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proceedings

PREFACE

Information science in general is concerned with generation and flow of information through various channels and its ultimate communication to the target audience. A thorough understanding of the subject requires knowledge about the various characteristics of generation of information, level of communication through which it moves, the barriers encountered in the process, approach of users and the mechanism to make information readily available to them. Bibliometry can play a positive role in this understanding.

Bibliometry as a subject is emerging fast within the field of information science. Scientific communication and bibliometrics are very much interlinked with each other and so the former plays a vital role in the development and progress of bibliometric research. Most of the empirical laws on the subject have been devised using the communication system as its experimental model. Thus to study bibliometry one needs to have thorough knowledge on various facets of scientific communication system. Besides the academic aspects, bibliometry has proved its worth in practical areas like selection of core journals, identification of significant contributions, development of a subject, trends of current research in a discipline etc. Hence it is desirable that working information personnel should have an exposure to the communication system and also current techniques of bibliometry. The main aims and objectives of this conference are to make working librarians and information scientists conversant about the practical usage of the technique of bibliometry along with communication sytem.

The Society for Information Science, India in recent times has taken sufficient interest in manpower development programme in the field of Information Science through its Annual Convention and Conference and number of training courses. Dr S C Pakrashi, FNA, Director, Indian Institute of Chemical Biology, who is a great admirer of library and information science, when appreached by the Society readily agreed to become the host of the Seventh Annual Convention and Conference of the Society. Shri T K Dutta, Scientist-in-Charge of Indian National Scientific Documentation Centre, when approached by Dr S C Pakrashi, readily agreed to corporate as a collaborator of the Conference. Dr S C Pakrashi, under his chairmanship formed a high power organising committee and sub-committees and extended his full administrative support to make the Conference a success. All members of these committees have worked hand-in-hand as a well-oiled machine. We have also received full cooperation from different sources within and outside the institute. I, on behalf of the Chairman and members of the Organising Committee, convey our grateful thanks to them.

(I N Sengupta)
Convenor
Seventh Annual SIS
Convention and Conference

Dated, Calcutta,
The 18th January, 1988.

CONTENTS

COLLABORATIVE RESEARCH IN DIFFERENT RESEARCH FRONTS OF GENETICS : A BIBLIOMETRIC STUDY

B.S. MAHESWARAPPA AND A. VINUTHA

Department of Library and Information Science
University of Mysore
Mysore

INTRODUCTION

Due to institutionalization and professionalization of science, almost every scientist of today, in contrast to the scientist of the past, works to a lesser or a greater degree, in collaboration with other scientific workers. Collaboration in research is said to have taken place "When two or more scientists work together on a scientific problem or project and contribute their effort - physical and intellectual"[1]. It can apparently be measured adequately from multiple authorship of papers. There has been much debate, over the extent to which the multiple authorship of papers reflects collaboration in research. Nevertheless, it has been considered as an unobtrusive indicator of collaboration in research. Meadows[2], Gooden[3] and Subramanyam[4] have reviewed the earlier studies in this area. Most of these studies either refer to the world science literature as a whole, or specifically to the literature produced in a country, or on a particular subject. It has been found from the earlier studies that collaboration in research varies from discipline to discipline, and for the same discipline from time to time and from one country to another. It has also been found to be influenced by a number of factors such as funding, use of large scale equipments, etc. The purpose of the present study is to determine the collaborative research in genetics as a whole and in different research fronts, specifically to see the variations among the different research fronts.

METHODOLOGY AND SAMPLE

Collection of data on collaborative research is a difficult problem. The basic reason is that "the extent of collaboration cannot be easily determined by traditional methods of survey and observation. The bibliometric methods offer a convenient and non-reactive tool for studying collaboration in research. Hence this method has been followed in the present study.

Authorship data in the different research fronts of genetics were collected from the 'Genetics Abstracts' for the calender years 1970,1975,1980 and 1985. Based on the data, the authorship pattern, average number of authors per paper and the degree of collaboration in genetics and in different research fronts were determined and analysed.

HYPOTHESIS

The following are the hypothesis of the study.

Null hypothesis I : There is no significant difference between pairs of research fronts as far as the proportions of single and multiauthored papers in genetics.

Null hypothesis II : There is no significant difference between the proportions of single and multiauthored

papers in research fronts of genetics*
as a function of time.

RESULTS AND DISCUSSION

Two author papers out number single author papers as well as paper with three, four and more authors and the proportions have changed over the years in favour of multiple authorship. Slightly less than 80 per cent of papers in genetics were multi-authored ones, while the single authored papers accounted for 21.36 per cent. The proportion of single and two authored papers have decreased over the years in favour of three and more authored papers. The percentage of single authored papers have decreased approximately by half, while the two-authored papers from 36.72 per cent in 1970 to 28.76 per cent in 1985. On the other hand, the percentage of three-, four-, five-, six-, seven and more authored papers have increased over the years. This provides an indirect clue to the increase in the size of the research teams over the years and it ranged from two to fourteen. The percentage of multiauthored papers have increased over the years from 70.8 per cent to 84.31 per cent. There is also a significant difference between proportions of single and multiauthored papers over the years (x^2 = 749.78). The average number of authors per paper has increased from 2.3 in 1970 to 3.13 in 1985, with an overall of 2.7 authors per paper. The corresponding figures

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.* Details of data will be presented and discussed in the conference.

for the degree of collaboration has increased from 0.70 to 0.84. On the whole, nearly 79 per cent of the papers in genetics were the result of collaborative efforts of scientists. Thus, a high degree of collaboration was found in genetics.

The proportion of single authored papers were maximum in four research fronts, two authored papers in fourteen reserch fronts and three authored papers in one research front. Thus, two authored papers were maximum in fourteen out of ninteen research fronts. More than 20 per cent of papers were three authored in ten research fronts. Slightly more than one-fourth of papers were by four and more authored in six research fronts. Highest proportion (80%) of multiauthored papers were found in nine research fronts and it ranged between 70 per cent to 79.9 per cent in three, 60 per cent to 69.9 per cent in three, 50 per cent to 69.9 per cent in one and less than 50 per cent and more than 40 per cent in three research fronts. Hence, the proportion of multiauthored papers considerably vary from one research front to another and so also the average number of authors per paper and the degree of collaboration, indicating the fact that the collaboration in research varies within the discipline/subject from one research front to another. The average number of authors and the degree of collaboration was found to be high in immunogenetics (3.42/0.90) and low in evolutionary genetics (1.62/0.40).

The data was further subjected to X^2 test to test the null hypothesis viz: there is no significant difference between pairs of research fronts as far as the proportions of single and multi-authored paper in genetics. Ninteen research fronts considered in the study gave rise to altogether 171 combinations. The calculated values of X^2 are compared with the table of X^2 distribution for 1 degree of freedom at 0.05 and 0.01 levels. The X^2 values fell within the significance level at 0.05 (3.81) and 0.01 (6.635) levels respectively in 22 pairs and 28 pairs. The X^2 values are found to be much greater than X^2 at 0.05 level in 149 pairs and at 0.01 level in 143 pairs. Therefore, the null hypothesis was rejected. Hence, there is a significant difference between pairs of research fronts as far as the proportions of single and multiauthored papers in genetics and because the calculated values of X^2 are so large, the difference must be highly significant. Since, the proportions of single and multiauthored papers varies from one research front to another, the collaboration in research also varies from one research front to another within the field of genetics.

The data was also subjected to X^2 test to test the null hypothesis viz: there is no significant difference between the proportions of single and multiauthored papers in research fronts of genetics as a function of time. The calculated X^2 values for each of research fronts are compared with the table of X^2 distribution for three degrees of freedom at 0.05 level. The X^2 values fell within the significance level at 0.05 (i.e. 7.815) in four research fronts, while in the remaining 15 research fronts the values were found to be much greater than X^2 at 0.05 level. Therefore, the null hypothesis was rejected. Hence, it was concluded that there is a significant difference between the proportions of single and multiauthored papers in majority of the research fronts (15 out of 19) over a period of time.

SUMMARY AND CONCLUSIONS

In brief, the following are the major findings of the study. Slightly less than 80 per cent of papers in genetics were multi-authored. Two author papers out number single author papers as well as papers with three, four and more authors and the proportions have changed over the years in favour of multipleauthorship. The average number of papers has increased from 2.3 to 3.13 and so also the degree of collaboration from 0.70 to 0.84. The two author papers were maximum in fourteen research fronts. Highest proportion (80%) of multiauthored papers were found in nine research fronts and it ranged between 70 to 79.9 per cent in three, 60 to 69.9 per cent in three and less than 50 per cent and more than 40 per cent in three research fronts. The average number of authors per paper and the degree of collaboration was found to be high in immuno-genetics and low in evolutionary genetics. There is a significant difference between pairs of research fronts as far as the proportions of single and multiauthored papers in genetics as indicated by X^2 test. Thus, indicating the fact that the collaboration in research varies from one r esearch front to another within a discipline. There is also a significant difference between the proportion of single and multiauthored papers in the majority of research fronts as a function of time. The findings of the study have some implications in planning and policy making in genetics research and also in planning more effective information services to accelerate research activities in genetics.

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A CITATION ANALYSIS OF DOCTORAL DISSERTATIONS IN CHEMISTRY

V.R. HIREMATH AND S.L. SANGAM**

Gulbarga University Library,
Karnataka

INTRODUCTION

Developing countries are faced with the immense challenge of organizing their resources and providing services in order to meet the expanding requirements of their societies. Education and libraries are synonymous in most developed countries but in three-quarters of the world, education is yet to be a universal reality. "Governments of poorer countries usually spend a fifth of their budgets"[1] on education and since this has often to be spent on basic infrastructures such as schools and vocational centres, little is left over for libraries which are considered an expansive luxury. Librarians in developing countries thus have, of necessdity, to work with limited budgets and this is reflected in the type and extent of services they can provide for their clientele.

This shrinking budget allocation, is not able to meet the rising prices of the reading materials, and inspired librarians to conduct documents use studies to determine collection development policies, which will make optimum use of money and space available while meeting the current and anticipated needs of library clientele

OBJECTIVES

The objectives of this study are to determine :

i) the main bibliographic forms ;

ii) the core journals ;

iii) the language, and the country of origin of the cited documents ;

iv) the obsolescence rate of literature ; and

v) the applicability of Bradford's Law of scattering to the Chemistry literature.

METHODOLOGY

Citation approach, the methodology chosen for this project, is based on the analysis of the foot-notes and the bibliographic references appended to thesis taken as the samples. The dates on foot-notes cited in the text and the data on the bibliographic entries listed at the end of each thesis were collected by means of a work sheet designed for this purpose.

Here a foot-notes entry and a bibliographic entry are considered as equal for the unit of count. Whenever a thesis makes references to a citation more than once either in the foot-note or in the bibliography the duplicates are considered as one. The analysis was done by studying the cumulative total of all the citations and their distribution across the bibliographic variables mentioned in the work sheet.

The Ph.D thesis in Chemistry accepted by the Gulbarga University, Gulbarga, during 1980-1985 are taken as the source of data for the present study. The total number of citations collected from 12 Ph.D thesis, from the basis of this study. The total number of citations is 4488.

ANALYSIS

Analysis of citations by form

The channels used to communicate research are many and varied. They may be formal or informal means of transmission. A total number of 4488 citations of 12 Ph.D theses are distributed among different sources as shown in table 1.

Table 1

FORM-WISE DISTRIBUTION OF CITED LITERATURE

Sl No	Form of literature	No of citations	Percentage
1	Journals	4,005	89.237
2	Books	318	7.085
3	Ph.D Theses	66	1.470
4	Conference proceedings	63	1.403
5	Patents	30	0.668
6	Reports	6	0.133
	Total	4,488	99.996

It was found that the journals are the major forms of media used with a citation count of 89.237% of the total literature used. The use of non-serial publications has been ralatively insignificant except for books(7.085%). The remaining 3.674% of the literature constitutes Ph.D theses, conference proceddings, patents and reports.

The relatively, high percentage of citations to periodicals and low percentage of citations to conference proceedings, reports, etc., tend to indicate that periodicals are the most preferred channel of information use. Patents citations are also found to be very low, though patents are accepted universally as an important source of information. According to Gorgin[2], most scientific and technological observations and developments are firstmade public in journals or patents. Liebesny[3] also observes that patent literature can be a very fruitful and useful source of technical and even legal information, whose value is, however rarely and not fully appreciated[4].

Analysis by place of publication

In the case of journal articles their place of publication was checked with Ulrich International Periodical directory. It is clear from the table No.2 that 56.639% of the literature cited from U.S.A. whereas India and U.K. are the next two countries each contributing 15.418% and 11.764% of literature respectively. Thus 83.821% of literature is cited from these three countries only. The remaining 18 countries are producing just 16.179% of the total literature.

It is observed that U.S.A., India and U.K. account for a large number of citations. This may be due to the fact that the Chemistry subject is a well developed and well organised and primary periodicals are coming out in these three countries, as a primary communication media in the area of Chemistry are very strong.

Table 2

COUNTRY-WISE DISTRIBUTION

Sl No	Country of origin	No. of citations	Percentage
1	U.S.A.	2,542	56.639
2	India	692	15.418
3	U.K.	528	11.764
4	Switzerland	123	2.740
5	W. Germany	99	2.205
6	Japan	84	1.871
7	Russia	75	1.671
8	Australia	69	1.537
;	Netherlands	63	1.403
10	Canada	43	0.958
11	Denmark	33	0.735
12	France	27	0.601
13	Romania	25	0.557
14	Hungary	21	0.467
15	Italy	18	0.401
16	Austria	12	0.267
17	Czechoslovakia	11	0.245
18	Poland	9	0.200
19	China	6	0.133
20	Israel	4	0.089
21	Pakistan	4	0.089

Analysis of citations by language

It is observed from the table 3 that the citations are mostly from sources in English. The percentage of English language sources is 92.045%. The citations for the other languages is quite negligible. It may be noted that English is the predominant language for the Chemistry scholars. Though the majority of the scholars are from the non-English speaking areas, but the citations are mostly from sources in English.

Table 3

DISTRIBUTION BY LANGUAGE

Sl No	Language	No of citations	Percentage
1	English	4,131	92.045
2	German	125	2.785
3	French	117	2.606
4	Russian	63	1.403
5	Japanese	27	0.601
6	Italian	14	0.311
7	Polish	9	0.200
8	Kannada	2	0.044

Table 4

RANKING OF PERIODICALS

Sl No	Rank No	Journal Title	No of citations	Percentage
1	1	Chemical Abstracts	977	24.394
2	2	J. of the chemical society,chemical communications	304	7.590
3	3	Indian Chemical Society Journal	264	6.591
4	4	Journal of Inorganic and Nuclear Chemistry	251	6.267
5	5	American Chemical Society Journal	225	5.617
6	6	Indian Journal of Chemistry Section A	189	4.719
7	7	Inorganic Chemistry	111	2.771
8	8	Indian Journal of Chemistry Section B	91	2.272
9	9	Spectrochemica Acta Part A	89	2.222
10	10	J. of Organic Chemistry	78	1.947
11	11	Inorganica Chemica Acta	69	1.722
12	12	J. of Karnatak University:Science	65	1.622
13	13	Australian Journal of Chemistry	61	1.523
14	14	J. of Heterocyclic Chemistry	61	1.523
15	15	J. of Medicinal Chemistry	60	1.498
16	16	Coordination Chemistry Review	55	1.373

Sl No	Rank No	Journal Title	No of citations	Percentage
17	16	Chemical Society of Japan Bulletin	40	0.998
18	17	Canadian Journal of Chemistry	38	0.948
19	18	Transition Metal Chemistry	30	0.749
20	18	Chemische Berichte	30	0.749
21	19	Tetrahedron letters	28	0.699
22	20	Current Science	27	0.674
23	21	J. of Chemical Physics	24	0.599
24	22	J. of Pharmacology and Experimental Thera- putics	23	0.574
25	23	Nature	22	0.549
26	24	Acta Chemica Scandinavica	21	0.524
27	25	Zhurnal Neorganicheskoi khimii	20	0.499
28	25	Inorganic and Nucl- ear Chemistry letters	20	0.499
29	25	Russian Journal of Inorganic Chemistry	20	0.499
30	25	Revue Romaine De chimie	20	0.499
31	26	Helvetico chimica Acta	18	0.499
32	27	Tetrahedron	16	0.399
33	28	J,of Pharmaceutical Sciences	15	0.374
34	28	Synthesis and Reac tivity in Inorga- nic and Metall- organic Chemistry	15	0.374
35	29	Acta chemica	14	0.349

Table 4 contd.

Sl No	Rank No	Journal Title	No of citations	Percentage
36	29	Zeitschrift fur anorganische und allgemeine chemie	14	0.349
37	29	Progressive Inorganic Chemistry	14	0.349
38	29	Chemical Reviews	14	0.349
39	30	Arzneimittelforchung/ Drug Research	13	0.324
40	30	J. of Physical Chemistry	13	0.324
41	31	Annal and Der chimi	12	0.299
42	31	Biochemical Pharmacology	12	0.299
43	31	Bulletin of Society of Chimiste of France	12	0.299
44	31	Chimica Therapeutica	12	0.299
45	31	J.of Biological Chemistry	12	0.299
46	31	Zhurnal obshcheikhimii	12	0.299
47	32	American Journal of Physiology	11	0.274
48	32	Biochemical Journal	11	0.274
49	32	New English Journal of Medicine	11	0.274
50	33	Chemical communications	10	0.249
51	33	J.of coordination Chemistry	10	0.249
52	33	Pharmaceutical Society of Japan,Journal	10	0.249
53	33	Experimentia	10	0.249
53	33	Total	3,604	89.962
148		(other titles each having less than ten citations)	401	9.991
201			4,005	99.953

Distribution of the citations by age

The table No.5 shows the distribution of citations to all types of documents (including books, theses, conference proceedings, reports) by the age of document is analysed.

