 1997)
138	Mathematica Balkanica. New Series	2	BG	0.000
139	Mathematical Biosciences. An International Journal	2	US	0.791
140	Mathematical Programming	2	NL	1.077
141	Mathematical Research Letters	2	GB	0.000
142	Mathematics of Computation	2	US	0.627
143	National Academy of Science Letters. A Monthly Journal of Research	2	IN	0.078
144	Nonlinear Analysis. Theory, Methods and Applications. An International Multidisciplinary Journal	2	GB	0.280
145	Physical Review E. Statistical Physics, Plasmas, Fluids, and Related Interdisciplinary Topics. Third Series	2	US	2.233
146	Physical Review. D. Third Series	2	US	3.420
147	Probability in the Engineering and Informational Sciences	2	US	0.000
148	Random Structures and Algorithms	2	GB	0.464
149	Rendiconti del Circolo Matematico di Palermo. Series II	2	IT	0.000
150	SIAM Journal on Control and Optimization	2	US	1.031
151	Soochow Journal of Mathematics	2	TW	0.000
152	Statistica Sinica	2	TW	0.538
153	Taiwanese Journal of Mathematics	2	TW	0.000
154	The Quarterly Journal of Mechanics and Applied Mathematics	2	GB	0.692
155	Theoretical Computer Science	2	NL	0.361
156	Universitatis Debreceniensis. Institutum Mathematicum. Publicationes Mathematicae	2	HU	0.089
157	Acta Mathematica Scientia. English Edition. Shuxue Wuli Xuebao	1	NL	0.080
158	Acta Mathematica Vietnamica	1	VN	0.000
159	Advances in Theoretical and Mathematical Physics	1	US	0.000
160	American Journal of Physics	1	US	0.597
161	Annales Mathematiques Blaise Pascal	1	FR	0.000
162	Annales Polonici Mathematici	1	PL	0.000
163	Annales Scientifiques de l'Ecole Normale Superieure. Quatrieme Series	1	FR	0.917
164	Annals of Differential Equations. Weifen Fangcheng Niankan	1	CN	0.000
165	Annals of the Institute of Statistical Mathematics	1	JP	0.368

No.	Journal title	No. of papers	Journal country	IF (*JCR* 1997)
166	Applicable Algebra in Engineering, Communication and Computing	1	DE	0.110
167	Applicationes Mathematicae	1	PL	0.000
168	Applied Mathematics Letters. An International Journal of Rapid Publication	1	US	0.442
169	Archiv der Mathematik. Archives of Mathematics. Archives Mathematiques	1	CH	0.281
170	Asia Pacific Journal of Operational Research	1	NZ	0.074
171	Australian Mathematical Society. Journal. Series A. Pure Mathematics and Statistics	1	AU	0.000
172	Australian and New Zealand Journal of Statistics	1	AU	0.000
173	Automatica. A Journal of IFAC, the International Federation of Automatic Control	1		
174	Beitrage zur Algebra und Geometrie. Contributions to Algebra and Geometry	1	DE	0.000
175	Biometrika	1	GB	1.446
176	Bulletin of Informatics and Cybernetics	1	JP	0.000
177	Bulletin of the Australian Mathematical Society	1	AU	0.198
178	Bulletin of the Belgian Mathematical Society. Simon Stevin	1	BE	0.000
179	Bulletin of the Korean Mathematical Society	1	KR	0.000
180	Colloquium Mathematicum	1	PL	0.000
181	Communications in Numerical Methods in Engineering	1	DE	1.651
182	Communications in Partial Differential Equations	1	US	0.494
183	Communications in Statistics. Simulation and Computation	1	US	0.142
184	Compositio Mathematica	1	NL	0.463
185	Constraints. An International Journal	1		
186	Czechoslovak Journal of Physics	1	CZ	0.212
187	Discrete and Continuous Dynamical Systems	1	US	0.000
188	Dissertationes Mathematicae (RozprawyMatematyczne)	1	PL	0.000
189	Documenta Mathematica	1		
190	Dynamic Systems and Applications	1	US	0.000
191	Ergodic Theory and Dynamical Systems	1	GB	0.441
192	European Journal of Combinatorics	1	GB	0.395
193	Far East Journal of Theoretical Statistics	1	IN	0.000
194	Foundations of Physics Letters	1	US	0.418
195	Fundamenta Informaticae	1	NL	0.000
196	Games and Economic Behavior	1	US	0.000

No.	Journal title	No. of papers	Journal country	IF (*JCR* 1997)
197	Geometriae Dedicata	1	NL	0.236
198	Georgian Mathematical Journal	1	US	0.000
199	Glasnik Matematicki. Serija III	1	HR	0.000
200	Helvetica Physica Acta. Physica Theoretica. Societatis Physicae Helveticae Commentaria Publica	1	CH	0.355
201	*IEEE Transactions on Circuits and Systems. I.* Fundamental Theory and Applications	1	US	*0.565*
202	IEEE Transactions on Signal Processing	1	US	1.238
203	Institut Mathematique. Publications. Nouvelle Serie	1	YU	0.000
204	Institute of Mathematics and Computer Sciences. Journal. (Mathematics Series)	1	IN	0.000
205	International Journal for Numerical Methods in Engineering	1	GB	1.114
206	*International Journal of Bifurcation and Chaos* in Applied Sciences and Engineering	1	SG	*0.880*
207	International Journal of Game Theory	1	DE	0.065
208	International Journal of Mathematics	1	SG	0.613
209	International Journal of Modern Physics. E. Nuclear Physics	1	SG	1.358
210	Inventiones Mathematicae	1	DE	1.127
211	Israel Journal of Mathematics	1	IL	0.312
212	Journal of Applied Analysis	1		
213	Journal of Applied Mathematics and Stochastic Analysis	1	GB	0.000
214	Journal of Automata, Languages and Combinatorics	1	NL	0.000
215	Journal of Combinatorial Mathematics and Combinatorial Computing	1	CA	0.000
216	Journal of Computer and System Sciences	1	US	0.602
217	Journal of Cryptology. The Journal of the International Association for Cryptologic Research	1	US	0.481
218	Journal of Difference Equations and Applications	1	CH	0.000
219	Journal of Geometry and Physics	1	NL	0.758
220	Journal of Integral Equations and Applications	1	US	0.000
221	Journal of Interdisciplinary Mathematics	1		0.000
222	Journal of Logic Programming	1	US	0.721
223	Journal of Logic and Computation	1	GB	0.604
224	Journal of Mathematical Research and Exposition	1	CN	0.000
225	Journal of Nonlinear Science	1	US	0.636

No.	Journal title	No. of papers	Journal country	IF (*JCR* 1997)
226	Journal of Number Theory	1	US	0.332
227	Journal of Pure and Applied Algebra	1	NL	0.481
228	Journal of the ACM	1	US	1.355
229	Journal of the American Mathematical Society	1	US	1.397
230	Journal of the Korean Statistical Society	.1	KR	0.000
231	Journal of the Royal Statistical Society. Series B. Statistical Methodology	1	GB	2.141
232	Kyushu Journal of Mathematics	1	JP	0.000
233	Letters in Mathematical Physics. A Journal for the Rapid Dissemination of Short Contributions in the Field of Mathematical Physics	1	NL	0.922
234	Linear and Multilinear Algebra	1	CH	0.000
235	Manuscripta Mathematica	1	DE	0.270
236	Mathematical Methods of Operations Research	1	HU	0.000
237	Mathematical Models and Methods in Applied Sciences	1	SG	0.388
238	Modern Physics Letters B. Condensed Matter Physics, Statistical Physics, Applied Physics	1	SG	0.580
239	Naval Research Logistics. An International Journal	1	US	0.285
240	Numerical Methods for Partial Differential Equations. An International Journal	1	US	0.000
241	Operations Research Letters	1	NL	0.343
242	Operations Research Spektrum	1	DE	0.511
243	Pacific Journal of Mathematics	1	US	0.292
244	Panamerican Mathematical Journal	1	US	0.000
245	Physica A. Statistical Mechanics and its Applications	1	NL	1.178
246	Physica A. Statistical and Theoretical Physics	1	NL	1.206
247	Physica D. Nonlinear Phenomena	1	NL	1.508
248	Physics Essays. An International Journal Dedicated to Fundamental Questions in Physics	1	CA	0.312
249	Physics of Atomic Nuclei	1	RU	0.208
250	Potential Analysis. An International Journal Devoted to the Interactions between Potential Theory, Probability Theory, Geometry and Functional Analysis	1	NL	0.310
251	Proceedings of the Indian National Science Academy. Part A. Reviews and Tracts. Physical Sciences	1	IN	0.000
252	Proceedings of the Royal Society of Edinburgh. Section A. Mathematics	1	GB	0.426
253	Questiio. Quaderns d'Estadistica i Investigacio Operativa. Segona Epoca	1	ES	0.000

No.	Journal title	No. of papers	Journal country	IF (*JCR* 1997)
254	Queueing Systems. Theory and Applications	1	CH	0.000
255	RAIRO Recherche Operationnelle. Operations Research	1	FR	0.116
256	Real Analysis Exchange	1	US	0.000
257	Review of Economic Studies	1	GB	0.000
258	SIAM Journal on Matrix Analysis and Applications	1	US	0.875
259	SIAM Journal on Numerical Analysis	1	US	0.938
260	Scandinavian Journal of Statistics. Theory and Applications	1	SE	0.396
261	Semigroup Forum	1	DE	0.233
262	Statistics. A Journal of Theoretical and Applied Statistics	1	DE	0.299
263	Studia Scientiarum Mathematicarum Hungarica. A Quarterly of the Hungarian Academy of Sciences	1	HU	0.000
264	The American Mathematical Monthly	1	US	0.292
265	The Annals of Statistics	1	US	0.729
266	The Asian Journal of Mathematics	1	US	0.000
267	The Canadian Journal of Statistics. La Revue Canadienne de Statistique	1	CA	0.260
268	Topology. An International Journal of Mathematics	1	GB	0.882
269	Transactions of the American Mathematical Society	1	US	0.578
270	Transformation Groups	1	US	0.000
271	Utilitas Mathematica	1	CA	0.123
272	Yokohama Mathematical Journal	1	JP	0.000
273	Zeitschrift fur Angewandte Mathematik und Physik. ZAMP. Journal of Applied Mathematics and Physics. Journal de Mathematiques et de Physique Appliquees	1	CH	0.488

Total	873	
Non-journal items	98	
	971	

Impact factor values are taken from *Journal Citation Reports* 1997. Some journals with 0 impact factor are included in *Journal Citation Reports* 1997, and others are non-*SCI* journals.