It is indicated from the table that citations to recent papers are greater in number than citations to older papers. A major portion (88.991%) of citation are of 29 years age old. This age distribution reveals that a heavy dependence on recent Chemistry literature and that the dependence gradually decreases with an increase in the age of the publication.

Table No.5

AGE DISTRIBUTION OF THE CITATION DATA

Age old	Citations	Percentage	
0- 9	1,401	31.216	
10- 19	1,646	36.675	
20- 29	947	21.100	
30- 39	289	6.439	
40- 49	114	2.540	2
50- 59	44	0.980	
60- 69	12	0.267	
70- 79	8	0.178	
80- 89	5	0.111	
90- 99	12	0.267	
100-109	6	0.133	
110-119	2	0.044	
120-129	1	0.022	
130-134	1	0.022	

WEDDING POLICY

The librarian is faced with the problem of deciding on the matter of the optimum size of the document collection and back runs of the same, of ascertaining the utility of the old volumes and old editions etc. There is no direct measure available to him which would give a clear cutoff values in terms of age of the documents.

It is clear from the present study that Chemistry scholars cited 88.991% of the citations below 29 years old. Remaining 11.003% of the citations are of the 134 years old. Hence this 11.003% of the literature may be weeded out or it may be sent to the dormitory section.

CONCLUSION

The above study discloses the familiar pattern of concentration and dispersion of literature in the field of Chemistry. These ranked list may be used as a tool in evaluating the primary journals in the subject. The above study will help in the selective acquisition of periodicals. However the result of this analysis not only helps the librarian but also readers in selecting the periodicals more relevant to their field to keep themselves abreast with new developments in their specialisation. It is also useful in developing a core collection as well as compiling reading lists. However such studies may not prove to be conclusions but only guidelines.

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BIBLIOMETRIC STUDY OF LITERATURE ON MEDICINAL & AROMATIC PLANTS

S.D. PANWAR & H.C. JAIN

Publication & Information Directorate
New Delhi

An analysis of 8156 articles, abstracted from 519 journals taking Medicinal and Aromatic Plants Abstracts Vol.4 (1982), Vol.5 (1983) and Vol.6 (1984) as source. The analysis of ranking of journals reveals that 77.32% (i.e. 6326) entries are covered by first 100 journals and the rest of 22.41% (i.e. 1830) references are covered by the remaining 419 journals. Further analysis of sourcewise distribution of references shows that primary journals account for 87.28% references (citations), and non-serial publications (eg. books, monograms, reports, conference, proceedings etc.) account for remaining 12.72% coverage. A ranked list of first 100 journals from the main communication channels. With regard to scatter 60% of significant literature of medicinal and aromatic plants research is covered by the first 40 journals only and rest by 476 journals. Subjectweise analysis shows that phytochemistry accounts for 43.51% of literature on medicinal and aromatic plants. It emphasises the fact that major research is being done in natural products, pharmacology and toxicology of plants.

BIBLIOMETRIC STUDY OF LITERATURE PUBLISHED IN INDIAN JOURNAL OF NEMATOLOGY (1981-1986)

GIAN SINGH AND TAPAN MUKHERJEE

**Publication and Information Directorate,
New Delhi**

Nematology is an important discipline of plant pathology. Indian Journal of Nematology (I.J.N), started in 1971 (published twice a year by the Nematological Society of India, located at the Division of Nematology, IARI, New Delhi) is the only Indian journal totally devoted to the study of Nematodes. In order to study the characteristics of literature in nematology, the nature of work published in this journal has been analysed. The growth of literature (from 1981-1986) i.e. number of articles cited in these papers, average authorship of the articles published and number of institutions publishing papers in I.J.N. thereby showing active centres of nematode research have been investigated. An attempt will be made to find the core journals in this field and the subject-wise distribution of literature. During first ten years (1971-1980), 421 papers were published, while during next six years (1981-1986), 434 papers were published in this journal. The work published in I.J.N. emanated mainly from fifteen research institutes. The number of paers published shows a significant increase in 1985 and 1986.

CITATION ANALYSIS : CASE STUDY

NARINDER KUMAR

Reader-in-Library & Information Science
K.U.K.

Reports and evaluates four case studies supervised by the author based upon citation analysis of M. Phil dissertations submitted by four M.L.I.Sc. students assessing the compatibility of current periodical intake in the subjects of Economics, Education, History and Political Science in Kurukshetra University Library. In all the four cases the results had been encouraging for the library, as the current intake showed relevance to the subjects of study of the M.Phil. students. These positive indications are perhaps due to :

1) The subjects of dissertations might have been chosen keeping in view the available current library stock ;
2) The M.Phil dissertations attempts were delimited to the material available in the Kurukshetra University Library as the time and energy available at the disposal of the students is limited.

For an objective study citation analysis of Ph.D. dissertations both for current periodicals as well as available book-stock in various subjects shall provide a relatively objective assessment of the stock.

A BIBLIOMETRIC ANALYSIS OF A RESEARCH FIELD

S.C. SINHA
Library Officer, C.B.R.I., Roorkee

INTRODUCTION

Inspite of the tremendous importance of buildings in human life, building science as such as a discipline of scholarly activity has not yet crystalised as well as some of the hard sciences such as physics, chemistry and biology or even some narrow specialities like liquid crystals and electro-chemistry.

We present in Table given below 44 journals which contributed the most to the literature of building science in the period 1974-76. In this period there were 4,760 articles in Building Science Abstracts called from 484 journals. Apart from these articles, there were numerous papers presented in various conferences, as technical reports and current papers.

Table - 1

TABLE INDICATING THE NUMBER OF ARTICLES AND THE CUMULATIVE NUMBER IN THE CORE JOURNALS OF BUILDING SCIENCE (SOURCE BSA 1974-76)

Sl.No.	Title of Journals	Year 1974	1975	1976	Total	Cumulative Number
1	2	3	4	5	6	7
1.	J Geotechnical Engg. Div, ASCE Proc	17	35	118	170	170
2.	Cement & Concrete Research	66	63	28	157	327
3.	J Struct Div, ASCE Proc	33	43	67	143	470

1	2	3	4	5	6	7
4.	Bautechnik	1	71	21	93	563
5.	J of Sound Vib	20	18	48	86	649
6.	Bauingenieur	1	-	84	85	734
7.	Amer Concrete Inst J	36	15	33	84	818
8.	Internat J of Solids & Struct	44	7	25	76	894
9.	J Engg Mechanics Div, Proc ASCE	40	5	30	75	969
10.	Beton-uni Stahlbetonbau	2	38	22	62	1031
11.	Building	19	16	25	60	1091
12.	Applied Accoustics	10	15	33	58	1149
13.	Geotechnique	9	29	20	58	1207
14.	Architects' J	17	18	23	58	1265
15.	Structural Engineer	24	8	25	57	1322
16.	Build International	23	16	18	57	1379
17.	Transportation Research Record	23	18	15	56	1435
18.	Building Research & Practice	22	19	15	56	1491
19.	Forest Products J	-	34	19	53	1544
20.	Materiaux et Constructions	21	12	20	53	1597
21.	Stroitel'nys Materialy	2	9	42	53	1650
22.	Instn of Civil Engrs Proc Part 2	18	18	14	50	1700
23.	Indian Concrete J	20	12	14	46	1746
24.	Magezine of Concrete Research	14	18	13	45	1791

1	2	3	4	5	6	7
25.	Concrete	6	18	21	45	1836
26.	Building Services Engineer	9	17	19	45	1881
27.	Solar Energy	7	17	17	41	1922
28.	Soils and Foundations	11	19	10	40	1962
29.	Ashrae Journal	8	14	17	39	2001
30.	J of Materials Science	10	20	9	39	2040
31.	Betonwerk Und Fertigteil-Technik	9	14	15	38	2078
32.	Oil and Colour Chemists' Assoc J	11	15	10	36	2114
33.	J of the Acoustical Society of America	18	12	6	36	2150
34.	Canadian Geotechnical J	5	16	15	36	2186
35.	Building Science	9	17	9	35	2221
36.	Cement Wapno Gips	10	11	14	35	2256
37.	J Construction Div,ASCE Proc	16	6	12	34	2290
38.	Internat J For Numerical Methods in Engg	11	12	10	33	2323
39.	Acoustica	11	13	8	32	2355
40.	Water Power	1	10	20	31	2386
41.	Construction (DOE)	16	18	6	30	2416
42.	Baustoffindustrie	7	3	20	30	2446
43.	Beton	6	11	12	29	2475
44.	Bouw	11	7	11	29	2504

As is common in all branches of knowledge, the literature on building science also observes the Bradfords' Law of Scatter (Fig. 1) shown herein. More than ¼th of the literature appeared in 14 journals and the rest in 470 journals accounting for 50 percent.

As is seen from the table, the number of articles published in a year shows a good deal of fluctuation, for example J of Geotechnical Division, Proc ASCE and Beton-und Stablbetonbau.

Most journals appearing in the table seem to have very little that could be considered relevant to building science as seen from the very few entries in Building Science Abstracts. Only 44 journals have contributed to atleast 2504 articles to Building Science Abstracts over the three years period. Out of these 484 journals, 17 journals are covered by Source Citation Index. Out of these 17 journals only 8 belong to 44 most important building science journals.

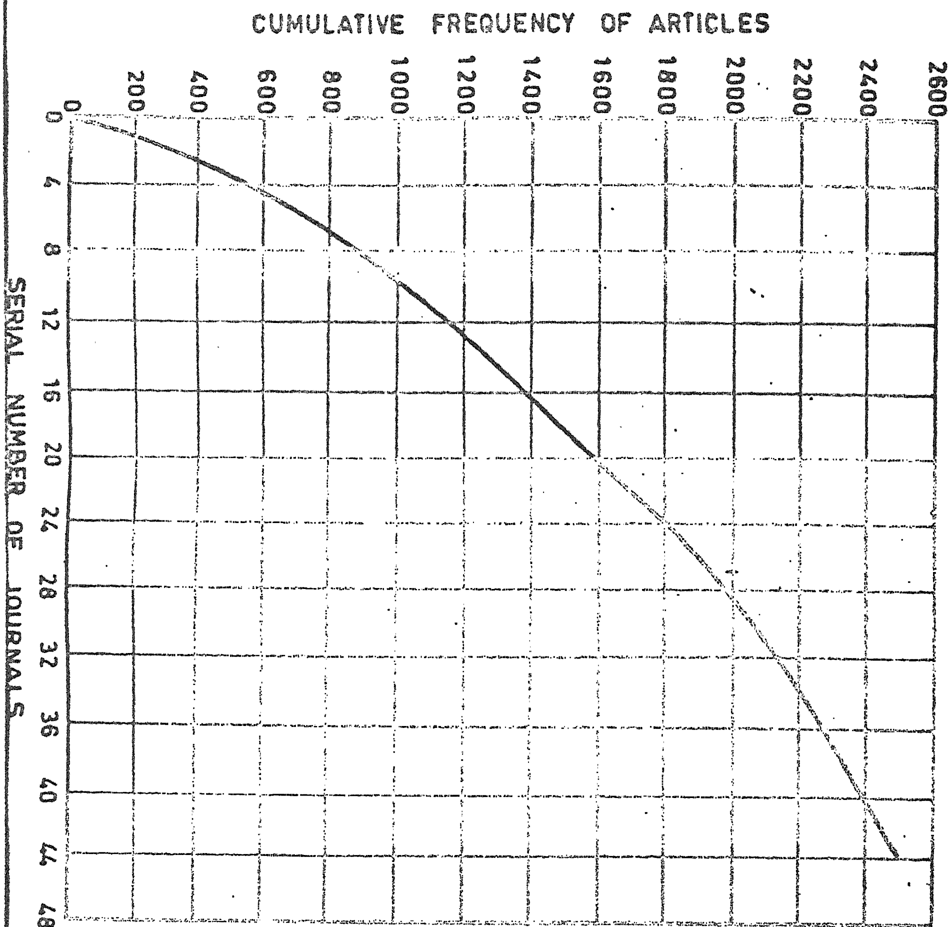
We were also interested to study the frequency and the number of articles published in 484 journals. The relationship has been given in the following table.

TABLE - 2

FREQUENCY FOR THE NUMBER OF ARTICLES PUBLISHED
(SOUCRCE BUILDING SCIENCE ABSTRACTS)

Sl.No.	Number of Articles	Journals	
		Number	Percentage
1	2	3	4
1	0-10	341	70.5

Bbl.27


CUMULATIVE FREQUENCY OF ARTICLES
0
200
400
600
800
1000
1200
1400
1600
1800
2000
2200
2400
2600
SERIAL NUMBER OF JOURNALS
0
4
8
12
16
20
24
28
32
36
40
44
48

1	2	3	4
2	10-20	74	15.2
3	20-30	26	5.3
4	30-40	15	3.1
5	40-50	6	1.2
6	50-60	11	2.3
7	60-70	2	0.4
8	70-80	2	0.4
9	80-90	3	0.7
10	90-100	1	0.2
11	100	3	0.7

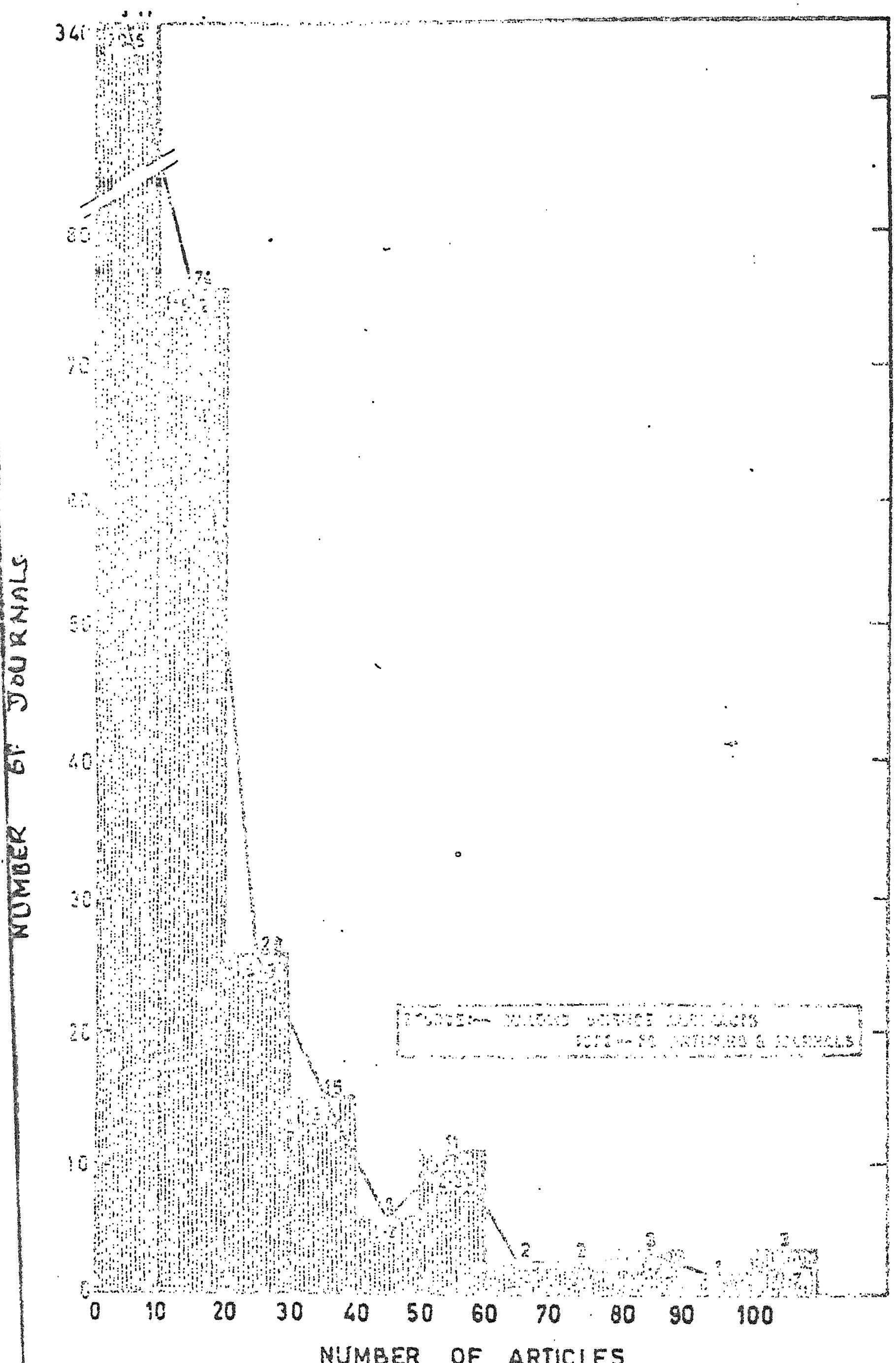
The above table indicates that the articles ranging from 0-10 are covered by 341 journals leading to 70.5 percent of literature. This is shown by the histogram appearing in this paper.

Let us see the mutual citation likeness amongst these eight journals.