Table 4. Indian research papers covered by *MATHSCI* 1998 classified by subfield

No.	Code	Subfield	No. of papers 1998	No. of papers 1994
1	81	Quantum theory	114	97
2	62	Statistics	85	142
3	90	Economics, operations research, programming, games	55	58
4	76	Fluid mechanics	45	31
5	83	Relativity and gravitational theory	45	43
6	54	General topology	40	110
7	68	Computer science	40	35
8	11	Number theory	34	50
9	60	Probability theory and stochastic processes	30	26
10	05	Combinatorics	28	34
11	65	Numerical analysis	28	30
12	47	Operator theory	27	49
13	30	Functions of a complex variable	26	42
14	33	Special functions	23	46
15	58	Global analysis on manifolds	23	17
16	35	Partial differential equations	21	21
17	46	Functional analysis	19	36
18	93	Systems theory	19	28
19	34	Ordinary differential equations	18	32
20	73	Mechanics of solids	17	8
21	16	Associative rings and algebras	16	38
22	26	Real functions	14	29
23	94	Information and communication, circuits	13	0
24	14	Algebraic geometry	12	16
25	70	Mechanics of particles and systems	12	6
26	20	Group theory and generalizations	11	32
27	42	Fourier analysis	11	20
28	92	Biology and other natural sciences, behavioral sciences	11	7
29	15	Linear and multilinear algebra	9	9
30	49	Calculus of variations and optimal control	9	11
31	82	Statistical mechanics, structure of matter	9	19
32	45	Integral equations	8	8
33	01	History and biography	7	26
34	39	Finite differences and functional equations	7	11
35	41	Approximations and expansions	7	15

No.	Code	Subfield	No. of papers 1998	No. of papers 1994
36	04	Set theory	6	2
37	13	Commutative rings and algebras	6	9
38	32	Several complex variables and analytic spaces	6	8
39	52	Convex and discrete geometry	6	3
40	78	Optics electromagnetic theory	6	3
41	17	Non associative rings and algebras	5	7
42	44	Integral transforms operational calculus	5	12
43	53	Differential geometry	5	67
44	22	Topological groups, Lie groups	4	12
45	28	Measure and integration	4	9
46	03	Mathematical logic and foundations	3	6
47	40	Sequences, series, summability	3	17
48	43	Abstract harmonic analysis	3	4
49	51	Geometry	3	2
50	55	Algebraic topology	3	2
51	57	Manifolds and cell complexes	3	6
52	00	General	2	3
53	80	Classical thermodynamics, heat transfer	2	0
54	06	Order, lattices, ordered algebraic structures	1	6
55	12	Field theory and polynomials	1	6
56	19	K theory	1	1
57	08	General algebraic systems	0	1
58	31	Potential theory	0	1
59	18	Category-theory	0	4
		Total	**971**	**1391**

Table 5. Indian research papers covered by *MATHSCI* 1998 classified by subfield along with activity index [Source: *Mathscinet*]

No.	Code	Subfield	No. of papers			Activity index
			India (CD)	India (*Mathscinet*)	World (*Mathscinet*)	
1	81	Quantum theory	114	133	3544	1.629
2	62	Statistics	85	140	3007	2.021
3	90	Economics, operations research, programming games	55	71	2829	1.089
4	76	Fluid mechanics	45	55	2224	1.073
5	83	Relativity and gravitational theory	45	84	1555	2.345
6	54	General topology	40	77	915	3.652
7	68	Computer science	40	74	3571	0.899
8	11	Number theory	34	51	1890	1.171
9	60	Probability theory and stochastic processes	30	50	2192	0.990
10	05	Combinatorics	28	41	2061	0.863
11	65	Numerical analysis	28	33	3363	0.426
12	47	Operator theory	27	41	1451	1.226
13	30	Functions of a complex variable	26	41	854	2.084
14	33	Special functions	23	58	360	6.993
15	58	*Global analysis analysis on manifolds*	23	23	2008	0.497
16	35	Partial differential Equations	21	26	3330	0.339
17	46	Functional analysis	19	33	1467	0.976
18	93	Systems theory	19	21	2010	0.453
19	34	Ordinary differential equations	18	22	1982	0.482
20	73	Mechanics of solids	17	18	1112	0.703
21	16	Associative rings and algebras	16	30	925	1.408
22	26	Real functions	14	17	462	1.597
23	94	Information and communication, circuits	13	15	906	0.719
24	14	Algebraic geometry	12	12	857	0.608
25	70	Mechanics of particles and systems	12	15	562	1.158
26	20	Group theory and generalizations	11	19	1487	0.555
27	42	Fourier analysis	11	16	684	1.015
28	92	Biology and other natural sciences, behavioral sciences	11	15	557	1.169
29	15	Linear and multilinear algebra	9	13	587	0.961
30	49	Calculus of variations and optimal control	9	17	879	0.839

No.	Code	Subfield	No. of papers			Activity index
			India (CD)	India (*Mathscinet*)	World (*Mathscinet*)	
31	82	Statistical mechanics, structure of matter	9	10	1033	0.420
32	45	Integral equations	8	11	182	2.623
33	01	History and biography	7	12	1044	0.499
34	39	*Finite differences and functional equations*	7	9	396	0.986
35	41	Approximations and expansions	7	13	621	0.909
36	04	Set theory	6	5	89	2.438
37	13	Commutative rings and algebras	6	8	445	0.780
38	32	Several complex variables and analytic spaces	6	8	680	0.511
39	52	Convex and discrete geometry	6	6	379	0.687
40	78	Optics electromagnetic theory	6	7	482	0.630
41	17	Non associative rings and algebras	5	6	522	0.499
42	44	Integral transforms operational calculus	5	12	121	4.304
43	53	Differential geometry	5	20	1314	0.661
44	22	Topological groups, Lie groups	4	6	317	0.821
45	28	Measure and integration	4	11	446	1.070
46	03	Mathematical logic and foundations	3	5	1552	0.140
47	40	Sequences, series, summability	3	19	120	6.872
48	43	Abstract harmonic analysis	3	7	135	2.250
49	51	Geometry	3	2	358	0.242
50	55	Algebraic topology	3	4	327	0.531
51	57	Manifolds and cell complexes	3	3	692	0.188
52	00	General	2	2	531	0.163
53	80	Classical thermodynamics, heat transfer	2	2	157	0.553
54	06	Order, lattices, ordered algebraic structures	1	4	366	0.474
55	12	Field theory and polynomials	1	1	108	0.402
56	19	K theory	1	0	65	0.000
			971	1454	62113	

For calculating activity indices for different subfields, we have used the total number of world papers as 63627, which is the total for all subfields. Indian researchers had published papers only in 56 subfields and the world's publications in these subfields total 62113.

Table 6. India's contribution to the journal literature of mathematics arranged by country of publication of the journal as seen from *MATHSCI 1998*

No.	Publication country	Country code	No. of papers 1998	No. of journals 1998	No. of papers 1994	No. of journals 1994
1	United States	US	254	82	271	87
2	India	IN	166	27	475	51
3	The Netherlands	NL	116	30	125	29
4	Great Britain	GB	93	29	81	29
5	Singapore	SG	45	10	41	9
6	Taiwan	TW	24	6	24	4
7	Germany	DE	24	14	49	18
8	Italy	IT	15	3	22	10
9	Korea	KR	15	4	6	2
10	Poland	PL	13	7	11	4
11	Hungary	HU	12	5	17	6
12	Japan	JP	12	7	25	15
13	Australia	AU	10	4	16	5
14	Czech Republic	CZ	9	4	6	3
15	Canada	CA	9	6	12	8
16	Belgium	BE	6	2	0	0
17	France	FR	6	4	4	3
18	Switzerland	CH	6	6	30	13
19	Romania	RO	3	1	18	7
20	Yugoslavia	YU	3	2	9	4
21	Austria	AT	2	1	3	3
22	Bulgaria	BG	2	1	6	3
23	Denmark	DK	2	1	2	1
24	China	CN	2	2	15	10
25	Spain	ES	1	1	5	5
26	Croatia	HR	5	2	0	0
27	Israel	IL	1	1	1	1
28	New Zealand	NZ	1	1	1	1
29	Russia	RU	1	1	3	2
30	Sweden	SE	5	2	3	1
31	Vietnam	VN	1	1	1	1
32	Turkey	TR	0	0	11	3
33	Bangladesh	BD	0	0	2	1
34	Barbados	BB	0	0	4	1
35	Brazil	BR	0	0	2	1

No.	Publication country	Country code	No. of papers 1998	No. of journals 1998	No. of papers 1994	No. of journals 1994
36	Bosnia	BA	0	0	1	1
37	Pakistan	PK	0	0	2	1
38	Venezuela	VE	0	0	1	1
39	South Africa	ZA	0	0	3	2
40	Argentina	AR	0	0	2	1
41	Finland	FI	0	0	1	1
42	Hong-Kong	HK	0	0	2	2
43	Portugal	PT	0	0	2	1
44	Mexico	MX	0	0	1	1
45	Qatar	QA	0	0	1	1
Non-journal items and unknown country of publication			107	6	74	
Total			971	273	1391	353

Table 7. Indian journals covered by *MATHSCI 1998*
(arranged by number of papers)

No.	Journal title	No. of papers	Impact factor (*JCR* 1997)
1	Indian Journal of Pure and Applied Mathematics	30	0.092
2	Indian Academy of Sciences. Proceedings. Mathematical Sciences	17	0.184
3	Differential Equations and Dynamical Systems. An International Journal for Theory and Applications	15	0.000
4	The Mathematics Education	10	0.000
5	Ganita	9	0.000
6	Opsearch	9	0.000
7	Mathematics Today (Ahmedabad)	7	0.000
8	Far East Journal of Mathematical Sciences	6	0.000
9	Indian Academy of Mathematics. Journal	6	0.000
10	Indian Journal of Mathematics	6	0.000
11	Vijnana Parishad Anusandhan Patrika. The Research Journal of the Hindi Science Academy	6	0.000
12	Journal of the Indian Society of Agricultural Statistics	5	0.000
13	Journal of the Ramanujan Mathematical Society	5	0.000
14	Indian Institute of Science. Journal	4	0.000
15	Pure and Applied Mathematika Sciences	4	0.000
16	Sadhana. Academy Proceedings in Engineering Sciences	4	0.071
17	Ultra Scientist of Physical Sciences. International Journal of Physical Sciences	4	0.000
18	IAPQR Transactions. Journal of the Indian Association for Productivity, Quality and Reliability	3	0.000
19	Proceedings of the National Academy of Sciences, India. Section A	3	0.000
20	Gurukula Kangri Vijnana Patrika Aryabhata	2	0.000
21	Indian Journal of History of Science	2	0.000
22	Kochi University. Faculty of Science. Memoirs. Series A. Mathematics	2	0.000
23	National Academy of Science Letters. A Monthly Journal of Research	2	0.078
24	Current Science	2	0.376
25	Far East Journal of Theoretical Statistics	1	0.000
26	Institute of Mathematics and Computer Sciences. Journal. (Mathematics Series)	1	0.000
27	Proceedings of the Indian National Science Academy. Part A. Reviews and Tracts. Physical Sciences	1	0.000
	Total	**166**	

Table 8. Indian institutions publishing papers as seen from *MATHSCI 1998*

No.	Institution	No. of papers	Cumulative number
1	Indian Statistical Institute, Calcutta	65	65
2	Tata Institute of Fundamental Research, Mumbai	62	127
3	Indian Institute of Science, Bangalore	49	176
4	Institute of Mathematical Sciences, Chennai	41	217
5	Indian Institute of Technology, Kharagpur	38	255
6	Indian Institute of Technology Madras, Chennai	34	289
7	Indian Statistical Institute, New Delhi	32	321
8	Jadavpur University, Calcutta	31	352
9	Indian Institute of Technology, Kanpur	28	380
10	Indian Institute of Technology Bombay, Mumbai	22	402
11	University of Calcutta, Calcutta	20	422
12	University of Delhi, Delhi	19	441
13	Panjab University, Chandigarh	19	460
14	Mehta Research Institute, Allahabad	18	478
15	Aligarh MuslimUniversity, Aligarh	16	494
16	University of Hyderabad, Hyderabad	16	510
17	Indian Statistical Institute, Bangalore	16	526
18	University of Poona, Pune	16	542
19	Indian Institute of Technology Delhi, New Delhi	14	556
20	Banaras Hindu University, Varanasi	12	568
21	Anna University, Chennai	11	579
22	Saha Institute of Nuclear Physics, Calcutta	11	590
23	S. N. Bose National Center for Basic Science, Calcutta	11	601
24	Cochin University of Science and Technology, Cochin	10	611
25	University of Madras, Chennai	10	621
26	University of Jammu, Jammu,	9	630
27	University of Kalyani, Kalyani	9	639
28	Lucknow University, Lucknow	9	648
29	Institute of Physics, Bhubaneswar	9	657
30	Kalyan Mahavidyalaya, Bhilainagar	8	665

No.	Institution	No. of papers	Cumulative number
31	Bharathiar University,Coimbatore	8	673
32	Sardar Patel University, Vallabh Vidyanagar	8	681
33	Bhabha Atomic Research Centre, Mumbai	8	689
34	Bangalore University, Bangalore	7	696
35	Bharathidasan University, Tiruchirapalli	7	703
36	Marathwada University, Aurangabad	7	710
37	University of Roorkee, Roorkee	7	717
38	Andhra University, Waltair	6	723
39	Annamalai University, Annamalainagar	6	729
40	University ofKashmir, Srinagar	6	735
41	University of Mysore, Mysore	6	741
42	University of North Bengal, Darjeeling	6	747
43	Institute of Advanced Study in Science and Technology (IASST), Gauhati	5	752
44	Shri Guru Teg Bahadur Khalsa College, New Delhi	5	757
45	Berhampur University, Berhampur	5	762
46	Karnatak University, Dharwad	5	767
47	Kurukshetra University, Kurukshetra	5	772
48	Pondicherry University, Pondicherry	5	777
49	Vikram University,Ujjain	5	782
50	National Aerospace Laboratory, Bangalore	5	787
51	Madras University Post Graduate Center, Salem	4	791
52	Burdwan University, Burdwan	4	795
53	Himachal Pradesh University, Simla	4	799
54	Indian Institute of Management, Calcutta	4	803
55	Jai Narain Vyas University, Jodhpur	4	807
56	Punjabi University, Patiala	4	811
57	University of Rajasthan, Jaipur	4	815
58	Utkal University, Bhubaneswar	4	819
59	Visva-Bharati University, Santiniketan , West Bengal	4	823
60	Physical Research Laboratory, Ahmedabad	4	827
61	Indian Association for the Cultivation of Science (IACS), Calcutta	4	831
62	Regional Engineering College, Rourkela	3	834

No.	Institution	No. of papers	Cumulative number
63	Faculty of Mathematical Sciences, New Delhi	3	837
64	Government College, Shahdol	3	840
65	Janta College, Bakewar, Etawah	3	843
66	Loyola College, Chennai	3	846
67	Mahatma Gandhi College, Ahmedpur	3	849
68	Zakir Husain College, Delhi	3	852
69	Shri G. S. Institute of Technology and Science, Indore	3	855
70	Haryana Agricultural University, Hissar	3	858
71	University of Gorakhpur, Gorakhpur	3	861
72	Guru Nanak Dev University, Amritsar	3	864
73	Gauhati University, Gauhati	3	867
74	Indian School of Mines, Dhanbad	3	870
75	Nagarjuna University, Nagarjunanagar	3	873
76	Rani Durgavati University, Jabalpur	3	876
77	Pandit Ravishankar ShuklaUniversity, Raipur	3	879
78	SambalpurUniversity, Burla, Sambalpur	3	882
79	M. L. Sukhadia University, Udaipur	3	885
80	Indira Gandhi Center forAtomic Research, Kalpakkam	3	888
81	VikramSarabhai Space Centre, Trivandrum	3	891
82	SPICScience Foundation, Chennai	3	894
83	Government Engineering College, Jabalpur	2	896
84	Government Engineering College, Ujjain	2	898
85	Madras Christian College, Chennai	2	900
86	Jamia Millia Islamia, NewDelhi	2	902
87	Presidency College, Calcutta	2	904
88	AlagappaUniversity, Karaikudi	2	906
89	Gurukula Kangri Vishwavidyalaya, Hardwar	2	908
90	Indian Institute of Management, Ahmedabad	2	910
91	Indian Statistical Institute, Chennai	2	912
92	Jawaharlal Nehru University, New Delhi	2	914
93	University of Kerala, Trivandrum	2	916
94	Kumaun University, Naini Tal	2	918

No.	Institution	No. of papers	Cumulative number
95	Shivaji University, Kolhapur	2	920
96	University of Bombay, Mumbai	2	922
97	Vidyasagar University, Midnapore	2	924
98	Indian Council of Agricultural Research, New Delhi	2	926
99	Bengal Engineering College, Howrah	1	927
100	Malaviya Regional Engineering College, Jaipur	1	928
101	Regional Engineering College, Srinagar	1	929
102	Visvesvaraya Regional College of Engineering, Nagpur	1	930
103	Zakir Husain College of Engineering and Technology, Aligarh	1	931
104	St. Andrew's College, Gorakhpur	1	932
105	Asutosh College, Calcutta	1	933
106	Cotton College, Gauhati	1	934
107	Dungar Autonomous College, Bikaner	1	935
108	FerozeGandhi College, Rae Bareli	1	936
109	Faculty of Science, Baroda	1	937
110	Gaya College, Gaya	1	938
111	Holkar Science College, Indore	1	939
112	Hans Raj College, Delhi	1	940
113	Maharaja College, Arrah	1	941
114	Pachunga University (P.U.) College, Aizawl	1	942
115	Science College, Nanded	1	943
116	St. Stephen's College, Delhi	1	944
117	Ramakrishna Mission Vivekananda College, Chennai	1	945
118	Willingdon College, Sangli	1	946
119	St. Xavier's College, Palayankottai	1	947
120	Birsa Agricultural University, Ranchi	1	948
121	Birla Institute of Technology Mesra, Ranchi	1	949
122	Birla Institute of Technology and Science, Pilani	1	950
123	Agra University, Agra	1	951
124	University of Allahabad, Allahabad	1	952
125	Bhagalpur University, Bhagalpur	1	953