TABLE - 3

TABLE SHOWNING THE CITED JR PACKAGE
(SOURCE SCI, JCT 1977)

Sl.No.	Cited Journal	Citing Journal	Total
1		3	4
1.	Acustica		550
		Acustica	161
		J Acoust Soc Am	119



.3 HISTOGRAM AND FREQUENCY POLYGON FOR ARTICLES PUBLISHED IN DIFFERENT JOURNALS

1	2	3	4
		J Sound Vib	40
		Sov Phys Acoust	9
		Biol Cybern	8
		J Appl Phys	8
		Indian J Pure Ap Phy	7
		Annu Rev Fluid Mech	6
		J Audio Engg Soc	6
		All others (97)	166
2.	Can Geotech J		102
		Can Geotech J	65
		Geotechnique	10
		Eng Geol	4
		Int J Solids Struct	3
		J Eng Mech ASCE	3
		Arch Mech	2
		All others (12)	15
3.	Geotechnique		281
		Geotechnique	118
		Can Geotech J	38
		Mar Geotechnol	24
		Eng Geol	10
		Arch Mech	9
		Philos T Roy Soc A	7
		Int J Rock Mech Mim	6
		All others (35)	69

1	2	3	4
4.	J Sound Vib		1110
		J Sound Vib	498
		J Acoust Soc Am	104
		ATAA J	50
		J Fluid Eng	37
		Acoustica	28
		J Fluid Mech	28
		Annu Rev Fluid Mech	25
		J Appl Mech-T ASME	25
		Sov Phys Acoust	18
		Int J Numer Meth Eng	14
		J Eng Mech ASCE	14
		All others (119)	209
5.	J Oil Colour Chem As		160
		J Oil Colour Chem As	51
		Prog Org Coat	23
		J Coating Technol	19
		J Sci Ind Res India	11
		Powder Technol	10
		Corrol Sci	5
		All others (32)	41
6.	J Struct Div ASCE		553
		J Struct Div ASCE	380
		J Eng Mech ASCE	54
		P I Civ Eng Pt 2	23
		Int J Number Meth Eng	13
		Forest Prod J	6
		ATAA J	8

1	2	3	4
		All others (340	72
7.	Mag Concrete Res		111
		J Struct Div ASCE	29
		Mag Concrete Res	17
		Concrete	8
		J Eng Mech ASCE	7
		I Civ Eng Pt 2	5
		J Mater Sci	4
		All others (40)	41
8.	Solar Engergy		385
		Sol Energy	202
		Int J Heat Mass Tran	25
		J Heat Trans-T ASME C	11
		Appl Optics	9
		Brennst-Warme-Kraft	8
		Energ Convers	7
		Science	8
		J Solid State Chem	7
		Photo Chem Photo Biol	7
		All others (57)	101

In order to suggest the core journal in the area of building science, it will be essential to see the journal ranking of the journals in the area of building science. We give below the table showing the journal ranking package having impact factor, citations, source items and immediately index.

TABLE - 4

JOURNAL RANKING PACKAGE

(SCI JCR - 1977)

Sl. Name of journals	Impact Factor	Citations in 1972-77 items	Source Item 1977	Immediacy Index
1. Acustics	0.555	15	85	0.176
2. Anti-Corros Method	0.008	0	62	0.0000
3. Can Geotech J	0.253	1	48	0.021
4. Eng Geol	0.054	1	15	0.067
5. Geotechnique	0.352	4	30	0.133
6. Ind J Technol	0.062	1	34	0.029
7. Int J Rock Mech	0.239	4	30	0.133
8. J Eng Mech ASCE	0.303	8	84	0.095
9. J Mater Sci	1.289	93	262	0.355
10. J Oil Colour Chem ASN	0.483	3	49	0.061
11. J Power Div ASCE	0.083	0	6	0.000
12. J Sound Vib	0.658	43	246	0.175
13. J Struct Div ASCE	0.424	12	176	0.068
14. Mag Concrete Res	0.153	1	19	0.053
15. Soil Sci	0.868	21	112	0.188
16. Sol Energy	1.104	9	134	0.067

From the above tables, it is observed that there is no journal citations line-ness amongst the building science journals.

As already mentioned, suggestions of the number of journals to be considered for the inclusion in SCI to give better coverage to building science field. Journals being received in Central Building Research Institute are ranked by various Head of the Divisions of the Institute. The main criterion of ranking was to rank these journals between 1-9, keeping the scope and utility of these journals in view.

We present below the list of journals which have been ranked between 9 and 8. 9 and 8 ranks stand for the journals which are excellent and very good. These journals are listed below alongwith their addresses:

TABLE - 5

LIST OF JOURNALS

Sl. No.	Name of Journal	Publisher's Address
1	2	3
1.	J ACI	American Concrete Institute, P.O. Box 19150, Detroit, Michigen 48219, U.S.A.
2.	Ashrae Journal	American Society of Heating Refrigerating and Airconditioning Engineering, Inc., 345 East, 47th St. New York, NY 10017, U.S.A.

1	2	3
3.	Ashrae Transactions	American Society of Heating Refrigerating and Airconditioning Engineering Inc., 345 East, 47th St. New York, NY 10017, U.S.A.
4.	Bautechnik	Verlag, Berlin, West Germany
5.	Bauingenieur	- do -
6.	Building Science	Pergamon Press, Headington Hill Hall, Oxford OX3 OBW.
7.	Built Environment	Kogen Page ltd., 120, Pentonville Road, London N1, England
8.	Cement and Concrete Research	Pergamon Press Ltd., Headington Hill Hall, Oxford, OX3 OBW, England
9.	Ekistics	Ikistics, Box 471, Athens, Greece
10.	Environment and Planning	PION Ltd., 207 Broneesbury Park, London, NW25JN, England
11.	Energy and Building	Elsevier Sequoia Sa. T, New York, U.S.A.
12.	Fire Technology	National Fire Protection Association, 470, Atlantic Ave, Boston, MA 02210
13.	Ground Engineering	Foundation Publications Ltd., 7, Ongar Road, Brentwood, Essex CM159AU, England
14.	IES Lighting Review	Illuminating Engineering Society of Australia, P.O. Box 4628, GPO Sydney, NSW 1001 Australia
15.	Indian Concrete Journal	Cement House, Bombay 400 020

1	2	3
16.	Journal of Fire and Flammability	Technomic Publishing Company, 265 West State Street, West Port, Connecticut 06880, U.S.A.
17.	Journal of the Geotechnical Engineering Division of ASCE	American Society of Civil Engineers 47th Street, 345 East, New York 10017, U.S.A.
18.	Journal of Indian Institute of Architect	Institute of Architect, Bombay 400 001
19.	Lighting Design and Application	Illuminating Engineering Society, 345 East, 17th Street, New York, NY 10017, U.S.A.
20.	Building Services	Illuminating Engineering Society, 49, Cadogen Sq., London SWIX OJB
21.	Building Research and Practice	International Council of Building Research and Documentation Studies, (CIB), Holland
22.	Lighting Research and Technology	Illuminating Engineering Society, 49, Cadogen Square, London, SWIX OJB, England
23.	Light-Technik	Richard Pflaum Verlag KG, 2 LA Zaretistr. 4, 8 Munich, West Germany
24.	Materials and Structures	DUNOD, 26, Boulevard DEL Hospital, 75005, Paris, France
25.	Soils and Foundations	Japanese Society of Soil Mechanics and Foundation Engineering, Toa Bekkaa Building, 13-5, 1 Chome, Nishi-Shinbashi, Minato-Ku, Tokyo, Japan
26.	Wood Science and Technology	Springer-Verlag, 175, Fifth Avenue, New York, NY 10010, U.S.A.

CONCLUSION

True, building science is not as coherent a corpus of knowledge as certain areas of physics, chemistry or biology and its literature is scattered over many journals most of them devoting only a minor fraction of the space available to the building science. Still it is surprising to say the least, that out of the top 44 journals only 8 have been covered by SCI. Thus, for individual and organisations devoted to building science research SCI will be of very little use.

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SCIENCE CITATION INDEX : AN EFFECTIVE TOOL FOR TRACKING SCIENTIFIC INFORMATION

I. N. SENGUPTA

Indian Institute of Chemical Biology
4, Raja S.C. Mullick Road,
Calcutta

ABSTRACT

Garfield considered citation analysis as an effective tool for tracking scientific information and for journal evaluation. It can interlink scientific papers and thereby establish network of scientific papers on identical subject. It provides methodology to rank scientific journals according to their relative degree of importance.

Referring to earlier communication at the end of scientif papers is a common practice since the beginning of the communication system through scientific periodicals which started with the inception of the first scientific periodical Journal des sanants as early as in 1665. Smith discussed elaborately on the applications, limitations and analysis of citations of scientific communications. There may be manifold reasons behind citing an earlier work in a scientific communication. Weinstock enumerated fifteen specific reasons for using citations in scientific papers.

By introducing the Science Citation Index (SCI) in 1964, Garfield has provided a new dimension to the concept of evaluation of scientific articles and indexing system as a whole. If the researchers have easy access to SCI or its machinereadable data base strenuous labour in wading manually through

thousands of references published in a group of source journals can be very elegantly and effectively avoided. In spite of some technical limitations of the SCI, it is undoubtedly considered as one of the most powerful tools for measuring values of information.

CITATION CHARACTERISTICS OF BIOMASS ENERGY LITERATURE

O.N. CHADDHA AND S.K. ARORA
INSDOC, New Delhi

INTRODUCTION

Concern with the state of scientific literature has increased considerably during the past few years because of an exponential development in its size and growth rate. So is true for literature in the new emerging field of Bio-energy. The institutions engaged in this area are expected to acquire and maintain document material relevant to their programs. Bio-energy encompasses a very wide field and there is always a constant pressure on the library budgets. It is really difficult for any library to develop a comprehensive collection of literature sources within the stipulated budget. Thus, it becomes essential to scrutinize the collection list thoroughly and judiciously. One has to restrict oneself per force to a core collection i.e. only those documents which have relatively high relevance to the subject of the collection.

Citation studies in several subjects have been undertaken both in India and abroad with a view to developing a core list of relevant publications. The information is collected from the list of references cited in bibliographies and also the foot notes of source articles which have substantive information. These citations are highly specific and by studying the average number of citations one can develop the list of unique cited journals i.e.

the journals in which the maximum number of literature is published.. In the present paper, an attempt has been made to study the structure of the information sources in Biomass energy. Thereby, a core list of publications for any libraryt could be developed.

Methodology

Many of the earlier studies for preparing the core list of journals have been done by conducting the citation analysis in one abstracting and indexing periodical or a primary periodical or a reviewing periodical. It is felt that the coverage of any such publication would be subjective to linguistic or national approach mostly. This attitude gets definitely reflected in the core list of publications thus developed. To overcome these anticipated disadvan tages, a combined citation analysis has been undertaken of an important abstracting periodical, international in character and a primary periodical. This has been selected on the basis of the outcome of the analysis of the abstracting periodical.

Source Journals

Biomass Abstracts is a well known international abstracting periodical in this field. It is brought out by IEA Biomass Conversion Technical Information Service, Dublin, Ireland. All the entries covered in the Vol 8 (1984) have been screened to sort out the entries related to Biomass energy.

The citation analysis of this periodical has shown that most of the Biomass energy literature is published in the Primary periodical Biomass. Close to it comes the ASAE Technical papers & Alternative Sources of Energy and Biotechnol Bioeng. The former two periodicals have not been taken for study because the articles in it are of a general and popular type and do not posses bibliographies at the end. The third one was not studied because of its non-availability. Biomass is a reputed journal brought out by Elsevier Applied Science Publishers, England. It has research articles and gives bibliographies at the end. Hence, this has been studied.

Citation Pattern

Abstracting Periodical :

The Vol.8 (eight) of Biomass Abstracts contains 4416 references. These were scanned to search the articles on Biomass energy and we could get 2616 such entries, which are 51.24% of the total entries. The break-up of these references is given in table 1. The maximum number of references (765) were published in primary periodicals.

Table 1

Dispersion of Biomass Energy Literature in Biomass Abstracts 1984.Vol.8

Type of Document	Number of references on Biomass energy	Percentage	Remarks
1 Journals	765	29.25	in 327
2 Proceedings of Seminars	695	26.56	individual
3 Reports	462	17.66	periodicals
4 Books	420	16.05	
5 Patents	216	8.25	
6 Theses	41	1.56	
7 Other Publications	17	00.65	
Total	2616	100.00	

Table 2

Citation Pattern of References in the Articles on Biomass Energy in the Journal Biomass 1984.

Type of Document	No of References	Percentage	Remarks
1 Journals	303	43.97	In 109
2 Proceedings of Seminars	90	13.06	Periodicals
3 Reports	128	18.57	
4 Books	111	16.12	
5 Patents	12	1.75	
6 Theses	8	1.16	
7 Other Publications	37	5.37	
Total	689	100%	

The total number of citations here are 689. Out of these, 43.97% of references are published in primary periodicals. The periodical literature is widely scattered here too and the periodicals which have published more than ten references are only 8. Next to periodical literature is reports (18.57%) and close to it are books (16.12%) and proceedings rank 4th (13. 6%). Citations of the patents (1.75%) and theses (1.16%) occupy a very low position in primary articles.

Ranking of Publications

Combined citation data obtained from the primary periodical (Biomass) as well as secondary periodical (Biomass Abstracts) is given in Table 3. On analyzing, it is found that the primary periodicals (32.32%) continue to dominate the scene. Proceedings of seminars (23.75%) come next to it and Reports rank 3rd (17.85%). Books citation rank 4th (16.06%) and Patents. The other publications like pamphlets, in-house documents, anouncements, etc rank 6th in the combined list (1.63%) but their coverage in the abstracting periodical is only 0.65%. This is too low when compared with their citation in the primary journal (5.37%). Theses rank 7th (1.48%), the lowest in the combined citation which may be due to its inaccessability, it being more or less a localized unpublished document.

Table 3

Ranking of Biomass Energy Publications in the Journal Biomass and Biomass Abstracts (1984).

Rank	Type of Documents	Total No of Cited references	Percentage
1	Journals	1068	32.32
2	Proceedings	785	23.75
3	Reports	590	17.86
4	Books	531	16.06
5	Patents	228	6.90
6	Others	54	1.63
7	Theses	49	1.48
Total		3305	100.00

Core Journals

Ranking of the journals list has been done on the basis of total citation frequency of journals in both the sources. The titles have been arranged in a decreasing order of the number of total citations which vary from maximum of 42 to a minimum of 1, but in the present list we have included only those periodicals which have total citations of 3 and above.

Rank	Journal Name	Citation Frequency in Biomass Abstracts	Biomass	Total Citations	Cumulative % of the Sources Citations
1	Biomass	28	14	42	5.71
2	ASAE Tech Pap	36	5	41	11.29
3	Biotechnol Bioeng	21	19	40	16.73
4	Altern Energy Sources	35	0	35	21.49
5	Science	7	23	30	25.57
6	Biotechnol Bioeng Symp	21	3	24	28.84
7	Econ Bot	3	15	18	31.29
8	Ind Eng, Chem Prod Des Dev	5	12	17	33.60
9	Agric Wastes	16	0	16	35.78
10.33	Energy Res	14	1	15	37.82
10.33	Process Biochem	2	13	15	39.86
10.33	Resour Conser	8	7	15	41.90
13	Energy Agric	14	0	14	43.80
14.5	Fbr Oroo J	8	5	13	45.57
14.5	Trans ASAE	11	2	13	47.34
16	Biotechnol Lett	4	8	12	48.97
17.5	Fbr Ind	11	0	11	50.47
17.5	Water Res	1	10	11	51.97
19.33	Appl Environ Microbiol	8	2	10	53.33
19.33	Indian Fbr	7	3	10	54.09
19.33	Phytochemistry	0	10	10	56.05
22.5	Energy (Oxford)	9	0	9	57.27
22.5	Tappi J	4	5	9	58.50
24	J AM Oil Chem Soc	4	4	8	59.59
25.2	Am Chem Soc, Div Pet Chem Prepr	7	0	7	60.54
25.2	Bio-energy Renews	7	0	7	61.49
25.2	Chem Eng J	6	1	7	62.44

25.2	Chem Eng Prog	2	5	7	63.40
25.2	Geogr J	7	0	7	64.35
30.2	Bio Science	1	5	6	65.17
30.2	Chem Eng News	2	4	6	65.98
30.2	Energy Technol (Washington DC)	6	0	6	66.80
30.2	Proc.Ind Acad Sci (Eng Sci)	6	0	6	67.61
30.2	WISS Umwelt	6	0	6	68.43
35.058	Agrologist	5	0	5	69.11
35.058	ASHAR Trans	5	0	5	69.79
35.058	LLZ Landtech Z	5	0	5	70.47
35.058	Energy Prog	5	0	5	71.15
35.058	Experientia	1	4	5	71.83
35.058	Eur J Appl Microbiol Biotechnol	5	0	5	72.51
35.058	Fuel	4	1	5	73.19
35.058	Int J Sol Energy	5	0	5	73.87
35.058	J Agric Food Chem	0	5	5	74.55
35.058	J Anal Appl Pyrolysis	5	0	5	75.23
35.053	J Chem Technol Biotechnol	3	2	5	75.91
35.058	J Ferment Technol	4	1	5	76.59
35.058	J Fbr	3	2	5	77.27
35.058	Munic J	5	0	5	77.95
35.058	S Afr Fbr J	5	0	5	78.63
35.058	Sonnenenergie Waerpumpe	5	0	5	79.31
35.058	Urja	5	0	5	80.00
52.066	Agartechnik	4	0	4	80.54
52.066	Bull Fbr Fbr Prod Res Inst japan	4	0	4	81.08
52.066	Can J Chem	4	0	4	81.63
52.066	Chem age India	2	2	4	82.17
52.066	Envir Sci Technol	1	3	4	82.72
52.066	Holz Rog-Werkst	4	0	4	83.26

52.066	Holz Zentralalalt	4	0	4	83.80
52.066	Landtechnik	4	0	4	84.35
52.066	North Logger Tinber Process	4	0	4	84.89
52.066	Proc Ind Waste Conf	4	0	4	85.44
52.066	Reg J Energy, Heat Mass Transfer	4	0	4	85.98
52.066	Res & Ind	2	2	4	86.53
52.066	Sol Energy	3	1	4	87.07
52.066	Sugar Y Azucar	2	2	4	87.61
52.066	Umwelt	4	0	4	88.16
67.034	Ambio	1	2	3	88.57
67.034	Am Chem J	3	0	3	88.97
67.034	Annals of Bot	0	3	3	89.38
67.034	Appropriate Technol	3	0	3	89.09
67.034	BioCycle	3	0	3	90.20
67.034	Calif Agric	0	3	3	90.61
67.034	Can Res	3	0	3	91.02
67.034	Chem Tech	2	1	3	91.42
67.034	Ecology	0	3	3	91.83
67.034	Food Technol	1	2	3	92.24
67.034	Fbr Ecol Manage	1	2	3	92.65
67.034	Fbr Sci	0	3	3	93.06
67.034	Holzforschung	3	0	3	93.46
67.034	Indian J Environ Hlth	3	0	3	93.87
67.034	Indian J Fbr	3	0	3	94.28
67.034	Interdiscip Sci Rev	1	2	3	94.69
67.034	J Agric Eng res	3	0	3	95.10
67.034	J Chromatogr	0	3	3	95.51
67.034	J Ecol	0	3	3	95.91
67.034	J Inst Engineers	3	0	3	96.32
67.034	J Sci Ind Res	3	0	3	96.73
67.034	Kagaku Kogaku	3	1	3	97.14
67.034	NSTA Technol J	3	0	3	97.55
67.034	NZ J Fbr Sci	2	1	3	97.95
67.034	Cleagineux	3	0	3	98.36
67.034	Process Chem Eng	2	1	3	98.77

67.034	Promoclim E	3	0	3	99.18
67.034	Unasylva	2	1	3	99.59
67.034	Zuckerindustrie	3	0	3	100.00
	Total 95 Periodicals	507	228	735	

Grand Total 382 Periodicals Total No of Citations 1068

From the table 4, it is evident that upto the 67th rank 95 periodicals titles are covered out a total of 382 cited periodicals. These 95 periodicals cover 735 citations out of a total of 1068 i.e. these periodicals show 7.7 citations per periodical. The rest 287 titles are cited in the rest 333 citations which show 1.16 citations per periodical which is a quite negligible figure and hence have been excluded in developing the core list. The percentage ranking of core periodicals here is also familiar to the Brandford scattering pattern. Further, it is observed that half of the citations (371 approx) are concentrated merely in 17 journal titles whereas half of the total journals (i.e. 47) contribute to 77.27% of the total citations. This statistics now gives a clear picture of the concentration and dispersion of primary periodicals in Biomass energy field.