No.	Institution	No. of papers	Cumulative number
126	Bhavnagar University, Bhavnagar	1	954
127	University of Calicut, Calicut	1	955
128	Gujarat University, Ahmedabad,	1	956
129	Gulbarga University, Gulbarga	1	957
130	Hari Singh Gour University, Sagar	1	958
131	University of Jodhpur, Jodhpur	1	959
132	Jiwaji University, Gwalior	1	960
133	Kumaun University, Almora	1	961
134	Madurai Kamaraj University, Madurai	1	962
135	Maharaja Sayajirao University of Baroda, Baroda	1	963
136	North-Eastern Hill University, Shillong	1	964
137	Osmania University, Hyderabad	1	965
138	Patna University, Patna	1	966
139	Ranchi University, Ranchi	1	967
140	Saurashtra University, Rajkot	1	968
141	National Council of Education Research and Training, New Delhi	1	969
142	Department of Science and Technology, New Delhi	1	970
143	Raman Research Institute, Bangalore	1	971
	Total	**971**	**971**

Table 9. Contribution made by different types of organizations as seen from *MATHSCI 1998*

Institution type	No. of papers
Academic	
General universities	680
General colleges	55
Engineering universities	23
Engineering colleges	22
Agricultural universities	4
Total	**784**
Research institutions and central ministries	
Dept. of Atomic Energy (DAE)	152
Dept. of Science and Technology (DST)	17
Dept of Space (DOS)	7
Council of Scientific and Industrial Research (CSIR)	5
Dept. of Agricultural Research	2
NCERT (Dept. of Education)	1
Total	**184**
Others	
Private foundation	**3**
Grand total	**971**

Table 10. Indian cities contributing in the field of mathematics as seen from *MATHSCI 1998*

No.	City	No. of papers 1998	No. of papers 1994
1	Calcutta	149	185
2	Chennai	107	126
3	Mumbai	94	106
4	New Delhi	86	135
5	Bangalore	78	96
6	Kharagpur	38	32
7	Kanpur	28	27
8	Allahabad	19	22
9	Chandigarh	19	27
10	Aligarh	17	37
11	Hyderabad	17	13
12	Pune	16	14
13	Bhubaneswar	13	22
14	Varanasi	12	48
15	Cochin	10	15
16	Gauhatti	9	16
17	Jammu	9	12
18	Kalyani	9	21
19	Lucknow	9	26
20	Bhilainagar	8	9
21	Coimbatore	8	8
22	Vallabh Vidya Nagar	8	5
23	Ahmedabad	7	7
24	Aurangabad	7	24
25	Roorkee	7.	13
26	Srinagar (JK)	7	2
27	Tiruchirappalli	7	6
28	Ujjaini	7	11
29	Annamalainagar	6	6
30	Darjling	6	1
31	Mysore	6	15
32	Visakhapatnam	6	8
33	Berhampur	5	17
34	Dharward	5	10

No.	City	No. of papers 1998	No. of papers 1994
35	Jodhpur	5	8
36	Jaipur	5	8
37	Jabalpur	5	13
38	Kurukshetra	5	2
39	*Pondicherry*	5	0
40	Trivandrum	5	6
41	Burdwan	4	17
42	Ghorakhpur	4	13
43	Indore	4	6
44	Patiala	4	3
45	Salem	4	0
46	Simla	4	2
47	Santiniketan	4	4
48	Ahmedpur	3	3
49	Amritsar	3	7
50	Burla	3	0
51	Dhanbad	3	0
52	Etawa	3	2
53	Hissar	3	1
54	Kalpackam	3	3
55	Nagarjuna Nagar	3	6
56	Ranchi	3	9
57	Raipur	3	3
58	Rourkela	3	1
59	Shahdol	3	0
60	Udaipur	3	0
61	Baroda	2	3
62	Haridwar	2	14
63	*Kolhapur*	2	10
64	Karaikudi	2	0
65	Midnapore	2	0
66	Nainital	2	1
67	Agra	1	2
68	Almora	1	9
69	Arrah	1	0
70	Bikaneer	1	0
71	Bhagalpur	1	2
72	Bhavnagar	1	0
73	Calicut	1	1
74	Gaya	1	1
75	Gulburga	1	0

No.	City	No. of papers 1998	No. of papers 1994
76	Gwalior	1	0
77	Howrah	1	3
78	Aizwal	1	2
79	Madurai	1	7
80	Nanded	1	0
81	Nagpur	1	2
82	Pilani	1	5
83	Palayankottai	1	0
84	Patna	1	0
85	Raibareli	1	2
86	Rajkot	1	2
87	Sagar	1	19
88	Shillong	1	0
89	Sangli	1	0
90	Bodh-Gaya	0	5
91	Rohtak	0	6
92	Ludhiana	0	8
93	Orai	0	5
94	Rewa	0	10
95	Meerut	0	3
96	Sambalpur	0	3
97	Goa	0	4
98	Mangalore	0	5
99	Jaunpur	0	3
100	Surat	0	3
101	Barwari	0	1
102	Ghazipur	0	2
103	Tirupathi	0	1
104	Ghaziabad	0	1
105	Najibabad	0	2
106	Rishikesh	0	2
107	Chattarpur	0	1
108	Dehradun	0	1
109	Srinagar (UP)	0	1
	Total	**971**	**1391**

Table 11. Indian states contributing to the world literature of mathematics as seen from *MATHSCI 1998*

No.	State	State code	No. of papers 1998	No. of papers 1994
1	West Bengal	WB	213	263
2	Tamil Nadu	TN	139	155
3	Maharashtra	MH	122	159
4	Uttar Pradesh	UP	106	237
5	Karnataka	KA	90	127
6	Delhi	DH	89	135
7	Madhya Pradesh	MP	32	72
8	Haryana	HN	27	9
9	Andhra Pradesh	AN	26	28
10	Orissa	OR	24	43
11	Gujarat	GJ	19	20
12	Kerala	KE	16	22
13	Jammu Kashmir	JK	16	14
14	Rajasthan	RJ	15	21
15	Bihar	BR	10	17
16	Assam	AS	9	16
17	Punjab	PJ	7	18
18	Pondycherry	PY	5	0
19	Himachal Pradesh	HP	4	2
20	Meghalaya	MG	1	0
21	Mizoram	MZ	1	2
	Total		**971**	**1360**

Table 12. India's contribution to journal literature of mathematics categorized
by leading institutions and leading journals (*MATHSCI* 1998)

Journal	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	Total
Indian Journal of Pure and Applied Mathematics	0	0	0	0	0	1	1	0	0	0	2	0	1	0	1	1	0	0	1	0	8
Journal of Physics. A	1	0	3	0	0	1	0	0	1	0	0	1	0	0	0	1	0	1	0	1	10
Journal of Mathematical Analysis and Application	0	0	0	1	0	1	0	0	0	0	0	0	1	0	1	0	1	0	0	1	6
Indian Academy of Sciences. Proceedings	1	1	0	2	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	7
Fuzzy Sets and Systems	0	0	0	0	3	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0	7
Modern Physics Letters A	0	0	0	4	0	0	0	0	0	0	2	0	2	0	0	4	0	0	0	0	12
Differential Equations and Dynamical Theories	0	0	4	0	0	1	0	1	1	1	0	0	0	0	0	1	2	0	1	0	12
Journal of Mathematical Physics	0	0	0	1	0	1	0	0	1	0	0	2	0	0	0	0	0	0	1	1	7
Physics Letters. A	4	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	7
Physics Letters. B	0	1	0	2	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	5
Computers and Mathematics with Application	1	0	1	0	3	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6
International Journal of Modern Physics A	0	1	0	2	0	0	0	2	0	0	2	0	0	0	0	0	0	1	0	0	8
Communications in Statiostics	1	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	4
International Journal of Mathematics and Mathematical Sciences	0	0	0	0	0	0	0	2	0	0	0	0	1	0	2	0	0	0	0	0	5
Journal of Fuzzy Mathematics	0	1	0	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	6
Nuclear Physics. B	0	5	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	7
The Mathematics Education	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Ganita	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
Opsearch	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	1	4
Total	8	9	8	12	9	8	1	7	4	3	9	7	7	4	4	7	3	3	5	7	125

A = Indian Statistical Institute, Calcutta
B = Tata Institute of Fundamental Res., Mumbai
C = Indian Institute of Science, Bangalore
D = Institute of Mathematical Sciences, Chennai
E = Indian Institute of Technology, Kharagpur
F = Indian Institute of Technology, Chennai
G = Indian Statistical Institute, New Delhi

H = Jadavpur University, Calcutta
I = Indian Institute of Technology, Kanpur
J = Indian Institute of Technology, Mumbai
K = University of Calcutta, Calcutta
L = University of Delhi, Delhi
M = Panjab University, Chandigarh
N = Mehta Research Institute, Allahabad

O = Aligarh Muslim University, Aligarh
P = University of Hyderabad, Hyderabad
Q = Indian Statistical Institute, Bangalor
R = University of Poona, Pune
S = Indian Institute of Technology, New Delhi
T = Banaras Hindu University, Varanasi

Table 13. India's contribution to journal literature of mathematics categorized by leading institutions and impact factor(MATHSCI 1998)