Suggestions

Bioenergy has been in wide spread use and research in the last 3-4 decades, but there have not been many specific primary publications in this area. Because of its multi-disciplinary nature, the literature has been scattered in a wide range of periodicals. It is high time that few primary periodicals specifically devoted to Biomass energy are published.

The conferences continue to be a very valuable information source in their own right because they lead to establishment of a good network of personal contacts. It is quite evident from the coverage in the source periodicals that no library can afford to miss the core conferences too. Due to the limited resources it was not possible to do an active detailed citation analysis of conferences but it is worth undertaking before one goes for their collection.

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CITATION ANALYSIS OF COMMUNICATIONS OF ORGANIZATIONAL BEHAVIOUR RESEARCHERS IN INDIA : A RESEARCH PROPOSAL

ROSHAN RAINA

Indian Institute of Management
Lucknow

Organizational Behaviour (OB) is a social science with a strongly behavioural orientation. Its ambit is the study of the behaviour of organizations - the way they function, design themselves, choose goals and strategies, and seek to be effective in their environmental context (macro-OB) - and the study of the behaviour and effectiveness of persons and groups within the organization in the context of the structure, functioning choices, and effectiveness of the organization (macro-OB) 1.

The profession of librarianship is a problem oriented discipline where the working professionals daily face queries from their users based on practical problems. Ours is a fourth national level management institute established recently by the Govt. of India. The main aim of the Library of the institute (where I have been working for nearly three years, i.e., since its inception) is to act as its centre of learning resources to meet the information requirements of its various academic and research programmes. Out of the various disciplines in the field of management and relatede areas like operations research; computer science; statistics; economic ; sociology; marketing etc., the institute is actively engaged in the study and research in the area of "Organizational Behaviour Research". Also keeping in view the national and international level contributions to this branch of knowledge, we find that India has been one of the more active sites of OB research, with about a thousand publications to-date. In his survey of industrial psychology, Durganand Sinha[2] surveyed 272 writings from 1919 to 1969 in the two areas that broadly cover OB, "performance and jobs satisfaction" and "management and organizations". He reported that there were only 5 studies from 1919 to 1947; the rest of the studies were postindependance. His data suggests that an average of around 6 studies were annually published in the early fifties, and 19 in the late sixties. J.B.P. Sinha[3] in his survey of OB work during 1971-1976, located 317 references, an annual average of 53. Ganesh and Rangarajan[4] in their survey of OB work during 1970-79 located 456 references, an average of 45 per year. While the average was 29 per year during 1970-1975, it was 69 per year during 1976-1979, with 84 references in 1976. Currently the annual output of OB, Ph.D thesis, research based books, monographs and research papers may be around 70 nin the aggregate, between 5% to 10% of the global output[1].

All these facts and figures taken into consideration are suggestive of the fact that a good number of scientists are engaged in this branch of knowledge. This being so, I propose to take up a research project of studying the communications of these scientists to find out: (a) what these scientists cite and (b) who cite them?

But before doing so I would like to have the feed back/reaction of the expert members in the audience present in this special seminar on this kind of a research proposal. I am aware similar kind of studies have been made in the countries like US, UK.

The aim of the study being to :

i) trace the need and growth of this discipline particularly in India;

ii) ascertain the impact of the Indian contributions in meeting the desired objectives both at national and international level;

iii) identify gaps in the present studies and highlight areas of research for continuation/discontinuation;

iv) suggest new areas of research, if any, for futuristic study; and thereby

v) ascertain the information needs of this group of scientists and also to understand better how such needs can effectively be fulfilled.

Analysis of citations of these communications through various angles is the methodology, I intend to follow for the purpose of the proposed study. Citations are the author's references to previously recorded information used primarily for identifying how pertinent the earlier work is to the present work. Other reasons of using citations are as under[5]:

i) Paying homage to pioneers ;

ii) Giving credit for related work ;

iii) Identifying methodology, equipment, etc. ;

iv) Providing background reading ;

v) Correcting one's own work ;

vi) Correcting the works of others ;

vii) Criticising previous work ;

viii) Substantiating claims ;

ix) Altering researches to forthcoming work ;

x) Providing leads to poorly disseminated, poorly indexed for uncited work

xi) Authenticating data and classes of fact - physical constants, etc.

xii) Identifying the original publications in which all idea or concept was discussed ;

xiii) Identifying the original publication describing an eponymic concept or term, an eg. ; Hodghins' diserse, Pareto's Law, Friedel-Crafts Reaction.

Citation analysis spurted with the publication of the Science Citation Index in 1963. The index indicates the frequency with which papers by specific authors have been cited in the literature over time.

The same principles together with the context analysis of both citing (source) and cited (reference) documents of the communication's in the OBR in India may help us to achieve our goals.

However, following aspects need to be given serious consideration before taking up such a study :

i) Scope and coverage of the subject has to be well defined especially in the present set up where knowledge has no boundaries and there is mushrooming and overlapping of inter-disciplinary subjects;

ii) Easy accessibility to the literature on the subject would facilitate speedy research ;

iii) Easy accessibility of the cited documents in the literature at (ii) would help in proper and speed understanding of the growth of the subject and so on ; and

iv) Availability of expertize to interpret the contexts in which citation have been used, in the literature, over a period of time would help in arriving at conclusion, findings, etc.

Once the methodology is found appropriate to arrive at the desired results, it can be applied to other areas of knowledge. In the long run, once there are no duplication of efforts, effective and meaningful researches are conducted, We are bound to achieve our goal of utilizing our resources properly.

The work would be divided into three parts. First part would give a brief review of OBR in India giving an exhaustive bibliography of all the literature in this area. Part two would analyse the citations from various angles of all these publications to arrive at the desired objectives. Part three would provide a model plan for OBR in India.

The tentative design would be as under :

Chapter one would deal with the concept, characteristics and importance of OBR.

Chapter two would provide a brief historical account of OBR in general with special reference to India.

Chapter three would review the Indian literature in the field of OBR and will be appended by an exhaustive bibliography on the subject.

Chapter four would analyse the citations of all these source documents to indicate the comparative usage of the various modes of communication.

Chapter five would analyse the citations to trace the growth of this discipline particularly in our country.

Chapter six would analyse the citations to suggest the impact of the works done in this country over the works done elsewhere. Co-relation among the works carried out in the country and the usage of foreign sources will be another area that will be discussed in this chapter.

Chapter seven would be devoted to the citation context analysis.

Chapter eight would provide a model plan for communication in the area of OBR.

Chapter nine would give conclusions and proposals.

Appendices, a bibliography, and an index would be included in the thesis.

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INDIAN SCIENTIFIC PERIODICALS : A BIBLIOMETRIC STUDY BASED ON SCI (1984)

VED BHUSAN KOCHHAR and NARENDRA KUMAR
I N S D O C, New Delhi

INTRODUCTION

Wide application of bibliometric techniques in the library and information fields, such as the identification of core journals in specific disciplines to formulate need-based acquisition policies in libraries, quantification (viz. citation analysis) of research and growth of literature in different scientific and technical subjects, as well as, identification of authorship and users of literature in different subjects, has aroused tremendous interest among information speialists in India. More work is being done on the subject so much so that the Insdoc has taken upon itself a bibliometric study project.

Periodicals are regarded as an important communication channel for the dissemination of research in information and are indispensable for scientists engaged in research and develoopment and/or teaching activities. According to an estimate about 55000 scientific periodicals are currently being published in the world, including about 2000 periodicals from India. But not all these journals are really contributing relevant knowledge to the world's literature. An important criteria to evaluate a journal is to study its citation pattern. In other words one has to look for the number of times articles in the journal gets cited in the international journal literature and covered by the secondary journals the world over, notwithstanding the bias against developing countries and language barrier by the latter.

SCI as an International Scientific Information Tool

The SCI is a bimonthly publication with quite a comprehensive coverage of scientific literaturte. Started in 1961 with 613 selected journals, the SCI is the only regularly published index in science and technology now covering about 3281 primary journals being published the world over. The SCI provides a base for (i) studying the important characteristics features of scientific literature, (ii) undertaking studies in citation behaviour of literature pertaining to the history and sociology of science, and (iii) conducting research activities in the field of documentation and information science.

Indian Scientific Periodicals

India has made a significant progress in publishing Scientific journals science the publication of the first scientific journals, 'Asiatic Researches' in 1788, published by the Royal Asiatic Society of Bengal. Before India's independence in 1947 there were only a few Indian Science journals and their number had been growing steadily. The number has, however, increased rapidly since 1947 and is currently estimated at around 2000. On the growth of Indian Scientific Periodicals, Kesavan's observation thus sums up the

TABLE I

Growth of Scientific Periodicals from 1900 onwards (*World & Indian**)

World Periodicals			Indian Periodicals		
Period	No. of titles	Average No. of new title year	Period	No. of title	Average No. of new title year
1900-1920	25000	-	1900-1920	46	-
1900-1934	36000	786	1900-1940	109	3
1900-1953	50000	737	-	-	-
1900-1965	60000	833	1900-1960	474	27
1900-1975	75000	1500	1900-1968	797	40
-	-	-	1900-1976	1292	62
Rate of growth is 200% for the duration of 54 years ending 1975			Rate of growth is 264% for the duration of 54 years ending 1975		

* World list of scientific periodicals is taken as a source for world science periodicals.

** CSIR technical Report No.10 & INSDOC Directories are taken as a source for Indian Science Periodicals.

scene in the introduction to the second edition of the Directory of Indian Scientific Periodicals; 'the first eight years after independence show a steady but somewhat limited growth of periodicals, the annual addition being in the range of 15-25. After 1955 the growth was somewhat steeper and 1964 recorded the spurt of 65 new periodicals in a year.

TABLE II

GROWTH OF INDIAN SCIENTIFIC PERIODICALS 1820-1981.*

Sl. No.	Year	Periodicals at the end of year
1	1820	2
2	1850	8
3	1900	31
4	1920	77
5	1940	140
6	1947	175
7	1950	233
8	1955	312
9	1960	505
10	1964	607
11	1968	828
12	1976	1323
13	1981	1892

* Data from 1820-1960 are taken from CSIR, RPSO survey report No.10 and from 1964-81 are from INSDOC data based that includes the Directories of Indian Scientific Periodicals 1964, 1968 and 1976 and the Union List of Current Scientific Periodicals in India 1982.

*This data does not includes annual reports, house journals, news letters with research papers, bibliographical and abstracting journals.

Analysis

The break-up of the sponsoring agencies of Indian Science journals covered by SCI 1984 into four categories shows that the research societies/associations are major contributors towards active research work that has been published in their respective journals. Following this is the category of the government-aided autonomous institutions, like the CSIR, ICMR and ICAR. Publishers community, unlike their western counterpart, take the back seat as a sponsoring body.

TABLE III

Coverage of Science Journals Institutionwise

Sl.No.	Sponsoring Agencies	Number of Agencies/Institution
1	Research Societies/ associations	11
2	Govt organisations and autonomous bodies	9
3	Academic Institutions/ organisations	2
4	Private bodies & publishers	1

The table IV gives details about the year of origin, publishing agency, periodicity and SCI subject category for 22 Indian journals. As is obvious, two of these journals, like 'Nature' are multidisciplinary, namely 'Current Science and Indian Journal of Scientific & Industrial Research. All other 20 journals are devoted to the subjects reflected in their respective titles. Total number of subject headings listed in the SCI (1984) count at 186 and see references category numbering is 128, out of which Indian journals cover only 20 subject categories.

TABLE IV

Subjectwise coverage of Indian Science Journals

Sl.No.	Journal	Year of origin	Publishing organisation	Periodicity	SCI's subject categories
1	Comparative physiology & Ecology	1976	Premier Publications, Jodhpur	Qtrly	Physiology, Ecology
2	Current Sci	1938	Current Sci. Association, Bangalore	Fortnightly	Multidisciplinary Sciences
3	Entomon	1975	Assoc. for advancement of Entomology, Kerala Univ., Trivandrum	Qtrly	Entomology
4	Indian Jr. of Animal Sci.,	1931	Indian Council of Med.Res.		
5	Indian Jr. of Biochemistrty Biophysics	1964	Publications & & Information CSIR,New Delhi	Bimonthly	Biochem & Molecular Biology Bio-Physics
6	Indian Jr. of	1976	-do-	Monthly	Chemistry
7	Indian Jr. of chem.,Sec.B	1976	-do-	Monthly	Chem.Organic
8	Indian Jr. of Expt,.Biology	1963	-do-	Monthly	Biology
9	Indian Jr. of Med.Res.	1922	Indian Council of Med.Res. New Delhi	Monthly	Med.General and Internal
10	Indian Jr. of Pure & Applied Maths	1970	Indian Natl.Sci Sci.Academy, N.Delhi	Monthly	Mathematics
11	Indian J of Pure & Appl. Phys.	1963	PID,N.Delhi	Monthly	Physics
12	Indian J of Radio & space	1972	-do-	Bimonth	Astronomy & astro Physics Meterology Atomo.Sci.

13	Indian Veterinary Journal	1924	IVA Avenue Road,Madras	Monthly	Verteinary Medicine
14	J of astrophysics & Astronomy	1980	I.A.Sc, Bangalore	Qtrlty	Astronomy & Astrophyysics
15	J of Bio-Sci	1979	I.A.Sc, Bangalore	Qtrly	Biology,Microbiology
16	J of Geolo Soc.of India	1959	Geol Sco.of India,Bangalore	Monthly	Geology
17	J of Indian chem.Socy	1924	Indian Chem Soc.	Monthly	Chemistry
18	J of Sci & Ind.Res.	1942	PID,N.Delhi	Monthly	Multidisciplinary Sci.,
19	Pramna	1973	I.A.Sci Bangalore	Monthly	Physics
20	Proceeding of I.A.Sci.,Anim Sci(Animal)	1934-35			Zoology
21	Proceeding of I.A.Sci., Chem.Sci,	-do-	I.A.Sci.,Bangalore		Chemistry
22	Proceeding of I.A.Sci., Earth & Planetory Sci.	-do-	-do-		Geosciences
23	Proceeding of I.A.Sci., Mathematical Sci.,	-do-	-do-		Maths

Citation Pattern

Citation pattern of Indian Scientific Journals and their impact on the international scientific periodical literature can be better studied under the following three headings.

Who cite the Indian literature : In an early study the authors[3] have pointed out that about 95% literature in Indian journals is being contributed by Indian scientists and the remaining 5% by the foreign scientists, thereby highlighting the fact that Indian journals are publishing results of Indian scientific research. Citation analysis of the SCI (1984) indicates that 10548 citations in 22 Indian journals were recorded from the coverage of the SCI literature, but only 7115 citations published in 268 journals originating from 35 different countries have been given since names of citing journals of remaining citations have not be given by the SCI. India tops the list of countries who cite the Indian literature with 4094 citations (57.54%).