Institution	A	B	C	D	E	F	G	H	I	J	Total
Indian Statistical Institute, Calcutta	21	29	5	8	1	1	0	0	0	0	65
Tata Institute of Fundamental Research, Mumbai	23	15	10	3	3	2	0	0	6	0	62
Indian Institute of Science, Bangalore	23	17	2	4	3	0	0	0	0	0	49
Institute of Mathematical Sciences, Chennai	21	8	0	5	5	0	0	0	2	0	41
Indian Institute of Technology, Kharagpur	15	11	10	2	0	0	0	0	0	0	38
Indian Institute of Technology, Chennai	15	15	0	3	1	0	0	0	0	0	34
Indian Statistical Institute, New Delhi	15	13	2	0	2	0	0	0	0	0	32
Jadavpur University, Calcutta	15	4	6	1	3	0	0	0	0	2	31
Indian Institute of Technology, Kanpur	15	7	2	4	0	0	0	0	0	0	28
Indian Institute of Technology, Mumbai	9	8	4	0	1	0	0	0	0	0	22
University of Calcutta, Calcutta	8	5	1	3	3	0	0	0	0	0	20
University of Delhi, Delhi	7	8	0	3	1	0	0	0	0	0	19
Panjab University, Chandigarh	7	8	0	3	1	0	0	0	0	0	19
Mehta Research Institute, Allahabad	10	1	2	2	0	0	0	0	3	0	18
Aligarh Muslim University, Aligarh	13	3	0	0	0	0	0	0	0	0	16
University of Hyderabad, Hyderabad	6	2	3	5	0	0	0	0	0	0	16
Indian Statistical Institute, Bangalore	9	4	3	0	0	0	0	0	0	0	16
University of Poona, Pune	2	3	3	1	3	2	0	0	1	1	16
Indian Institute of Technology, New Delhi	8	2	1	1	2	0	0	0	0	0	14
Banaras Hindu University, Varanasi	8	2	0	2	0	0	0	0	0	0	12
Total	250	165	54	50	29	5	0	0	12	3	568

A = 0.00   E = 1.50 < 2.00   I = 3.50 < 4.00
B = 0.00 < 0.50   F = 2.00 < 2.50   J = 6.00 < 6.50
C = 0.50 < 1.00   G = 2.50 < 3.00
D = 1.00 < 1.50   H = 3.00 < 3.50

Table 14. India's contribution to journal literature of mathematics categorized by leading institutions and subfields (MATHSCI 1998)

Code	Subfield	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	Total
81	Quantum theory	15	8	2	12	0	2	7	0	2	0	3	3	3	13	0	3	0	0	0	0	73
62	Statistics	23	0	1	0	0	0	3	0	3	1	5	3	4	0	3	0	0	2	0	1	49
90	Economics, operations research, programming, games	1	0	3	0	6	1	6	2	1	0	0	1	2	0	1	0	0	0	3	2	29
76	Fluid mechanics	1	0	11	0	3	5	0	1	0	1	1	0	2	0	0	2	0	0	3	0	30
83	Relativity and gravitational theory	1	5	0	1	0	0	0	8	0	1	0	1	0	2	0	1	0	6	1	2	29
54	General topology	0	0	0	0	1	0	0	0	0	0	3	0	0	0	1	2	0	0	0	3	10
68	Computer science	10	2	5	5	8	2	0	1	2	1	0	0	0	0	0	1	0	0	0	0	37
11	Number theory	1	16	0	4	0	0	0	0	1	0	0	0	3	2	0	0	0	0	0	0	27
60	Probability theory and stochastic processes	5	1	1	0	1	3	2	0	1	0	0	1	0	0	0	0	3	0	3	0	21
05	Combinatorics	0	0	0	0	2	5	0	0	1	0	0	0	1	0	0	1	2	2	0	0	14
65	Numerical analysis	0	0	3	0	2	2	1	0	1	7	0	0	0	0	0	0	0	0	0	0	16
47	Operator theory	0	0	0	0	0	1	3	1	0	1	1	0	0	0	1	0	1	1	0	0	10
30	Functions of a complex variable	0	0	0	0	2	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	7
33	Special functions	0	0	0	6	0	0	0	0	0	0	0	0	0	0	1	3	1	0	0	1	12
58	Global analysis on manifolds	0	2	3	0	0	0	0	4	1	1	2	0	0	0	0	0	0	0	0	0	13
35	Partial differential Equations	0	3	3	2	0	0	1	2	0	0	0	0	1	0	0	1	0	2	0	1	16
46	Functional analysis	1	0	0	1	1	1	2	0	0	0	0	1	0	0	0	0	1	0	0	0	8
93	Systems theory	0	1	4	0	4	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	13
34	Ordinary differential equations	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3
73	Mechanics of solids	0	0	1	0	0	2	0	2	0	0	1	0	0	0	1	0	0	0	0	0	7
16	Associative rings and algebras	0	0	0	0	1	1	1	0	0	0	0	2	1	0	2	0	0	1	0	0	9
26	Real functions	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2
94	Information and communication, circuits	0	0	0	1	1	0	0	0	4	0	0	1	0	0	1	0	0	0	2	0	10
14	Algebraic geometry	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
70	Mechanics of particles and systems	0	0	2	0	0	0	0	0	5	1	0	1	0	0	0	0	0	1	0	0	10
20	Group theory and generalizations	0	1	0	0	0	2	0	0	0	0	0	1	0	1	1	0	0	0	0	0	6
42	Fourier analysis	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	2	0	0	1	5
92	Biology and other natural sciences, behavioral sciences	1	0	0	0	0	1	0	4	0	0	0	0	0	0	0	0	0	0	1	0	7

Code	Subfield	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	Total
15	Linear and multilinear algebra	0	0	0	0	0	1	4	1	0	1	0	0	0	0	0	1	0	0	0	0	8
49	Calculus of variations and optimal control	0	0	2	2	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	7
82	Statistical mechanics, structure of matter	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	4
45	Integral equations	0	0	2	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3
01	History and biography	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	4
39	Finite differences and functional equations	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
41	Approximations and expansions	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	2
04	Set theory	2	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	4
13	Commutative rings and algebras	0	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
32	Several complex variables and analytic spaces	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
52	Convex and discrete geometry	0	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	5
78	Optics electromagnetic theory	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4
17	Non associative rings and algebras	0	1	0	0	0	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4
44	Integral transforms operational calculus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
53	Differential geometry	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
22	Topological groups, Lie groups	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	4
28	Measure and integration	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	2	0	0	0	3
03	Mathematical logic and foundations	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2
40	Sequences, series, summability	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
43	Abstract harmonic analysis	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	3
51	Geometry	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	3
55	Algebraic topology	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	3
57	Manifolds and cell complexes	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	3
00	General	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
80	Classical thermodynamics, heat transfer	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2
06	Order, lattices, ordered algebraic structures	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12	Field theory and polynomials	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
19	K Theory	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Total	65	62	49	41	38	34	32	31	28	22	20	19	19	18	16	16	16	16	14	12	568

A = Indian Statistical Institute, Calcutta
B = Tata Institute of Fundamental Research, Mumbai
C = Indian Institute of Science, Bangalore
D = Institute of Mathematical Sciences, Chennai
E = Indian Institute of Technology, Kharagpur
F = Indian Institute of Technology, Chennai
G = Indian Statistical Institute, New Delhi
H = Jadavpur University, Calcutta
I = Indian Institute of Technology, Kanpur
J = Indian Institute of Technology, Mumbai

K = University of Calcutta, Calcutta
L = University of Delhi, Delhi
M = Panjab University, Chandigarh
N = Mehta Research Institute, Allahabad
O = Aligarh Muslim University, Aligarh
P = University of Hyderabad, Hyderabad
Q = Indian Statistical Institute, Bangalore
R = University of Poona, Pune
S = Indian Institute of Technology, New Delhi
T = Banaras Hindu University, Varanasi

Table 15. India's contribution to journal literature of mathematics categorized by impact factors of journals used and subfields (*MATHSCI* 1998)

Code	Subfield	A	B	C	D	E	F	G	H	I	Total
81	Quantum theory	28	8	8	43	10	0	0	15	2	114
62	Statistics	42	35	3	2	2	1	0	0	0	85
90	Economics, operations research, programming, games	33	16	4	2	0	0	0	0	0	55
76	Fluid mechanics	15	16	3	1	10	0	0	0	0	45
83	Relativity and gravitational theory	6	2	11	4	9	0	2	8	3	45
54	General topology	24	16	0	0	0	0	0	0	0	40
68	Computer science	11	25	4	0	0	0	0	0	0	40
11	Number theory	17	13	1	1	0	2	0	0	0	34
60	Probability theory and stochastic processes	14	16	0	0	0	0	0	0	0	30
05	Combinatorics	8	19	1	0	0	0	0	0	0	28
65	Numerical analysis	8	13	6	1	0	0	0	0	0	28
47	Operator theory	19	4	3	0	1	0	0	0	0	27
30	Functions of a complex variable	21	5	0	0	0	0	0	0	0	26
33	Special functions	16	3	1	3	0	0	0	0	0	23
58	Global analysis on manifolds	8	1	5	4	5	0	0	0	0	23
35	Partial differential Equations	10	4	4	1	0	2	0	0	0	21
46	Functional analysis	15	4	0	0	0	0	0	0	0	19
93	Systems theory	5	6	7	1	0	0	0	0	0	19
34	Ordinary differential equations	8	6	3	1	0	0	0	0	0	18
73	Mechanics of solids	2	10	3	1	1	0	0	0	0	17
16	Associative rings and algebras	7	9	0	0	0	0	0	0	0	16
26	Real functions	9	5	0	0	0	0	0	0	0	14
94	Information and communication, circuits	10	2	1	0	0	0	0	0	0	13
14	Algebraic geometry	5	4	3	0	0	0	0	0	0	12
70	Mechanics of particles and systems	4	2	2	4	0	0	0	0	0	12
20	Group theory and generalizations	4	7	0	0	0	0	0	0	0	11
42	Fourier analysis	6	3	2	0	0	0	0	0	0	11
92	Biology and other natural sciences, behavioral sciences	4	3	4	0	0	0	0	0	0	11
15	Linear and multilinear algebra	3	5	0	1	0	0	0	0	0	9

Code	Subfield	A	B	C	D	E	F	G	H	I	Total
49	Calculus of variations and optimal control	7	2	0	0	0	0	0	0	0	9
82	Statistical mechanics, structure of matter	0	0	0	6	2	0	0	0	1	9
45	Integral equations	4	3	0	1	0	0	0	0	0	8
01	History and biography	5	2	0	0	0	0	0	0	0	7
39	Finite differences and functional equations	2	5	0	0	0	0	0	0	0	7
41	Approximations and expansions	4	3	0	0	0	0	0	0	0	7
04	Set theory	3	3	0	0	0	0	0	0	0	6
13	Commutative rings and algebras	4	1	0	1	0	0	0	0	0	6
32	Several complex variables and analytic spaces	4	1	0	0	1	0	0	0	0	6
52	Convex and discrete geometry	2	1	2	1	0	0	0	0	0	6
78	Optics electromagnetic theory	0	0	0	2	4	0	0	0	0	6
17	Non associative rings and algebras	2	0	1	2	0	0	0	0	0	5
44	Integral transforms operational calculus	5	0	0	0	0	0	0	0	0	5
53	Differential geometry	2	2	0	1	0	0	0	0	0	5
22	Topological groups, Lie groups	3	1	0	0	0	0	0	0	0	4
28	Measure and integration	2	2	0	0	0	0	0	0	0	4
03	Mathematical logic and foundations	1	0	2	0	0	0	0	0	0	3
40	Sequences, series, summability	3	0	0	0	0	0	0	0	0	3
43	Abstract harmonic analysis	2	1	0	0	0	0	0	0	0	3
51	Geometry	2	1	0	0	0	0	0	0	0	3
55	Algebraic topology	1	2	0	0	0	0	0	0	0	3
57	Manifolds and cell complexes	0	3	0	0	0	0	0	0	0	3
00	General	2	0	0	0	0	0	0	0	0	2
80	Classical thermodynamics, heat transfer	0	2	0	0	0	0	0	0	0	2
06	Order, lattices, ordered algebraic structures	1	0	0	0	0	0	0	0	0	1
12	Field theory and polynomials	0	1	0	0	0	0	0	0	0	1
19	K Theory	0	1	0	0	0	0	0	0	0	1
	Total	423	299	84	84	45	5	2	23	6	971

A = 0.00   D = 1.00 < 1.50   G = 3.00 < 3.50
B = 0.00 < 0.50   E = 1.50 < 2.00   H = 3.50 < 4.00
C = 0.50 < 1.00   F = 2.00 < 2.50   I = 6.00 < 6.50

Table 16. Distribution of Indian mathematical science papers by impact factor range of journals [based on impact factor data from _JCR 1997_]

IF range	No. of journals	No. of papers	No. of journals-94	No. of papers-94
0.00	112	325	192	713
0.00-0.50	89	299	100	384
0.50-1.00	35	84	35	104
1.00-1.50	18	84	11	44
1.50-2.00	12	45	9	41
2.00-2.50	3	5	2	5
2.50-3.00	0	0	1	2
3.00-3.50	1	2	2	14
3.50-4.00	2	23	1	8
4.00-4.50	0	0		
6.00-6.50	1	6		
6.50-7.00	0	0	1	6
Total	**273**	**873**	**354**	**1321**
Non journal items		**98**		
Grand total		**971**		

Table 17. Distribution of Indian papers by number of institutions in the byline

No. of institutions	No. of papers
1	647
2	275
3	43
4	6
Total	971

Table 18. Distribution of Indian papers by number of authors in the byline

No. of authors	No. of papers
1	274
2	475
3	183
4	37
5	2
Total	**971**

Table 19. Nations collaborating with India as seen from *MATHSCI* 1998

No.	Country	Country code	No. of papers
1	UNITED STATES	US	80
2	FRANCE	FR	21
3	GERMANY	DE	17
4	CANADA	CA	15
5	GREAT BRITAIN	GB	11
6	KOREA	KR	9
7	JAPAN	JP	8
8	SPAIN	ES	7
9	ITALY	IT	7
10	THE NETHERLANDS	NL	6
11	BELGIUM	BE	5
12	SOUTH AFRICA	ZA	5
13	FINLAND	FI	5
14	CHINA	CN	4
15	AUSTRALIA	AU	3
16	BANGLADESH	BD	3
17	BRAZIL	BR	3
18	EGYPT	EG	2
19	KAZAKHSTAN	KZ	2
20	RUSSIA	RU	2
21	SWEDEN	SE	2
22	JORDAN	JO	2
23	SINGAPORE	SG	2
24	ISRAEL	IL	1
25	KUWAIT	KW	1
26	MEXICO	MX	1
27	MALAYSIA	MY	1
28	TAIWAN	TW	1
29	SWITZERLAND	CH	1
30	HUNGARY	HU	1
31	IRELAND	IE	1
32	IRAQ.	IQ	1
33	OMAN	OM	1
34	SLOVAKIA	SK	1
35	NORWAY	NO	1
36	SLOVANIA	SI	1
Total No. of links			**234**

Table 20. Distribution of papers by number of nations in the byline

No. of collaborating nations (other than India)	No. of papers
0	759
1	191
2	20
3	1
Total	971

Table 21. Number of papers published by Indian institutions with and without collaboration

Institution	No. of single inst. papers	No. of coll. papers	No. of int. coll. papers	No. of domestic coll. papers
Indian Statistical Institute, Calcutta	42	29	13	16
Institute of Mathematical Sciences, Chennai	20	26	15	11
Indian Statistical Institute, New Delhi	11	25	21	4
Indian Institute of Science, Bangalore	25	36	20	16
Indian Institute of Technology, Kanpur	14	15	8	7
Tata Institute of Fundamental Research, Mumbai	41	26	13	13
University of Calcutta, Calcutta	12	11	3	8
Indian Institute of Technology, Madras, Chennai	24	11	7	4
Kalyan Mahavidyalaya, Bhilainagar	1	7	7	0
Jadavpur University, Calcutta	25	7	2	5
Bharathiar University, Coimbatore	2	6	6	0
University of Poona, Pune	10	6	3	3
Institute of Physics, Bhubaneswar	3	9	4	5
Aligarh Muslim University, Aligarh	8	10	7	3
Indian Institute of Technology, Delhi, New Delhi	9	6	2	4
Indian Institute of Technology, Kharagpur	27	12	10	2
University of North Bengal, Darjeeling	2	5	4	1
Janta College, Bakewar, Etawah	0	3	0	3
Shri Guru Teg Bahadur KhalsaCollege, Delhi	2	3	0	3
Indian Institute of Technology, Bombay, Mumbai	14	9	8	1
University of Roorkee, Roorkee	4	3	1	2
Utkal University, Bhubaneswar	1	3	1	2
Government College, Shahdol	1	2	0	2
Andhra University, Waltair	4	2	1	1
Annamalai University, Annamalainagar	4	2	0	2
Burdwan University, Burdwan	2	4	0	4
Indian Statistical Institute, Bangalore	10	9	5	4
Indian Statistical Institute, Chennai	0	2	0	2
Panjab University, Chandigarh	13	8	4	4
Pandit Ravishankar Shukla University, Raipur	0	3	3	0
Sardar Patel University, Vallabh Vidyanagar	6	3	0	3
M. L. Sukhadia University, Udaipur	1	2	2	0
Visva-Bharati University, Santiniketan	2	3	1	2
Mehta Research Institute, Allahabad	14	9	3	6
Vikram Sarabhai Space Centre, Trivandrum	1	2	0	2
S. N. Bose National Center for Basic Science, Calcutta	7	4	4	0
Institute of Advanced Study in Science And Technology, Gauhati	4	1	0	1
Bengal Engineering College, Howrah	0	1	1	0
Madras Christian College, Chennai	1	1	1	0
Malaviya Regional Engineering College, Jaipur	0	1	0	1
Visvesvaraya Regional College of Engineering, Nagpur	0	1	1	0