Ranking of Indian Journals : among world scientific journals covered by the SCI (1984) Table No.IV. For the purpose of ranking of journals, their coverage, Impact factor and immediacy index (II) have been considered.

a) **Coverage :** From among 3281 world Science journals covered by the SCI (1984) the 'Journal of Indian chemical Society' ranks high at no.792 and tops the list of 22 Indian journals with maximum coverage of 1616 citations appearing in world science journals, followed by the Indian Journal of Medical Research (1158), current science (1153), Indian journal of chemistry-Sec.B (1119) and the Indian Journal of Chemistry Sec.A (1057) and so on.

b) **Impact Factor :** is a measure of frequency with which the average article in a journal has been cited in a particular year. The JCR, Impact factor is basically the ratio between citations and citable items published. The highest impact factor has been observed for the Annual Review of Biochemistry as 29,400. Compared to this Indian journals stand no where when we look to the scientific journals from the developed countries. We see that journal of Biosciences tops with Impact Factor of 0.538 among the Indian journals, followed by the Indian Journal of Chemistry Sec.B with an IF 0.432, Pramna with an IF 0.402 and Indian Journal of chemistry Sec.A with an IF 0.339.

c) **Immediacy Index** : is a measure of how quickly the average article in a particular journal is cited. A journal Immediacy Index considered citations made during the year in which the cited items were published. The highest Immediacy Index for 'Astrophysics Letters' has been observed as 8.875, which stands much higher than that for any Indian journal.Indian journal of chemistry Sec-B comes at the top with Immediacy Index as 0.141, followed by the Indian journal of Biochemistry and Biophysics with II as 0.123, Indian journal of Medical Research with 0.122 and pramna with 0.101.

Self-citation rate of Indian Journals (Table VI) : It is expressed as a percentage of all citations. Two types of citation rates are in vogue: the self-citing rate relates a journals self citations to the total references it makes, whereas the self-cited rate relates a journal's self-citations to the number of times it is cited by all journals including itself. The following table gives figures for the two type of self-citation rates for Indian journals covered by the SCI (91984). An imp0ortant significances of this is that a high self-citation rate is likely to mean that the subject field of the journals is small or isolated e.g. Indian Journal of Animal Sciencess and Indian Veterinary Journal etc., Multi-disciplinary journal (like journal of Scientific & Industrial Research, Current Science) and those which cover many aspects of their subject field (like Entomon) tend to have low self-citation rate.

TABLE V

Ranking of Indian Journals Among World Scientific Journal In the S.C.I.

Sl. No.	Source Journals	Number of Times cited		Impact Factor		Immediacy Index	
		Citations	Rank No out of 4150	Impact Factor	Rank No. out of 3910	Immediacy	Rank No out of 3316
1	Comparative physiology and Ecology	75	3351	0.132	3394	0.041	2937
2	Current Science	1153	1012	0.180	3224	0.043	2904
3	Entomon	48	3596	0.077	3626	0.000	3316
4	Indian J of Anim Sci	413	1934	0.095	3535	0.021	3194
5	Ind J of Biochem & Biophys	365	2C72	0.332	2639	0.123	2103
6	Ind J of Chem. Sec A	1057	1086	0.339	2603	0.027	3111
7	Ind J of chem. Sec.B	1119	1043	0.432	2313	0.141	1948
8	Ind J of Exptl Biol	933	1171	0.270	2888	0.092	2363
9	Ind J of Medical Res.	1158	1005	0.249	2965	0.122	2108
10	Ind J of Pure & Appl Maths	118	3055	0.090	3560	0.031	3053
11	Ind J of Pure Appl Phys	750	1345	0.182	3214	0.046	2880
12	Ind J of Radio & Space	52	3569	0.131	3399	0.000	3316
13	Indian veterinary Journal	567	1608	0.071	3652	0.008	3297
14	Journal of astrophysics & Astronomy	-	-	-	-	-	-
15	Journal of Biosciences	103	3154	0.538	2036	0.060	2719
16	Journal of geo Soc. of India	311	2234	0.342	2590	0.095	2330
17	Journal of Ind.Chem.Soc	1616	792	0.226	3053	0.026	3118
18	Journal of Scientific & Indl Res.	212	2616	0.191	3179	0.050	2834
19	Pramna	334	2164	0.402	2413	0.101	2270
20	Proc.of Ind.Acad.Sci Anim. Sci	52	3569	0.178	3232	0.026	3118
21	Proc.of I.A.Sci. Chem Sci.	76	3342	0.241	2993	0.063	2678
22	Proc of I.A.Sci-Earth & Plane Sci	31	3762	0.218	3082	0.000	3316
23	Proc. of I.A.Cci-Math Sci	5	4069	0.000	3910	-	-

TABLE VI

Self Citation Rate of Indian Journals

Sl.No.	Title of Journal	Self-citing	Self-cited Rate
1	Comparative Physiology & Ecology	2.86	32.00%
2	Current Science	3.18	14.57%
3	Entomon	2.32	3.34%
4	Indian Journal of animal Sci	6.09	13.58%
5	Indian Journal of Bio-chem & Bio-Phys	3.75	14.24%
6	Indian Journal of chem. Sec.A	5.20	21.00%
7	Indian Journal of chem, Sec.B	12.69	45.12%
8	Indian Journal of Experimental Biology	4.16	13.49%
9	Indian Journal of Medical Research	8.29	28.84%
10	Indian Journal of Pure & Appl Maths	4.82	55.93%
11	Indian Journal of Pure & Appl.Physics	6.53	21.60%
12	Indian Journal of Radio & space	4.95	38.46%
13	Indian Veterinary Journal	10.38	45.14%
*14	JournaL OF Astrophysics & Astronomy	-	-
15	Journal of Biosciences	0.70	13.59%
16	Journal of Geological Soc. India	7.66	31.51%
17	Journal of Indian Chem.Society	8.13	14.72%
18	Journal of Scientific & Industrial Res.	0.41	8.09%
19	Pramna	2.30	19.46%
20	PIAS-Animal Science	1.27	51.92%
21	PIAS-Chemical Science	0.49	25.00%
22	PIAS-Mathematical Science	0.00	00.00%
23	PIAS-Earth & Planetory Science	0.00	00.00%

*No figures have been given for this journal.

CONCLUSION

The present study has been taken with a view to highlight the recommendations of the Seminar on Primary Communication in Science and Technology in India[4] that the3re is a need for assessing the status and impact of the contributions of Indian scientists and technologists in relation to the world scientific and technological output. In order that there may be more significant impact of Indian scientific contributions on the world scientific literature output the most important development would be to look for the qualitative improvement in the nature of scientific research and hence the periodical literature in the country so as to enhance the coverage and impact on the world scientific periodicals. Very few Indian journals rank high in the list of more significant international journals covered by the SCI (1984). The citedness pattern of the former is very poor among journals of high impact factor. There are very few citations from journals of high impact factor, for example "Nature" with an impact factor of 10.248, which occupied the 23rd position among journals ranked by the impact factor, is found among the top journals and cites only one Indian journal i.e., Journal of Geological Society of India. Most of the citations from Indian literature among the journals of high impact factor are from the field of Chemistry and reflect the international recognition and appreciation of the Indian chemical literature.

Another important point highlighted by the study is that none of the Indian journals listed in the SCI is a publication of letters or short communication, which is mainly responsible for very low immediacy (less than 0.02) index. It also seems obvious that there is a growing need for the introduction of the new periodicals in some advanced fields in order to cover more subject categories.

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ADEQUACY OF CITATION DATA AS INDICATORS IN THE EVALUATION OF NUTRITION RESEARCH FROM INDIA

S. R. SASTRY and K. SATYANARAYANA

Indian Council of Medical Research
New Delhi

ABSTRACT

A study was conducted to see whether publication and citation data can be used as tools to evaluate research from the Indian context. Nutrition research was taken as a subject areas of study as the nutrition-related problems essentially affect the Third World population, and therefore most of this research tends to be need-based.

The main areas of research were identified as (i) Nutrition; (ii) Biochemistry/Biophysics; (iii) Food Toxicology; (iv) Maternal and Child Health; and (v) Pharmacology/Drug Toxicology. The intensity of research as reflected by the number of publications followed the same pattern. International impact was computed taking citations by peers elsewhere in the World as indicators. When overall citation rates were computed, Nutrition and Biochemistry/Biophysics almost get equal number of citations, followed by Pharmacology/Drug Toxicology, Food Toxicology and lastly Maternal and Child Health. The average citation rates also varied with the subject areas. Papers published in Pharmacology/Drug Toxicology had the highest averge citation rate per paper followed by Food Toxicology, Biochemistry/Biophysics, Nutrition and lastly Maternal and Child Health.

These data will be discussed vis-a-vis the priorities of research from the Indian context as well as relevance of this work to the needs of the country.

BIBLIOGRAPHICAL CONTROL OF INDIAN HISTORICAL PERIODICALS

ARJUN DAS GUPTA

Department of Library and Information Science
Calcutta University

INTRODUCTION

Ever since the advent of printing, there has always been an ardent effort from scholars to gain control on the ever increasing flow of various types of published or unpublished materials. Librarians, bibliographers and information scientists were also worried for the systematic listing of records of human communication particularly related to books and periodicals.

Periodicals pose a special problem with their ever incresing number for their location and acquisition. In the field of history, bibliographic control over the vast amount of published literature is attempted through means like directories, union list /catalogues, annual and cumulative indexes, indexing and abstracting periodicals. The present study is an attempt to make survey of such directories, lists and indexes in the field of Indian History upto the end of last decade. In addition, annual and cumulative indexes to 26 major Indian historical periodicals published during 1788-1970 have been taken into consideration.

DIRECTORIES

For general type of directories most informative, upto date and easily available directory is Ulrich's Intenational Periodical Directory, New York: R.R. Bowker includes titles historical periodicals along with periodicals of other disciplines. Press in India (1957) brought out by the Registrar of News Papers for India, New Delhi comprises a directory of all newspapers and periodicals being currently published in India. Other attempts in this direction are Indian Periodicals : an Annotated guide (Jaipur : The author 1969) and Indian Periodicals in Print (ED. HND Gandhi and others), 1973. On specific subject various guides and lists published from abroad are (1) World list of Histocal periodicals and Bibliographies (Oxford : International Committee of Historical Science 1939) (2) Historical Periodicals : an annotated World list of historical and related serial publications (Santon Barbara, California 1961) (3) Guide to Historical Periodicals in the English Language : (London : Historical Association 1970) etc.

UNION LISTS/CATALOGUES

There is a dearth of these publications in the field of history. Mention may be made of Catalogue of Periodicals, Nesspapers/Gazettes (Calcutta, National Library 1956), Union Catalogue of Social Science Serials (New Delhi, Social Science Documentation Centre 1969). There are two outstanding works published abroad, which may be relevant to scholars doing work in U.K. and U.S.A. (1) British Union Cataloguen of Periodicals : a record of the periodicals of the world from 17th Century to the present day in British Libraries (London, Butterworths Scientific Publications 1955-1958). (2) A union list of serials in the Libraries of the United States and Canada: (New York : Wilson 1965).

INDEXES

Of the 26 major Indian History Periodicals, 19 have issued annual indexes, and only four of them (Indian antiquary, Epigraphia India, Islamic Culture and Journal of Ancient Indian History) are almost regular. Cumulative indexes have been brought for 16 of these major periodicals namely : (1) Asiatic

Researchs, (2) Journal of Asiatic Society of Bengal, (3) Journal of Bombay branch of Royal Asiatic Society, (4) The Calcutta Review, (5) Indian Antiquary, (6) Epigraphia Indica, (7) Bengal Past and Present, (8) Quarterly Journal of Mythic Society, (9) Journal of Bihar & Orissa Research Society, (10) Annals of Bhandarkar Oriental Research Institute, (11) Journal of Indian History, (12) Indian Historical Quarterly, (13) Indian Culture, (14) New Indian Antiquary, (15) Proceedings of the Indian History of Congress, (16) Journal of Numismatic Society of India.

These cumulative indexes have the limitations of not covering the content of multiple periodicals. These are some multi-journal indexes which cover not only a large number of core titles but also scatter ones. They are (1) Bibliography of Indian History for the year 1927 (In Journal of the BVombay Historical Society 1, March 1928) (2) Bibliography of Indian History and Oriental Research for 1938 (Compiled by B.A. Fernandes) (3) Annual Bibliography of Indian History and Indology 1938-1942 (Compiled by B. A. Gernandes) (4) Bibliography of Indological Studies 1942-43 (by George M. Moraes) (5) Social Science Bibliograph : India 1952 (New Delhi : UNESCO 1954) (6) Bibliography of Studies in Indian Epigraphy 1926-1950 (by Sibdas Chowdhury) (7) Annotated Bibliography on the Economic History of India 1500-1947 A.D. (New Delhi, ICSSR 1974). The following foreign retrospective indexes cover a good number of Indian titles. (1) Cumulative Bibliography of Asian Studies 1966-1970 (Boston : G.K. Hall 1973) (2) South Asian History 1750-1950. A guide to periodicals, Dissertation and Newspapers (Princeton, N.J. : Princeton University Press 1968).

INDEXING PERIODICALS

1 Guide to Indian Periodical Literature (Social Sciences and Humanities)

Ed. V.K. Jain and others, 1964, Gurgaon, Prabhu Book Service)

2 Index India : a Quarterly Documentation list of selected articles, Editorials Notes, and letters etc. Ed. N.N. Gidwani(Jaipur, 1967).

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Following foreign indexing periodicals include some select Indian titles (1) Annual Bibliography of Indian Archaelogy. (Leyden, E.J. Brill, 1926), (2) International Bibliography of Historical Sciences (Paris-International Committee of Historical Sciences 1926-) (3) Index Islamicus 1906-1955 (Cambridge W. Heffer 1958).

ABSTRACTING PERIODICALS

The only abstracting periodical in the field of history is Historical Abstracts, published by the American Bibliographical Centre, California started in 1955 from 1971 (vol. 17) it started appearing in two parts Part A Modern History abstracts, World History 1775-1914. Part-B Twentieth Century Abstracts : World History 1914-1970 and is issue Quarterly.

CONCLUSIONS

From this survey, it is seen that no directory is published from our country and no union catalogue is specially or solely devoted to historical periodicals. It is essential to prepare one for comprehensive coverage of total output of Indian History periodicals. In case of indexes, the attempt has been partial and incomplete. a full composite index to all the major Indian historical periodicals covering the period of 1788-1970 should be prepared. This will form a comprehensive retrospective index. One Indian Historical Abstract in the pattern of Historical abstract published by american Bibliographical Centre, California is very much useful. In present era, many periodicals in a particular subject are coming from different parts of the country. In such cases, a team of indexes may be contributed from different regions of the country.

Much more active role is called for from bodies like Indian Council of Historical Research, Indian Council of Social Science Research, Institute of Historical Studies or Indian History of Congress.

INFORMATION MANAGEMENT BY ISRS IN INDIA

T. SEN, A. ARUNA, B. RAMADEVI & A. RAVINDRANATH

Naval Science & Technological Laboratory
Visakhapatnam

INTRODUCTION

It is very often heard that this is the age of Computers and Information Systems. It is curious to note that computers were initially designed to ease the operations of long and tedious arithematic calculations. Subsequently, engineers and scientists used computers for solving lengthy repetative and complex mathematical calculations in their respective fields. Of late, with the large memory units that most computers have, its relatively simple mode of operation and its decreasing cost and physical dimensions has resulted in extensive use of computers.

The phenomenal progress of research in Science, technology, engineering, medicine and social sciences, has led to very high productivity in document publications. To bring this vast amount of information under bibliographic control and to render it useful and easily accessible to potential users is a task of considerable magnitude and complexity which the 'information scientist' faces. Application of communication techniques and electronic data processing of information have made a profound impact on libraries.

Information centres and the computer and associated facilities have come to be recognised as indispensible for study and accurate upto date information storage, processing, retrieval and dissemination.

Information Storage and Retrieval Systems (ISRS) is one of the areas where "Information People" use computers very effectively.

ISRS : Modern ISRS units in Technical Information Centres of the developed countries, use Mainframe Micro-processors based computers with several terminals, permitting multi-user facility. The storage and subsequent retrieval on demand of specific information from such well organised ISRS set-ups is very user friendly and is considered an essential service for users.

ISRS and Software Packages : The efficiency of ISRS always depends upon the kind of software packages used. The software package should perferably be specifically designed to cope with the aims of ISRS of the individual Information Centres. General aims of ISRS are

- to provide right type of information
- to provide right quality of information
- to provide information in right time and, should be easily accessable.

Some software packages are available off the shelf but before using it in most cases, one hasd to often modify these packages to build the ISRS of the individual information centres. A new institutions in India have achieved good results by using ready-made packages adapted suitably and have built up computerised information systems which are functioning quite well. However there is considerable need to develop more ISRS unit in our country to adeaquately meet the requirements. Software packages specifically developed are preferable to ready-made packages. Probably sometimes, the general architecture of ready-made packages can be suitably restructured, to meet the particular type of ISRS being developed.

At this stage, it may be pointged out that some degree of user training is very desirable in order that best use of the retrieval system can be realised.

Implementation : For selecting a software package, evaluation of the package is the initial step.

The following points are mainly considered for evaluating the package.

Capacity or Accommodation : Package should be made so as to accommodate the maximum fields, records, and file sizes required for the ISRS system.

Data Input : Inputting the data should be an easy operation. A formated screen or prompts for the next field should be provided.

Editing : Software package should provide screen editing.

Update : It should have updating facility and the procedure should be simple and fast.

Menu-Driven : Package should be dedicatged to the system.

Help : On line help facility should be elaborative and informative.

A software which has got all these facilities incorporated automatically satisfies the aims and objectives of ISRS.

One should always use standard formats and techniques uniformly, like when required, for example, formating the screen for inputting the Information as per ISO standards or MARC format etc.

<u>Functioning of ISRS</u> : An overview of the entire system or technical information centre should be taken into consideration for efficient and streamlined functioning of ISRS.

Essentially the architecture of such a set up would be a combination of the following :

1) Establishments goals and charter of technical projects, both ongoing and futuristic
2) Collection of user profiles and specific requirements.
3) Procurement of relevant literature
4) Analysis and consolidation of the available information.
5) Feeding data in standard formats
6) Providing suitable display systems and hard copies as per requirements.
7) Analysis of user feed-back on effectivity of the ISRS
8) Updating and modifying the ISRS - data base from time to time.

It is obvious that to implement a cost effective ISRS, the first step is getting the correct user profile i.e., understanding and analysing the user's present and near futuristic requirements in the context of the overall research programme of the institution.

The system input consists of information about documents acquired by the Information Centres. Just before inputting the information, it is analysed, processed and consolidated. This procedure involves two quite distinct intellectual steps. The conceptual analysis of content and the translation of this into a particular vocabulary or index language. This controlled vocabulary or system vocabulary might be a list of subject headings, a thesaurus or simply a list of approved key words or phrases.

Information on user interest profiles helps one to develop suitable search strategies using appropriate vocabulary control devices. Once this is done, it is matched with the information available in ISRS Data Base and outputted to the user in the requested form on demand.

It is a controvertial matter who will be a good Abstract? A subject specialist with training in Abstracting and Indexing or an Information Scientist with sufficient knowledge in the concerned subject. Nevertheless, in order to be a good Abstractor and Indexer knowledge of Information Science is essential. It is very difficult to draft subject specialists into the information processing field. Perhaps a good solution in the Indian Context wilol be, Information scientist with basic subject back ground.

Feed back from users should be used to update the ISRS system. In course of time, it will greatly enrich the quality and quantity of readily available information. Thus we see that a good ISRS is very valuable and vital asset to any R & D Establishment. Although there are numerous well established ISRS unit in most research centres abroad, there are few such facilities in India. Considering the large number of scientists engaged in technical organisations in India, the need for more ISRS units is very desirable.

Most certainly, ISRS can in very good measure accelerate and enhance both the quality and quantity of research and development and bridge the technological gap particularly in advanced engineering and technological fields.

INFORMATION CONSOLIDATION : THE ROLE OF INFORMATION ANALYSIS CENTRES

SMT. B. RAMADEVI & T. SEN

Naval Science & Technological Laboratory
Visakhapatnam

In the words of Eugene Garfield, since 1945, our world has undergone an enormous change and one must attribute this global transformation, chiefly to the discoveries of scientists and the application of these discoveries by the technologists and engineers. Few recognize, however how fundamental has been the place of information in scientific and technological developments. Having the right information at the right moment has accelerated the scientists work. The information drawn up by scientists over the last four decades did not just appear. It had to be organised and stored, and networks established for its dissemination. Ironically it is the information scientists' very efficiency and industry that has made information overload a real possibility for researchers. However, now there is an over-abundance of literature/information on any one discipline which again presents a formidable modern information problems to different levels of users. Since there is vast increase in the demand for the information there has been also a vast increase in the supply of information. The information scientists and workers are, though strange it may appear, dealing with a field where an increase in supply does not alleviate the demand problems but actually aggravates it. There is very often a lack of appropriate information or in other words, information which users can comprehend, assimilate and directly use with some confidence at their own level and within the framework of their own circumstances. Much of the existing literature in any one given field is written by peers for peers, which in turn effectively shuts out the non-peers. A paradox is at work, while on the one hand there is an overabundance of literature on any given topic yet on the other hand an overwhelming majority of potential users who may benefit from such literature cannot use it directly.

The real problem related to the use of information is not just only its overabundance, but the fact that information is not being packaged in a form useful to decision makers at different levels, providing a synthesis, evaluation and/or summary of alternate choices. The emphasis now is on better utilisation of resources by means of faster contacts between resources and the users. A technique variously described as "Information Consolidation" or "Information Package " or "Adaptive Engineering" is considered as extremely important in the effective application of information.

Historically, the concept of Information Consolidation evolved as a response to complaints about and analysis of the so called "barriers" to fruitful use of information. Some of the problems associated are :-

(a) Too much information, very often tends to decrease the willingness to use information since it involves too much time and effort on the part of the user.

(b) Information presented in a language which is outside the users' experience (be it "foreign tongue" or "technicaleese").

(c) Information presented in a context outside the user framework.

(d) Information presented in a way that is hard to follow

(e) Information Validity and Reliability

In order to make better and quicker decisions, information collected and made available in a consolidated and appropriately packaged from is most desirable. The right information, drawn at the right time, highly leverages the success of any technical undertaking. However, these services may not contribute directly to overcome all the information transfer problems. Over the years a number of such consolidated packages have been tried out and there have emerged - the scientific and technical reviews ; state-of-the art reports ; handbooks, monographs, Critical and evaluated data ; briefings, popular science series ; Information Analysis Centres Products etc. Some of these are directed towards specialists while others are for broader groups like farmers, workers, technicians etc. In all these situations, the concept of a well defined audience is present. The greatest impetus comes from the practices of Information Analysis Centres.

In a sense, every individual acts as a small information analysis center when he writes a research paper or uses existing knowledge to solve or even to formulate a problem. An information analysis centre is a person or group of persons who have accepted a responsibility to gather together everything known that is relevant to a particular well-defined field and organize the information in some systematic fashion so that they and others will know what information exists, to analyse the contents in such a fashion that they create new knowledge and to maintain these activities as a long term commitment.

Now let us look afresh on the most appropriate definition of Consolidated Information :

"CONSOLIDATED INFORMATION" is public knowledge, specifically selected, analysed, evaluated, and possibly restructured and repackaged for the purpose of serving some of the immediate decisions problems and information needs of a defined clientele or social group, who otherwise may not be able to effectively and efficiently access and use this knowledge as available in the great amounts of documents or in its original form". The critiria for selection, evaluation restructuring, and repackaging of this knowledge are derived from the potential clientele.

The objectives and audience of information consolidation are clearly embedded in the definition itself and hence we are not dealing with them in detail. However, the processes involved in Information Consolidation are just indicated :

1. Study of potential users
2. Selection of Information Source(s)
3. Evaluation of Information as to its intrinsic merit,validity

and reliability

4. Analysis to identify and extract the most salient features
5. Reconstructuring - if necessary
6. Packaging and/or Repackaging
7. Diffusion/Dissemination
8. Feedback

A schematic flow chart of the processes involved is given in Figure 1

The figure summarizes the processes, elements and relations involved. Although related to a number of other information activities, most notably abstracting and indexing, information consolidation is a proposition of much higher complexity and greter demands. Herein lies basic problem of information consolidation. In comparison to many information activities, it involves higher complexity of processes and organizations and greater demands on human, technical and economic resources, all aimed at providing the user with a potent facility which is both convenient and easy to use.

The benefits that accrue from use of consolidated information are given in the following table (4) :

GENERAL ACTIVITY OR AREA	POTENTIAL BENEFITS
Decisions	Better informed about alternatives. Improved decisions making process. Reduction of uncertainity
Knowledge,Competence	Increase in level, depth, breadth by individual groups. Higher sophistication in drawing relations between seemingly unconnected facts.

Adaptation	More appropriate and adjusted responses by individuals, groups or organizations to demands of and changes in the environment and a complex world.
Productivity	Higher levels and outputs in work and other activities. More contacts.
Resources	Increased capacity and effectiveness. More efficient and economic use of resources. Increased capacity and/or effectiveness.Better economy.
Success	Contribution towards attaining aims of individuals, groups, organizations. Better or wider spread and acceptance of results. Detection of necessary adjustments.
SPECIFIC AREAS	**INFORMATION CONSOLIDATION AIMED TOWARDS BENEFITS SUCH AS :**
Enterprises,Business Commerce	Broadening markets, Providing appropriate responses to market conditions and demands. Meeting competition. Complying with standards and regulations.Motivating personnel. Making business decisions.
Industry	Incorporating technical innovations.
Manufacture	Adding new products. Making products appropriate. Increasing Productivity. Reducing breakdown.
Science	Keeping up with research front.

	Judging own position and advances. Making appropriate decisions on policy and allocations. Searching for related works and/or ideas for further work or methodology.
Education	Keeping up with advances in given fields and in education Research, Methods, Approaches, Providing for educational planning and assessments or comparisons.
Individuals	Providing for self fulfillment and adfvancement in their given area of work or interest. Providing for wider opportunities in employment, self-help and adjustments to changing environments and conditions. Increasing sophistication towards higher quality of life.

Two examples of IACS products and efforts aimed at specialists and broader groups are :

SHOCK AND VIBRATION INFORMATION CENTER,
Naval Research Laboratory, Deptt. of Defense,
Washington/D.C.

a) Random Noise and Vibration in Space Vehicles
b) Theory and Practice of Cushion Design
c) Programming and Analysis for Digital Time Series Data
d) Dynamics of Rotating Shafts
e) Principles and Techniques of Shock Data Analysis
f) Optimum Shock and Vibration Isolation
g) Influence of Damping in Vibration Isolation
h) Selection and Performance of Vibration Tests

TATA ENERGY RESEARCH INSTITUTE, BOMBAY

a) Biogas Handbook
b) Biogas Technology : A Manual for Design Makers
c) Biogas Technology : A Manual for Extension Workers
d) Wind Pump Handbook
e) Cooking Stoves Handbook etc.

The work of information scientists - their research into an expertise over bibliographic control has a very broad and significant impact in the sphere of Information Consolidation.

The value of Consolidated Information changes with the type of and amount of information. The higher value of information is in a set of alternative choices summjarized from all the other sources mentioned and recommendations for decisions or resolution of the problems. It actually means that :

As the amount of information presented to a decision maker is increasingly consolidated, its value increases.

As the information is increasingly expressed in everyday or popular and widely understood language taking into account the social cultural framework of the user, its value increases quite significantly.

As the information is increasingly packaged in a way that will make its use easier, its value also greatly increases.

While these values of consolidated information are clear to the clientele or potential users.

According to Saracevic, the secret of information consolidation is :

"WHILE INFORMATION CONSOLIDATION INVOLVES COMPLEXITY IN PROCESSES,

IT OFFERS SIMPLICITY AND APPROPRIATENESS IN PRODUCTS. THE POTENTIAL BENEFITS DERIVED IN USING CONSOLIDATED INFORMATION ARE HIGH".

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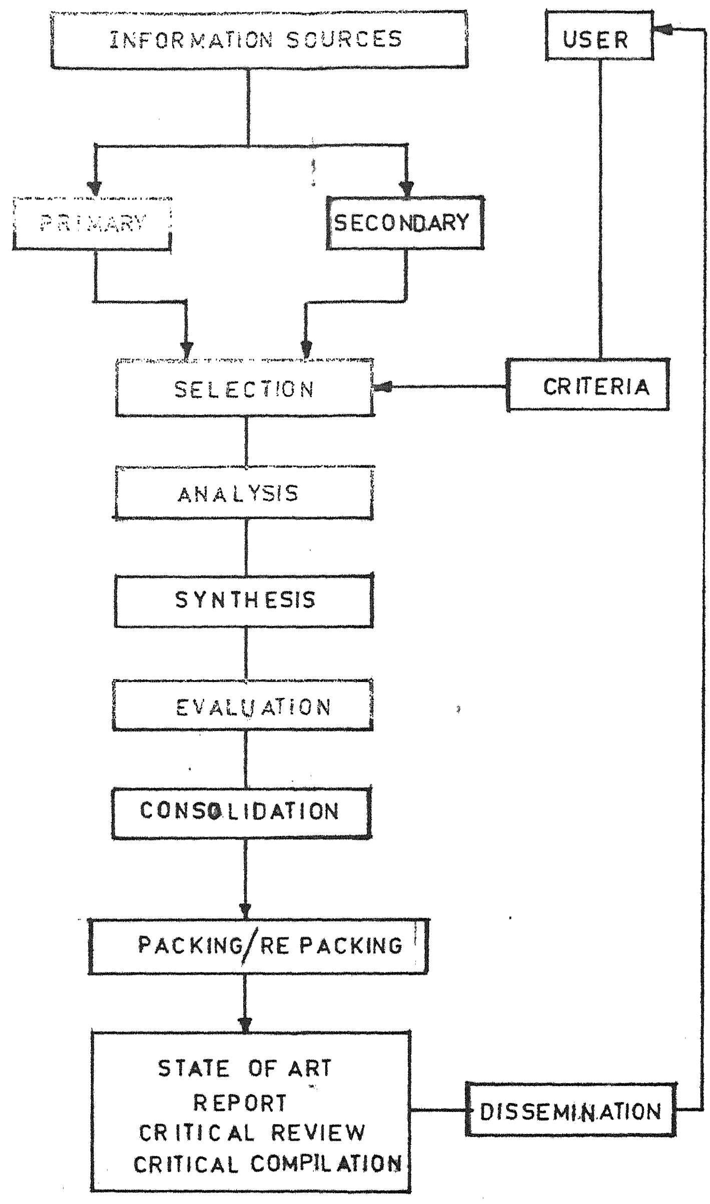
INFORMATION SOURCES
USER
PRIMARY
SECONDARY
SELECTION
CRITERIA
ANALYSIS
SYNTHESIS
EVALUATION
CONSOLIDATION
PACKING/RE PACKING
STATE OF ART
REPORT
CRITICAL REVIEW
CRITICAL COMPILATION
DISSEMINATION

FIG-I

TECHNOLOGY TRANSFER : SCOPE OF PATENT LITERATURE AS INFORMATION SOURCE

T. KRISHNASWAMY, K.V. RAMACHANDRAN & S.V.R. CHANDER

Central Leather Research Institute
Madras

INTRODUCTION

This is an era of technological progress and the span of the few decades has been one of fast changing technologies, with the computers coming in, in a big way in developing high and sophisticated technology, the "Computer Aided Technology" (CAT), in every sphere of industrialisation. The frontiers of knowledge are being extended at incredible speeds, opening up wholly new areas and introducing new concepts. The level of scientific and technological development is the index of the material well-being of a nation. While formulating the science and technology plan for the Sixth Five Year Plan of the Govt. of India,it was assumed that 97% of the world R & D was confined to the advanced countries and the share of other developing countries was only a meagre 3 per cent[1]. Since then, things have been changing gradually, thanks to the importance given to S & T and Education and other developmental programmes. Besides development of indigenous technology, well organised mechanisms of technology transfer have been given due importance in the S & T developmental programmes. For this, emphasis has rightly been laid in the plan document on a strong information base, a pre-requisite, for an effective S & T plan with self-reliance as one of its principal objectives. It has been realised and also accepted that "information" is a very vital component and is utilised not only for the understanding of current status but also for anticipating the shape of things to come. A strong information base for each industry has therefore been a felt need for the pursuit of intellectual efforts in the direction of technological forecasting, information analysis, R & D management etc. With this in view, the Department of Science & Technology, had planned for the establishment originally of four sectoral Scientific Information Centres, one each for drugs and pharmaceuticals (NICDAP), leather and allied industries (NICLAI), food science and technology (NICFOS) and machine tools (NICMAT), and subsequently added four more, for aeronautics at NAL, for crystallography at Madras, for chemicals at NCL and for textiles at Ahmedabad. Each one of these centres caters to the information needs of the specific industry through the well developed systems of information storage and retrieval from the different sources of which, "Patents literature" is one.

INFORMATION VERSUS TECHNOLOGY TRANSFER

In the context of industrial development, "Technology transfer" assumes special significance. Several organisations at the international and national levels have been at the task of technology transfer. Any technology developed needs to be channelised be it from the laboratory to the industry at the national level or from a developed country to a developing country at the international level, and the process of dissemination of information or technology transfer mechanism varies in degree depending on the type of information and source available. At the international level, organisations like the UNIDO, FAO, ILO, OECD etc. play a vital role in technology transfer from the developed countries to the developing countries. The OECD for instance, was formed in 1961 and this organisation ensures and coordinates cooperation amongst the member nations and serves as a channel through which the membern nation may extend aid to the developing world. In the Indian context organisations like the NRDC of India play a key role in coordinating the R & D activities of the different national laboratories and other research institutions and has formulated a system of its own for effective transfer of technology and the terms and conditions are well defined as contained in the "CSIR guidelines for transfer of technology".

As for the development of a new technology, it involves the three stages of basic, applied and developmental research, and the industrial application of a new technology or the simple adaptation of technologies to suit the indigenous conditons are complicated processes requiring a considerable amount of lead time. As can be observed, there exists a gap between the development of a technology or scientific innovation and the industrial application of the technology so developed[2]. This is amply illustrated in Table 1.

Table 1

TIME ELAPSED BETWEEN SCIENTIFIC AND TECHNOLOGICAL DISCOVERIES AND THEIR COMMERCIALISATION

Description	Year of discovery	Year of industrial application	Time elapsed in years
Electric motor	1821	1886	65
Vacuum tube	1882	1915	33
Radio	1887	1922	35
X-ray	1895	1913	18
Atomic Reactor	1932	1942	10
Radar	1935	1940	5
Transistor	1948	1951	3
Solar cell	1953	1955	2
Synthetic resins	1950	1958	8

Source : Science and Technology Agency (Japan)

A valid observation that is made here is that the time lag seems to be narrowing down gradually and such a situation is purported to be due to the changing pattern of science and technology in modern times, and the process of technology transfer at the international level as well as at the domestic levels.

"Technology transfer" cannot remain a subject in isolation and is always linked with "Information" which has a vital role in the development of technology itself. The terms "Information", "High technology", "Appropriate technology", "Technology transfer" are inter-related, and the roles of each have been a subject of discussion many a time and each one defined very precisely. "Information" is of great significance in the industrial development of any country especially in the R & D Management and talking of the importance of "Information", the British Prime Minister Benjamin Disraeli is quoted to have once remarked, "As a general rule, the most successful man in life is the man with best information"[3].

INFORMATION SOURCES

"Information" exists at different levels and primarily is of two main categories, viz., (i) published information and (ii) unpublished information or "grey literature". Though it is inappropriate to call the second category as literature in the strict sense, this t erm has been coined for convenience's sake. Published information is available in varied forms as shown in the chart and is easily accessible. While there are several well developed systems for control (documentation, storage and retrieval) of published information, the access to unpublished information is rather difficult since the knowledge in such cases exists at a personal level in the sense that the information (technique or technology) is passed on from person to person as and when a need arises as in the case of some of the traditional arts and trades. The processing of grey literature has been discussed at length and a model system or approach for effective control (documentation, storage and retrieval) of such unpublished information has been suggested by Krishnaswamy et al,[4] earlier.