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Institution	No. of single inst. papers	No. of coll. papers	No. of int. coll. papers	No. of domestic coll. papers
St. Andrew's College, Gorakhpur	0	1	0	1
Mahatma Gandhi College, Ahmedpur	2	1	1	0
Madras University Post Graduate Center, Salem	3	1	1	0
St. Stephen's College, New Delhi	0	1	0	1
Willingdon College, Sangli	0	1	1	0
St. Xavier's College, Palayankottai	0	1	1	0
Zakir Husain College, New Delhi	1	2	1	1
Shri G. S. Institute of Technology and Science, Indore	2	1	0	1
Birsa Agricultural University, Ranchi	0	2	2	0
Birla Institute of Technology Mesra, Ranchi	0	1	0	1
Birla Institute of Technology and Science, Pilani	0	1	0	1
Agra University, Agra	0	1	0	1
University of Allahabad, Allahabad	0	1	1	0
Banaras Hindu University, Varanasi	11	1	0	1
Bharathidasan University, Tiruchirapalli	5	2	2	0
University of Delhi, New Delhi	18	8	0	8
University of Gorakhpur, Gorakhpur	2	2	0	2
Guru Nanak Dev University, Amritsar	2	1	0	1
Gauhati University, Gauhati	2	1	0	1
Hari Singh Gour University, Sagar	0	1	1	0
University of Hyderabad, Hyderabad	15	3	0	3
Indian Institute of Management, Calcutta	3	2	2	0
Jawaharlal Nehru University, New Delhi	1	1	0	1
Jai Narain Vyas University, Jodhpur	1	3	3	0
Karnatak University, Dharwad	4	1	1	0
Lucknow University, Lucknow	6	6	2	4
University of Madras, Chennai	7	3	2	1
Punjabi University, Patiala	3	1	0	1
Pondicherry University, Pondicherry	3	2	2	0
Rani Durgavati University, Jabalpur	2	1	0	1
University of Bombay, Mumbai	0	2	1	1
Vikram University, Ujjain	3	2	2	0
Indian Council of Agricultural Research, New Delhi	1	1	0	1
Department of Science and Technology, New Delhi	0	1	0	1
Indian Association for the Cultivation of Science, Calcutta	3	2	0	2
Saha Institute of Nuclear Physics, Calcutta	8	9	3	6
Christ Church College, Kanpur	0	3	0	3
Government Model Science College, Rewa	0	2	0	2
Jamia Millia Islamia, New Delhi	2	2	0	2
Ravenshaw College, Cuttack	0	2	0	2
Cochin University of Science and Technology, Cochin	10	2	0	2
Kurukshetra University, Kurukshetra	4	2	1	1
University of Rajasthan, Jaipur	3	2	1	1
Bhabha Atomic Research Centre, Mumbai	6	2	2	0
Government Engineering College, Jabalpur	2	1	0	1
Regional Engineering College, Srinagar	1	2	0	2
D.A.V. Post Graduate College, Dehra Dun	0	1	0	1
Faculty of Science, Baroda	0	1	1	0

Institution	No. of single inst. papers	No. of coll. papers	No. of int. coll. papers	No. of domestic coll. papers
Hans Raj College, New Delhi	1	1	0	1
Presidency College, Calcutta	0	1	0	1
R.K. Misson Residential College, Narendrapur	0	1	0	1
Tilak Dhari Post Graduate College, Jaunpur	0	1	0	1
Orissa University of Agriculture and Technology	0	1	1	0
Berhampur University, Berhampur	0	1	1	0
Bhavnagar University, Bhavnagar	1	1	0	1
Gujarat University, Ahmedabad,	1	1	0	1
Gurukula Kangri Vishwavidyalaya, Hardwar	0	1	1	0
Indian Institute of Management, Ahmedabad	1	1	1	0
Ranchi University, Ranchi	0	1	1	0
Sambalpur University, Burla, Sambalpur	3	1	0	1
SPIC Science Foundation, Chennai	3	1	0	1
Physical Research Laboratory, Ahmedabad	4	1	0	1

Table 22. Average impact factor of papers without collaboration and with domestic/ international collaboration for six institutions

Institution	Domestic	International	Single	All
Indian Statistical Institute, Calcutta	0.339	0.640	0.386	0.421
Tata Institute of Fundamental Res., Mumbai	0.994	1.112	0.636	0.798
Indian Institute of Science, Bangalore	0.425	0.277	0.388	0.361
Institute of Mathematical Sciences, Chennai	0.850	0.402	0.518	0.560
Indian Institute of Technology, Kharagpur	0.151	0.566	0.222	0.307
Indian Institute of Technology, Chennai	0.222	0.541	0.183	0.259

Table 23. Average impact factor of papers published by Indian institutions in collaboration with selected countries

Institution	US papers		France papers		Germany papers		Canada papers		Britain papers	
Indian Statistical Institute, Calcutta	0.612	6	0	0	0.607	4	0	1	1.446	1
Tata Institute of Fundamental Res., Mumbai	1.764	3	1.107	6	0.759	3	0	0	0	0
Indian Institute of Science, Bangalore	0.347	11	0	2	0	0	0	1	0.290	2
Institute of Mathematical Sciences, Chennai	0.550	5	0	2	0	0	0.249	1	0	1
Indian Institute of Technology, Kharagpur	0.735	5	0	0	0	0	0	0	0.313	3
Indian Institute of Technology, Chennai	0.339	1	0	0	0	1	0.339	1	0	0

Table 24. Distribution of collaborated papers by institution and IF of journals used

Institution	A	B	C	D	E	F	G	H	I	Total
Indian Institute of Science, Bangalore	14	16	2	2	2	0	0	0	0	36
Indian Statistical Institute, Calcutta	9	13	2	1	3	1	0	0	0	29
Institute of Mathematical Sciences, Chennai	12	6	1	2	4	0	0	0	1	26
Tata Institute of Fundamental Research, Mumbai	8	5	5	1	1	2	0	0	4	26
Indian Institute of Technology, Kharagpur	0	5	6	1	0	0	0	0	0	12
Indian Institute of Technology, Chennai	1	8	0	1	1	0	0	0	0	11
Total	44	53	16	8	11	3	0	0	5	140

A = 0.00   B = 0.00 < 0.50   C = 0.50 < 1.00   D = 1.00 < 1.50   E = 1.50 < 2.00
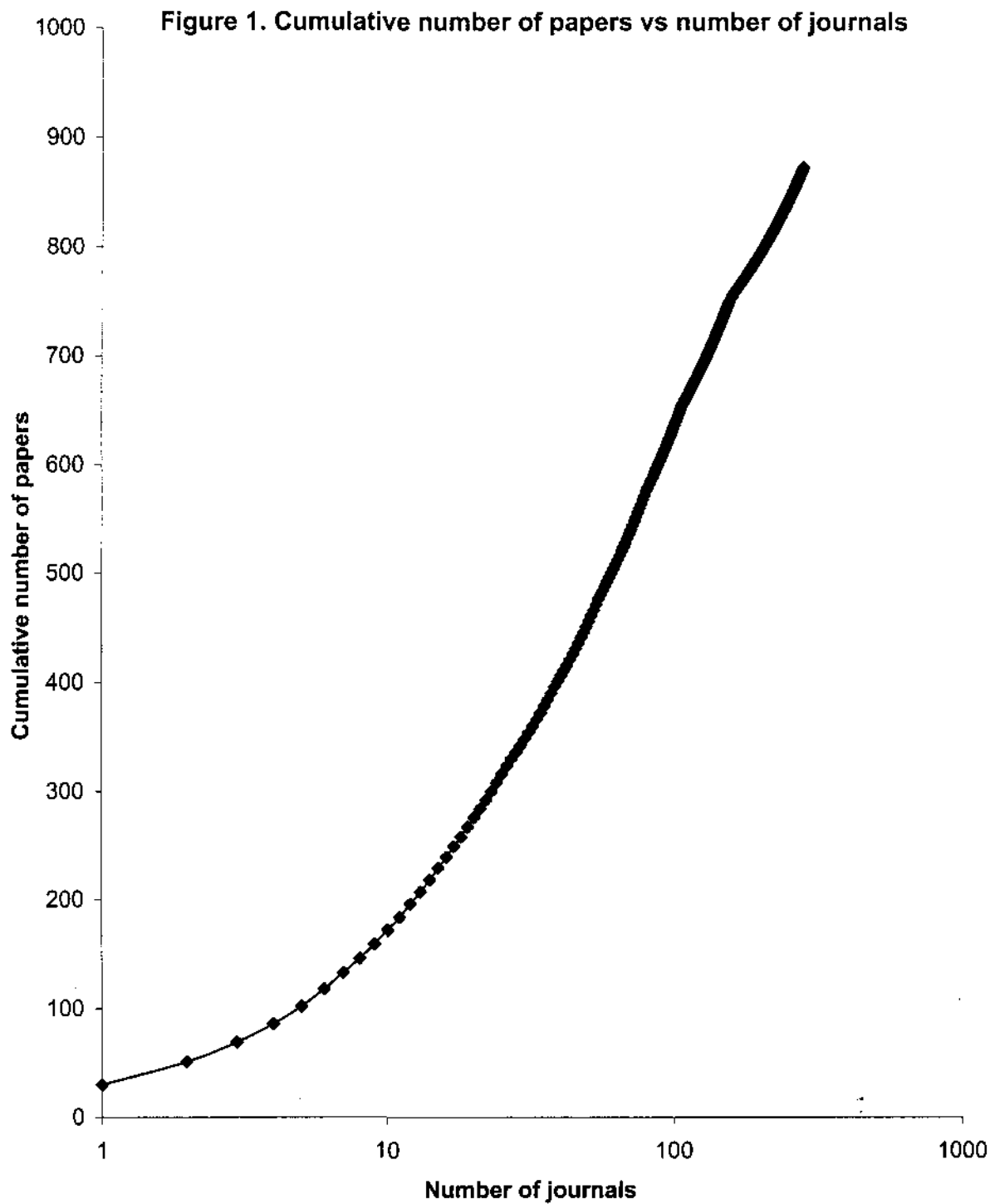F = 2.00 < 2.50   G = 2.50 < 3.00   H = 3.00 < 3.50   I = 3.50 < 4.00

FIGURES

Figure 1. Cumulative number of papers vs number of journals

Fig-1

Figure 2. Cumulative number of papers vs number of institutions
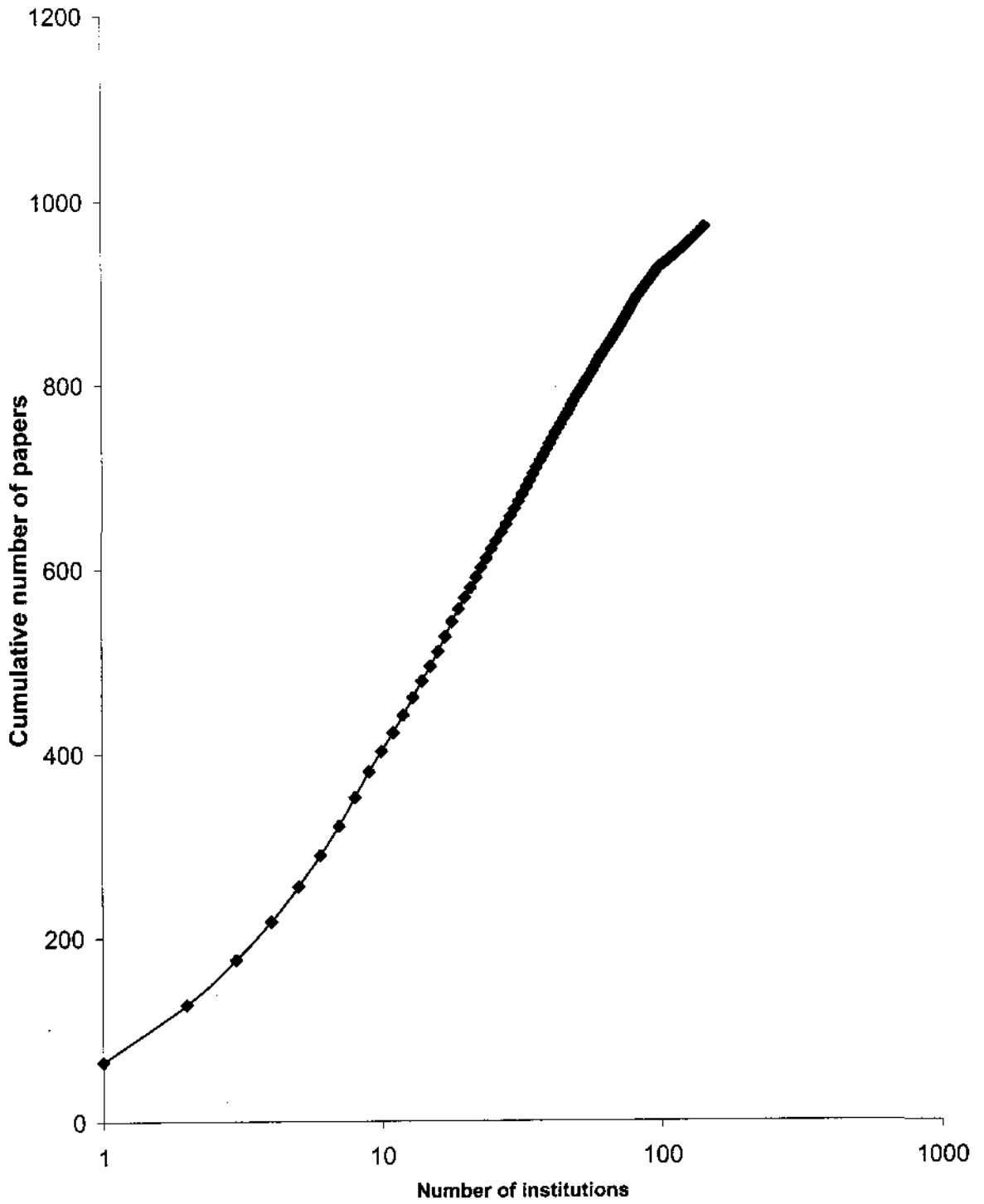
Fig-2

Figure 3. Contribution made by different types of organizations

General
Universities
70%

CSIR
1%

DOS
1%

DST
2%

Engineering
Colleges
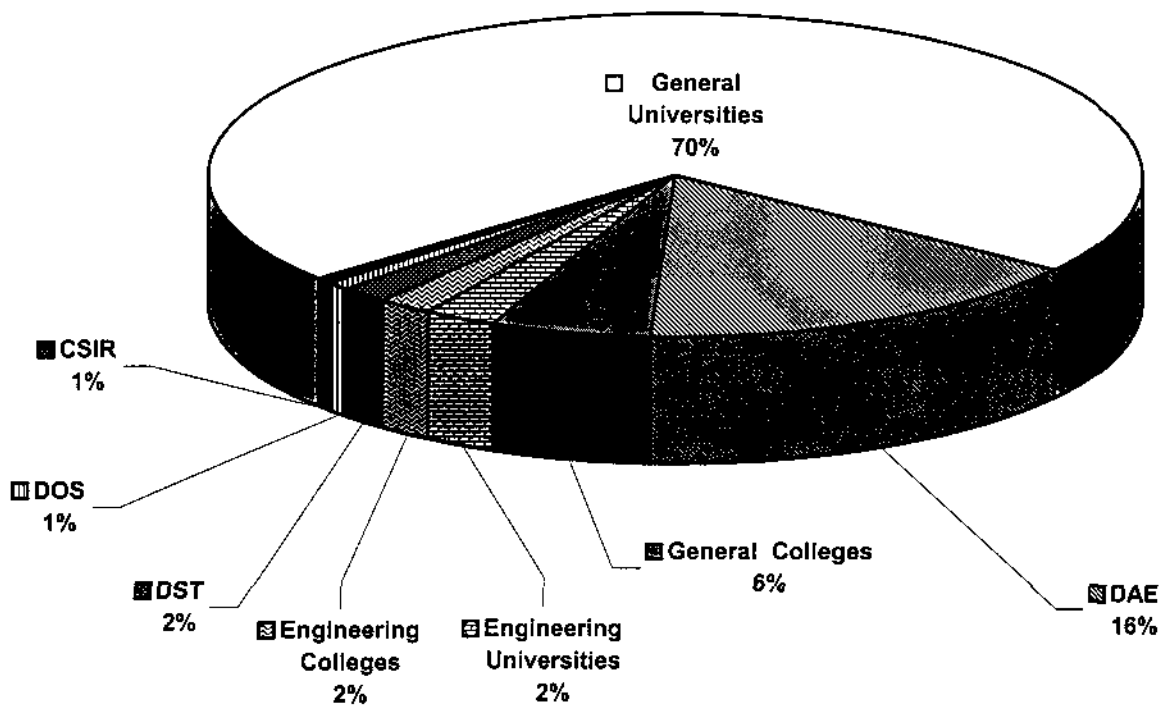2%

Engineering
Universities
2%

General Colleges
6%

DAE
16%

Fig-3

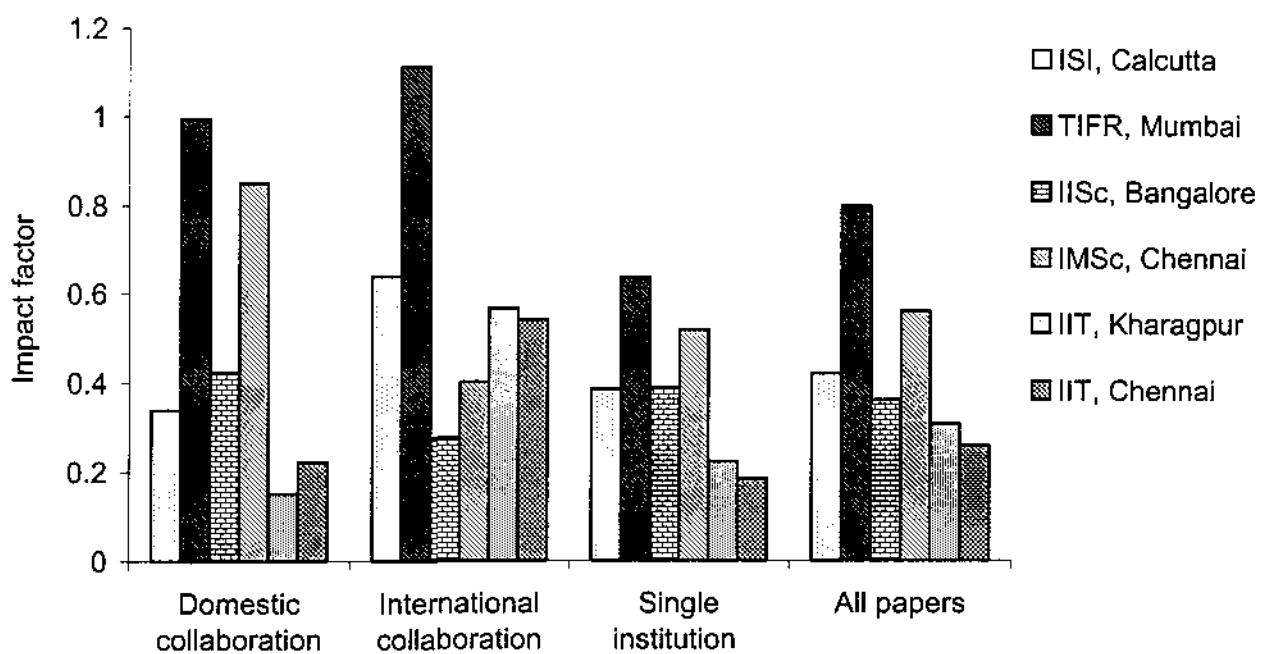Figure 4. Average IF of papers without collaboration and with domestic/ international collaboration for 6 institutions

Fig-4