INFORMATION

- Published information
  - Books Monographs
  - Thesis and dissertations
  - Journals/ periodicals
  - Project reports & special reports
  - Seminars/ conference proceedings
  - Patent literature
  - Awareness/ abstracting services
  - Directories
- Unpublished information
  - Oral consultancy
  - Trouble shooting, on-the-spot advice
  - Special lectures/ talks

PATENT LITERATURE AND IMPORTANCE

Patents, though not complete technologies in themselves, have an important role in the process of technology transfer, culminating in industrtial production.

While the term "patent" generally means a statutory grant by the Government to an inventor or inventors, conferring on them certain rights and privileges, a simple definition for a patent is not to be found in many of the patent laws. The UNCTAD study describes the patent as "a legal enforceable right granted by virtue of a law to a person to exclude, for a limited time, others from certain acts in relation to a described new invention".

The patent, while by itself confers certain rights to the inventor/s, the system of granting patent for new inventions has been universally adopted as a means for stimulating and encouraging inventions which are vital for the industrial development of a country. It is generally acknowledged that the patent system has been the backbone of industrial development of the countries which today are known as industrially developed countries, according to Vedaraman[5]. The famous American President Abraham Lincoln hailed the importance of patent system by saying, "the patent system added the fuel of interest to the fire of genius". Similarly, Franklin D. Roosevelt, President of the USA, during the Second World war, acknowledging the role of patent in industrial development had to say, "patents are the key to our technology; technology is the key to our production; production is the key to victory".

The uniqueness of patent literature as a source of information is that the information available in a patent specification is much more detailed and exhaustive than that available in any technical book or journal. For instnce, some common utility articles like the umbrella, walking stick etc., are also covered by patent documents, while developments on these items do not generally find any place in any journal/report, dissertation or like publications. In keeping with this view, Saunderson[6] says, "information which patents contain are of vital importance and the fact that patents contain good solid technical information surely make it axiomatic that a literature search proceeding, say, the grant of a capital sanction for a research project cannot be considered to be complete unless and until the patent literature has been scrutinised". To put in the words of Nagpaul[7], the unique nature of a patent can be enumerated thus :

1. Patents are the earliest to disclose information about latest scientific and technological developments.
2. Information available in a patent specification is more detailed and exhaustive than that available in any technical book or journal.
3. Patents are the only source of information in some cases, e.g. an application for grant of a patent is filled as soon as a new invention having a prima facia utility is made.
4. The subject matter covered by patents is primarily technological in charcter which the industry is basically concerned with.
5. Information regarding all inventions in respect of any particular subject matter is available under one classification heading.

6. Patents have a fairly uniform presentation as regards the bibliographic and technological data.
7. Patents bear a date (period of life) which is a vital information not available in books/journals which publish information about these inventions.
8. Patents indicate the name and address of the patentes/inventor, which information is not readily available in any other usual sources.

Despite these plus factors, studies carried out reveal that patents are very little used as sources of scientific and technical information. According to Houghton[8], the potentialities of a patent as a source of information are little appreciated. Indeed, patents are perhaps the most under-valued of all sources of information. Similar are the views expressed by Ramachandran[9], who says "the patent literature is a very fruitful and useful source of technical information whose value unfortunately has not been fully appreciated". The reasons for this type of a situation, according to him, include the (i) legal nature of the language in which the disclosure is described, (ii) the language barriers, (iii) an anormity of the patent information which is not readily accessible etc.

In this context, it will be of interest to cite the review of the patenting activities of CSIR and patent utilisation by Girdhar <u>et al</u>.[10]. This study covers a period of 37 years from 1940, the year in which the first patgent application was filed by CSIR (the then BSIR) upto 1977.

Table 2

Period	No. of patent applications filed	Average per year
1940-42	21	7
1943-47	83	17
1948-52	114	23
1953-57	281	56
1958-62	277	55
1963-67	515	103
1968-72	705	141
1973-77(projected)	725*	145

*Actuals for 4 years for the period 1973-76 are 581 applications.

Patent applications filed by CSIR during 1940-77

One striking observation made by the authors is that there has been a rising trend in the number of CSIR patents with the general trend of increase in the overall patenting in the country as a consequence of the increase in R & D activities of the CSIR laboratories indicative of a greater realisation by the research workers about the positive role of patents in technology transfer. It is further observed from this study that (i) the patented processes have better commercial acceptability than non-patented processes and (ii) the rate of commercial utilisation of CSIR patents (i.e.6.4% of the total patents) compares favourably with that of a worldwide basis which is only 5-10% according to a UN report.

A study made by Baker[11] also indicates the steady growth of patenting activity world over, as observed from the coverage of patent literature in the Chemical Abstracts. Though no attempt has been made to determine the current rate of growth of patents, the earlier study covering the 16-year period from 1955 to 1971 shows that the coverage of patent literature has been of the order of 25% (compared with the total bibliographic items covered in CA) in 1971, as against 21% in 1960 and 12% in 1955, thereby showing an increasing trend in patenting activity. From these studies, it is convincing rather than presumptuous that patent literature has continuously been a vital source of information for research and developmental activities.

PATENT LITERATURE ORGANIZATION

The concept of patenting has been one of a global R & D activity and has since gained universal recognition. The organisation of patent literature has been a falt need at the international level and organisations like the World Intellectual Property Organisation (WIPO), a unit of the United Nations, the International Patent Documentation Centre (INPADOC) at Vienna etc., have been at the task of devicing systems of storage, retrieval and dissemination of patent information, and a well developed network exists between the international organisations and patent information centres at the national levels.

The topic of patents organisation has been one of great importance and discussion at many a conference and workshops, and this subject has been exhaustively covered by Mohapatra[12] even at a workshop recently held at Nagpur.

CONCLUSION

Information is an important input in the fields of scientific and technological research and in turn the industrial development of a nation. Information about the latest R & D efforts the world over serves the two main functions viz.,(i) stimulates new channels of research and (ii) prevents unintentional duplication of research. It is in this context, imperative that Scientific Information Centres should be established at national levels to cater to the information needs of each research worker. Amongst the several sources of information, patent literature has come to be recognised as one of the important ones as it is unique in its own.

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READABILITY MEASURE OF BIOCHEMICAL LITERATURE

S.K.MUSIB, R.K.Mission Residential College, Narendrapur

and

I.N.SENGUPTA, Indian Institute of Chemical Biology, Calcutta

ABSTRACTS

The growth of literature on a particular discipline can be measured by counting the number of papers as well as number of pages published during a specific period. But due to phenomenal increase in the production cost of publication and also in the number of manuscripts submitted for publication to a particular journal, editors now-a-days prefers manuscripts in compact form to reduce the production cost and bulk of the journal. Moreover the editors often use smaller type phase to accommodate more information in a single page. All these factors affect readability of scientific papers. According to Dale and Chall (1) the sum total (including interactions) of all the elements with a given piece of printed material that affects the success which a group of reader have with it. The success is the extent to which they understand it, read it at optimum speed and find it interesting. So readability studies mainly depend on two factors, such as, word length and sentence length. Word length can be measured by counting the number of syllables per word or per sentence. The words with fewer syllables are easier to understand. So also familiar and shorter words when used in a communication more frequently then the text becomes easier to understand. On the other hand larger and unfamiliar words make the meaning of the text complicated and difficult to

understand and provide a strain to the reader's mind.

Considerable work has been done to measure the yardstick of readability and different scientists have formulated different yardsticks to measure the readability of a passage of a written communication.

In this paper we have applied the most accepted formula of Farr, Jenkins and Patterson's modified formula(2) namely,

$$RE = 1.6n - S - 31.5$$

where RE = reading ease ; n = number of one syllable word and S = average sentence length.

An attempt has been made to measure the readfability of biochemical literature for the period 1905-1985. For this purpose a sample number of articles have been chosen randomly from the Biochemical Journal and Journal of Biological Chemistry. The reading ease of both the journals have been determined using the above mentioned formula. Articles published in the years 1905, 1950 and 1985 were covered to determine easiness of reading of these journals.

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METHODS OF CLASSIFYING INFORMATION

H. BOSE

Former Library Officer, EI, P.I.D.
New Delhi

INTRODUCTION

In the present context, the term information will mean a mass of bibliographic citations which may or may not be accompanied with annotations or abstracts. Assuming that these citations are many, it becomes necessry to classify them so that they can be systematically organised for their subsequent storage, retrieval and communication to users. Conventional methods like alphabetical subject cataloguing exist, but they are too slow to meet the demands of fast information flow. On the other hand, classification systems have undergone modifications providing methods for the classification of complex subjects, and are thus adaptable to modern information processing methods. These, along with a cumulation of other techniques like indexing, abstracting etc, were later known as 'documentation'. Thereafter, computers arrived on the scene. These machines, originally used for number crunching, were applied to some of the techniques of documentation; the outcome is information science. It is also known as informatics etc. No doubt, the application of computers has r esulted in some modifications of the earlier conventional practices of classification and indexing. But the theoretical base on which these techniques rest remain unchanged. So, the present discussion will remain confined to the methods of classification and indexing as are now practical and the changes that have been introduced throygh computers.

CLASSIFICATION METHODS AND EVALUATION

Each of the available classification schemes, whether enumerative, analytics-synthetic or faceted, has its own methodology of classification. These are provided with respective schemes, and need no introduction here. What is worth discussion is the suitability of classification schemes that is suitable for application to technical libraries and are at the same time amenable to computerised manipulations. The choice is wide, and so at this stage, it is necessary to evaluate the comparative merits of schemes now in use.

The selection of a classification scheme, which is pre-reuisite to classification practive, is limited to enumerative, analytico-synthetic or faceted scheme. The problem does not end here. The user is confronted with newly emerging special schemes, with their roots in faceted classification and the tree-of-knowledge general schemes. Special classification schemes, being tailored to the requirements of particular subject fields, have the capacity to designate complex subjects, while others strive hard with its limited tables to identify specific concepts or subjects of the advancing frontiers of newly emerging specialized subject fields. A faceted scheme can incorporate minute details of a subject field, and provide co-extensive classification numbers with shorter notations through selective combination of nations and symbols from its tables. Even more precise classification is possible through a prescriptive combination order for facets and subfacets in the scheme. All the aspects of a subject field, which are dispersed in the Universal Decimal Classification (UDC) schedule due to their subordination to different specific subject. The array of terms, produced through facet analysis, is helpful both at the pre-coordination and post-coordination stage for information retrieval, while the hierarchical arrangement of facets within their respect catagories facilitates generic search.

A combination of various special classification schemes, individually covering diverse disciplines, cannot form a general classification scheme. But, the specific areas of enumerative classification schemes can be developed to any minute detail to provide faceted schemes for classifying specialised subjects. But, the difference between analytics - synthetic and faceted classification schemes seems to be somewhat overlapping. According to Ranganathan, it is the use of postulates and principles in an analytics-synthetic scheme that differentiates it from faceted schemes. Thus, every analytics-synthetic clasification scheme while the reverse may not be the case. Judging by this criteria, the UDC scheme is the first analytics-synthetic system which displays faceted structures. The relative merits of schemes belonging to both these categories need elaboration.

In Colon classification (CC), the limitation of its facet formula DMEST originated from the earlier misconception that the facets of a subject depend on or belong to the basic class which, as has now been lately realised, are facets of the subject itself. Since all the facets of a subject belong to the subject itself, basic class is only a facet relative to it.

Although the faceted classification does not need a fart formula as in CC to form any pre-coordinated heading, the sequence of facets, when aligned according to the citation order, is expected to follow their sequence in the schedule. This similarity in the pattern of the facet formula with that of CC is discernible, but the flexibility in the order of combination of facets is worth noticing. This is due to the absence of any prescribed rigid facet formula for the UDC, where even the auxiliaries can be brought forth as entry elements with the help of facet indicator device. But, the specific relationship in which terms combine to designate a synthetic concept is not explicit in the UDC due to non-provision of any relational operator, although the common auxiliary 'point of view' presents a vague attempt in that direction. But, the limitation of the enumerative scheme Deway's Decimal Classification (DC) is reflected in the UDC, which would appear like an attempt at a compromise between the porphyrial tree-of-knowledge classification and analytics-synthetic classification.

But, in all fairness to the DC, it may be conceded that there is little that can be considered as a standard for judging the correctness of hierarchical relationship in a tree-of-knowledge clasification scheme. The concept of hierarchy, as prevalent in classification schemes, is relative because they, inspite of all the logical r4easoning, reflects devise, if not arbitary, view-points of their creators, and as such, they cannot be deemed as absolute in any sense. What is classified is only the literature or subjects, and the so-called hierarchy, that one encounters in most of the schemes, is anything but natural. So, technical libraries may well adopt the UDC which is now the most widely used of all classification schemes. Added to it is the advantage of machine-readable versions of the UDC schedules, tapes and discs which are now available. These are adaptable to computerised manipulations.

OTHER METHODS

The emergence of indexing as a technique can be traced to library science, the technical aspects of which comprise classification, cataloguing and subject indexing. Indexing had subsequently been considered as one of the techniques of documentation. Information science originated when the techniques of documentation were computerised. Now, indexing can be done through computerised manipulation of keywords. This has resulted in mechanised indexes like KWIC, KWAC, KWOC, WADEX etc. which are the variations of the mechanised permitated index, developed by H.P. Luhn in 1959.

These mechanised indexes are based on tille citations. This technique presupposes that the title is constituted of significant words which help to make the indexes meaningful. This is not always the case. Aided by thesaurus, significant terms or keywords are mechanically selected. The machine memory is often programmed by a stoplist to ignore unsought terms i.e. prepositions etc. Nevertheless, some terms of doubtful utility may get admitted, which can be eliminated later or tolerated as "noise". In general, vocabulary management may be necessary to insert selected keywords to create the sense. The end product is a recirculating dissemination index. The alignment of entrywords, arranged alphabetically, helps to classify the information. In this case, the entry words have to be considered as subject headings.

Pre-coordinate indexing systems like the Preserved Context Indexing Systems(PRECIS) and Cyclic indexing are used to generate subject headings. In PRECIS, subject headings, generated by it, are used with enumerative classification scheme like DC for classifying information. This method has been successfully applied to the British National Bibliography (BNB) and Australian National Bibliography (ANB). In this indexing system, role operators are employed for ordering component terms of a composite subject. The role indicators of the PRECIS help in aligning the index terms into groups in the same way as terms are grouped into facets. It may be mentioned here that the principle of rotation of terms in PRECIS, which forms an essential feature of the system, is identical with the basic concept of cyclic indexing. The terms in PRECIS are amenable to computerised manipulation.

The problem, as is now evident, is to find a technique for generating subject headings for classifying the information. Subject headings, comprising a combination of keywords, are needed for this purpose. If these keywords are rotated according to a pre-fixed pattern, the resultant technique known as cyclic indexing becomes even more effective. In it, every entry is complete and significant. As the cyclic index is self-sufficient, it can be used alone and classification schemes dispensed with. As an example of it, the following subject can be cited :

Infra-red night vision for assault tanks.

In a cyclic index, the subject heading will be as follows

Tanks : night vision : infra-red

When augmented with 'see' reference entries, the index entries become multi-dimensional, e.g.

Infra-red: night vision:tanks

see Tanks : night vision : infra-red

Night vision : infra-red : tanks

see Tanks : night vision : infra-red

Other indexing systems need no discussion due to lack of space. In a passing reference, it can be stated that in chain indexing system, the disappearing chain results in certain entries which are only the 'leads' to the main index entry. As a result, the index gets crowded with entries of doubtful utility. Similar problem is encountered in SLIC index.

CONCLUSION

Thus starting from its elementary beginning as subject cataloguing, the art of classifying information has advanced far with the inception of computers. New methods need to be investigated, computerised on-line systems, through matching of keywords, display bibliographies on vides screens. These can be transferred to the printer. The printed bibliographies can be presented in classified form with the helpof selective combination of keywords. The assumption here is, of course, hypothetical and only time will tell if such a method is feasible.

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IDENTIFICATION OF THE INFORMATION NEEDS AND THE SOURCE OF THE OBTAINED INFORMATION OF THE RESEARCH SCHOLARS IN THE UNIVERSITY OF BURDWAN

S.K. MUSIB

Assistant Librarian, R.K. Mission College
Narendrapur,24-Parganas

INTRODUCTION

The current information plays a vital role to the research scholars for conducting their research work. Scholars should know what is happening in their field of research for avoiding the duplication of their research. The progress of the research depends very much upon the availability of information required at different stages of their work. Also they need different types of information at different stages of their research. In this paper an attempt has been made to identify the various types of information needs of the scholars and also to identify the important information sources.

OBJECTIVES OF THE STUDY

The investigation started with the following objectives :

1 to identify the types of information needs of the research scholars from the stages of the selection of the topic to the publication of the reserch report,

2 to identify the important information sources of their problems,

3 to identify the sources of information about the documents cited in their papers ;

4 to identify the sources of collecting of the original documents cited in their papers.

MATERIALS AND METHODS

36 research scholars from the science departments of the University of Burdwan have been interviewed to collect the data for our investigation. Scholars who are doing Ph.D and have published at least one paper in the learned journals have been selected for interview. Data was collected by questionnaire cum interview method. A questionnaire was prepared according to the objectives mentioned above.

RESULTS AND DISCUSSIONS

Identification of the nature of information needs.

In order to identify the nature of required information of the scholars, they are asked to mention some of the important problems for which they need information to solve the problems. A scholar has mentioned more than one such problems. All the problems then have been grouped under the following twelve major heads.

These are :

(i) To select the topic/definition of the problems(28)

(ii) To formulate scientific/technical solution(10)

(iii) To relate other works already done (8)

(iv) To choose the design for data collection (23)

(v) To select data gathering technique (27)

(vi) To design equipment/apparatus (6)

(vii) To select data analysis techniques (21)

(viii) To interprete the collected data (22)

(ix) To write the research report (24)

(x) To select the journal for publication of the report(10)

(xi) To prepare the report according to the particular journals, (5)

(xii) To revise the paper according to the editor's comment(16)

A Close look into the list shows that all the problems relate to different stages of the research. Information regarding a particular problem may be very important at a particular stage of research. In order to identify the most important problems faced by the scholars, they have been ranked according to the number of occurence to the scholars. The number in parentheses against each heading shows the number of scholars mentioned the problems for seeking information. It can be seen from the list that the most important problem faced by the scholars is to select the problem/ definition of the problem. Out of 36 scholars interviewed, 28 need information to solve that problem, followed by the problem of data gathering techniques with 27. The next important problems where scholars need information are (i) to choose the design for data collection, (ii) to select data analysis techniques, (iii) to interprete the collected data and (iv) to write the research report.

Sources of obtained information

It is obvious that scientists need various types of information at different stages of their research work. Some sources/providers of information seem to be very important at certain stages of their research. Also some sources/providers of information are very important for a specific type of problem. In order to determine the most important sources of information for a specific problem the six important problems have been selected from the list. The scholars then have been asked from where they have collected or will collect the required information to solve those problems. The information providers then have been grouped under the following heads :

(i) Journals (ii) Books, (iii) Preprints, (iv) Technical reports, (v) Conference,seminars, meetings, Journal clubs etc.,(vi) Supervisors, teachers and other senior scholars of the department, (vii) experts outside the University and (viii) others.

Table 1 shows the role of information providers for different kind of problems. It can be noticed from the table that for obtaining information regarding the selection of the topic/definition of the problem supervisors are the most important sources of information followed by experts from outside the University some scholars also used journals to solve that problem. Maximum number of scholars get their required information from the supervisor or the journal to solve the problem regarding the choice of the design for data collection and the selection of the techniques for data gathering, i.e. supervisors and journals are the main information providers. Journals, supervisors and experts from out side the University are also the main information providers for the selection of data gathering techniques. To interprete the collected data and to write the research report scholars depend much for their required information from the journals and supervisors. A close look into table 1 shows that almost all the cases journals, supervisors and experts from outside the University are the important information providers to the scholars.

Sources of information about the documents cited in the papers.

In this section an attempt has been made to identify the important information source regarding the document cited in the papers by the scholars. For this 36 papers (one from each scholars) have been collected. For each reference cited in the papers authors are askedfrom where they have obtained the information about that. Result shows that scholars received the information about 31% of the total documents cited in all the papers from the citations or footnotes, 29% of the total documents cited in all the papers are from indexing and abstracting journals, 16% from the recommendations of the supervisors, 16% from the primary journals and books ; and 8% from other sources. It can be seen from the above analysis that citations and indexing-abstracting journals play the vital roles for obtaining information about relevant documents on a topic.

Table 1

SOURCES OF OBTAINED INFORMATION OF THE SCHOLARS

Nature of Information needed	Sources of obtained information (in no.of scholars					
	Journals	Books	Reprints	Conference etc.	Supervisor etc.	Technical repor	Experts from outside
1 Selection of problem	8	1		2	21	-	10
2 To choose the design for data collection	15	5	2	2	14	-	5
3 To select data gathering techniques	13	4	-	1	12	1	5
4 To select data analysis technique	16	6	2	2	13	1	10
5 To interprete the collected data	13	6	1	2	17	1	6
6 To write the research report	10	7	-	3	19	5	

Major sources for collecting the original documents cited in the papers.

For identifying the sources of collection of the original documents cited in the papers, the references in all the 36 papers have been collected and the respective author of the paper have been asked to mention the sources from where they have collected the original documents cited in their papers. Result shows that 42% of the total documents cited have been collected from the University library, that of 15% from the personal collection. 19% of the total references cited in the papers have been collected from the supervisor, senior scholars other teachers of the department; 12% from the libraries outside Burdwan University and 9% from the INSDOC.

CONCLUSION

As seen from the above analysis that the scholars need information mainly for the selection of the problem, to select the data analysis and data gathering techniques, to interprete the collected data and to write the research report. The main sources of information for the scholars to solve various problems of their research are the journals, supervisors and the experts from outside the university. Scholars have collected information regarding the documents cited in their papers from the citations, followed by indexing and abstracting journals and supervisors' recommendation. It may also be shown that the University library provides 42% of the documents cited in their papers. It may be noted that Univesitylibrary should posses larger collection or journals so that more than 50% of needs of the scholars can be meet from the Univesity library.

INFORMATION GATHERING AND TRENDS IN INFORMETRICS

SMT. P.G. JOSHI

SR. LIBRARIAN
National Institute for Training in Industrial Engineering
Bombay

SOURCES OF INFORMATION

The Scientific literature appears in many forms, like books, periodicals, preprints, reprints, microforms, these convey new information and are called Primary Sources of information.

It is age old practice that librarians or information scientistsare helping the working scientist/technologists by surveying the current literature and bringing out the secondary sources of information.

Tertiary Sources of information are those which are based on primary as well as secondary sources of information and inform about primary sources like bibliographies of bibliographies, literature guides etc.

COMMUNICATION PATTERNS & INFORMATION NEEDS OF SCIENTIST AND TECHNOLOGISTS

To delineate the topic of information needs and uses which includes emperical studies on scientific communication when approached from the point of view of scientists and technologists, it is study of 'communication behaviour', while from point of view from any communication medium, these are user studies, and from science communication point of view they are studies on the flow of information amongst scientists and technologists.

PROBLEMS IN DEFINING INFORMATION NEEDS

It is, perhaps, self-evident that information needs will very not only according to the subject interests of the users, but likewise in relation to the type of activity in which they are engaged. Broadly speaking, it is possible to differentiate between those individuals in; (a) basic research, (b) applied research, and (c) management

Personnel in basic research are academically trained to locate information for themselves. They attribute a higher value to recorded information and can be described as literature oriented (papyrocentric).

In applied research, personnel are somewhat less literature oriented (papyrophobic) and are less prepared to appreciate the value of recording information.

Information needs are strictly relative to the subject interest, type of activity, and level of sophistication of users and to the purpose for which the information to needed.User surveys have shown that pure scientists are far more dependent on literature than industrial scientists and technologists.

Not all factors associated with user are personal; some are imposed on them in some way by their job or their environment. These includes :(a) time limit within which information has to be gathered, (b) time available for obtaining and searching for information (c) the information services available, which may condition information use and demand to a large extent. Constraints such as these will affect the ability and the opportunity to seek information.

In general, Scientists approach a journal via the title page, but engineers prefer to leaf through it page by page. Literature usage by scientists is usually clearly differentiated from that by engineers, with Scientists using journals and abstracting journals more and engineering making a greater use of text books, data compilations and technical reports.

DEFINITIONS OF BIBLIOMETRICS, INFORMETRICS, LIBRAMETRICS & THEIR INTER-RELATIONS

Initially the methods of measurements were restricted to measuring length, bredth, weight etc. As science progressed need arose to measure innumerable phenomenon, like heat, light, electricity etc. Study of Informetrics started way back in 1896 when P. Campbell (1) advanced the idea for the first time of scattering of information even though no term was coined for it. Cole and Eaeles in their study on the history of comparative anatomy, analysed the literature on the subject, applying statistical methods and called it 'Statistical Analysis' (2). Hulme used the term Statistical bibliography in 1923 for such studies (3). Ranganathan used the term Librametric Studies (4) he implied by Librametrics as the measurement of various Library activities and services, using mathematical methods.

Pritchhard coined the term '<u>bibliometrics</u>' to denote a new discipline, using quantitative methods to probe scientific communication processes, through written documents. The term 'bibliometrics' received wide acceptance.

Informetrics

In 1979 Nacke for the first time defined "Informetrics" as the application of mathematical methods to the investigation of information science objects. Rajan & Sen define 'Informetrics as that branch of knowledge which employs mathematical and statistical techniques, to measure publications and concepts, their growth, propogation, use and decay of information, establish laws governing these factors, and study the efficiency of information systems, explore intra & inter-relationship of disciplines.

Major aspects of studies in informetrics are on following topics

1 Quantitative growth of literature
2 Information Obsolescence and scatering
3 Efficiency of information products
4 Efficiency of information Systems and Information establishments.
5 The role of different kinds of documents as means of scientific communication.
6 The role of information channels in Scientific Communications.
7 Information relevance and pertinance
8 Ranking of periodicals/serials by various parameters.
9 Overlapping of subject contents between periodicals and serials

10 Citation habits of Scientists and interdisciplinary relation as determined on the basis of bibliographical reference.

INFORMETRICS AND LIBRAMETRICS

Various Library activities are measurable, e.g. the average no. of books, that a person can classify, catalog can be determined. The number of books issued or the number of queries answered can be measured, here the term book can be used, because books are more predominent in libraries.

All library activities as are measurable are encompassed by librametrics. The study of the number of books issued, or the number of queries answered within a given length of time is covered by librametrics as part of informetrics.

INFORMETRICS & SCIENTIOMETRICS

Scientiometrics is study related to measurements of science, which can be carried out by measuring production of graduates, Ph.D's in science, number of institutions engaged in research in science, scientific manpower, media of communication-primary and secondary scientific periodicals & scientific literaturte. The area of scientiometrics which deals with scientific information, is also covered by informetrics. A large shore of the literature of informetrics, pertain to scientiometrics.

It is obvious from this that bibliometrics is an integral part of informetrics and part of librametrics and scientiometrics are also covered by Informetrics. Metric Study of Information pe pertaining to any field of knowledge fall within the perview of of informetrics.

INFORMETRICS AND MEASUREMENT TECHNIQUES USED FOR STUDIES

Informetrics is based on various measurement techniques such as :

(i) **Growth of literature**

Two methods are used for studying the growth of literature. For breed subject, usually the number of entries per year appearing in the secondary services on the subject is determined, and on that basis the growth is measured. e.g. to measure the growth of chemical literature, the number of entries in the chemical literature, the number of entries in the chemical abstracts is counted for a specific period, difference in two consucutive years shows the growth. The coverage of even Chemical abstracts, which a wide coverage service, is not cent percent.

When a narrow subject is studied, usually several sources are consulted to prepare a bibliography. Duplicate entries are eliminated, this method is almost fool proof method, covering hundred percent literature.

(ii) **Efficiency of Information systems, Services & Products**

For measuring efficiency of information, systems are measured by taking into account the efficiency of its information services and products. Information serrvices comprise supply of documents i.e. books, photocopies, microfilms, microfiche etc. translations, bibliographies, answers to queries etc.

(iii) **Efficiency of document supply**

Efficiency of relating to the supply of documents can measured in terms of time and the number of documents supplied. The efficiency can be calculated on monthly basis.

(ii) **Efficiency of Translation Supply**

Measure by number of pages translated, the time and quality of translation.

(v) **Efficiency of Bibliographies compiled on request**

Measured in terms of exhaustively, time relevance.

(vi) **Efficiency of answers to queries**

Time required to answer query and relevance of a: are two measures.

(vii) Efficiency of SDI Services is measured on timel exhaustivity, and relevance.

(viii) **Efficiency of information products**

Measures to rate efficiency of these services a: coverage, timelines, and ease of handling.

(a) current awareness services,

(b) Indexing Services,

(c) Abstracting services

(d) Express information services.

COMPUTERS & INFORMETRICS

All these are statistical methods which can be stud: using computers. A simulation model can be prepared for ca: out the study. The use of computers provide more efficiency, a: and reliability. The results obtained are quick, reliable and :

INDIAN SCENARIO

Informetrics study in India started around 1958 by a pu: tion by S Dutta & TS Rajagopalan. In 1963 DRTC conducted a se on Documentation Periodicals. In 1978 DRTC organised another s: on the subject; from that year on an average 13 articles are : published per year on the subject, about 200 articles get publ: on the subject in the world, making Indian contribution to : to 8%

CONCLUSION

From the year 1958, the dawn of Informetrics, till today more than 200 articles are published on study of literature and activities of information gathering. The various sources of information, the patterns of communication amongst scientists and the importance of 'Information' as valuable resource, have emerged for the study of literature, measurements of the published items and their impacts on development and progress. The techniques for undertaking informetrics studies are varied but the study is crucial for understanding the role of Information: a vital resource.

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STANDARDIZATION OF INFORMATION SERVICE : UNIFORMITY IN FORMAT AND STYLE

P.C. BOSE

Agricultural Research Information Centre(ICAR)
New Delhi

INTRODUCTION

The new information technologies now offers greater opportunity for exchange of information among different groups, organizations, nations and international bodies. The main criteria for a information system is the compatibility and standardization of databases and information services. As applied to information services, compatibility is a property that governs the extent to which two or more organizations can communicate and exchange data. an obvious way for two organizations to achieve compatibility is to perform the activity according to the same standards. Thus, the work of agencies of standardization is most important for its recognition and adoption by the information service community.

NEED FOR COMPATIBILITY

Computer and telecommunication technologies greatly facilitate exchange of information among organizations. For this very reason, the automation of information service makes the achievement of compatibility more important than ever before. On the other hand, computers can themselves promote compatibility since they allow certain forms of conversion like record formats to be performed automatically.

Information services are very largely involved in manipulating records representing physical items (books, periodicals, periodical articles and other carriers of information) and it is in these records and the way they are handled rather than the handling of the physical items, that compatibility is so important. This applies most particularly to records in machine-readable form.

The extent to which two information centres can exchange data depends largely on how much compatibility exists between the two in digital encoding, record formats, hardware, software and telecommunication links.

Various compatibility issues directly affect the user of information services. Suppose a user wishing to perform online searches of several databases accessible through a single computer centre. Unless the databases are compatible in format and style it would be difficult to communicate with computer.

STANDARDIZATION OF FORMAT

In the last two decades much has been achieved in securing compatibility among bibliographic records. An international standard for a format to permit the exchange of such records (ISO 2709) has been widely adopted. Based on this standard, the UNISIST Reference Manual is to provide a complete working manual for the international standardization of the form and content of computer-readable bibliographic descriptions prepared by abstracting and indexing services and others. This format is also used by AGRIS(International Information System for Agricultural Sciences and Technology) of Food and Agriculture Organization and INIS (International Nuclear Information System) of International Atomic Energy Agency of United Nations. Other UN agencies have also adopted the ISO 2709 standard for their bibliographic databases. The MARC exchange format and its derivatives, including UNIMARC, have also been widely adopted by the information service community, establishing a significant level of compatibility among information and documentation centres. The Common Communication Format (CCF) is intended to satisfy the needs of both communities and one must have hope for its widespread acceptance.

The development by IFLA of international standard bibliographic descriptions for a wide variety of materials has contributed substantially to achieving compatibility in this area, while the International Standard Book Number (ISBN) and the International Standard Serial Number (ISSN) allow for the unique identification of these bibliographic items and thus facilitate the interlinking of different databases.

Much has been achieved in securing compatibility in the processing of component parts of works, especially journal articles, which is particularly unfortunate since these form the bulk of currently published literature. Not even a unique identifier yet exists greatly complicating the recognition of duplicate citations among machine-readable databases. Great variation in bibliographic citation practices still exists among secondary publishers and among primary publishers, causing numerous problems for their users.

Many possible approaches to securing compatibility of index languages have been studied, including the merging of vocabularies, the establishment of an intermediate lexicon, and the use of macro-vocabularies and imcrovocabularies. Nevertheless, while structural compatibility can be achieved by following ISO standards for thesaurus construction, it is doubtful if any significant progress can be claimed in achieving compatibility among vocabularies beyond this basic structural level.

SYSTEMS DESIGN

Information system designers and users can benefit from developments in hardware and software compatibility that originate in other application areas. Standards developed for programing languages, command languages input/output devices, storage devices, character sets, telecommunications and computer to computer links help to establish more uniform components from which to build information systems. The low cost IBM Personal Computer and its compatibles has opened new vista in the information management techniques. The software packages developed by the UNESCO like MINI CDS/ISIS based on the ILO's package of ISIS in the field of bibliographic information could now be used in all the IBM/Compatible Personal Computers. The software package like MINISIS developed by IDRC, Canada is another attempt in this regard. But it has its own drawback that it works only with a HP 3000 series computer.

It may be mentioned that new developments in technology frequently outpace the development of standards. For example, new technologies which one could incorporate in information systems such as videodisc, videotex and local area networks become new sources of incompatibility. CD-ROM technology is now fast engulfing the bibliographical databases because it could be retrieve with a IBM/Compatible P.C. with 512 KB memory using a compact disc player.

ORGANIZATION OF INFORMATION SERVICES

There are many problems of information requirements by the users and information service community due to national and cultural differences, research versus popular needs, and the varying levels of bibliographic details needed by primary publishers, secondary publishers and libraries. Further progress in achieving compatibility among information services will largely depend on the ability of the community to promote international standards or agreements sufficiently authoritative and flexible to replace the many national, regional and sectoral standards that now guide much of the work.

Information services have much to gain by the adoption of international standards. This applies particularly to the developing countries who need most to share their own resources and to efficiently exploit the resources of the developed world. Nevertheless, information services must guard against adopting a standard that may, in fact, reduce the effectiveness of the service for the particular audience for which it is designed. For example, the precise needs of the users of some specialized information centre may necessitate the development of a specific vocabulary. Adoption of an existing, more general thesaurus might not be desirable in this situation.

There is an urge to do more in promoting compatibility among various components of the information transfer cycle-primary publishers, secondary publishers, libraries and information centres - so that processing efficiency is improved in a coordinatd and integrated way throughout the cycle. Compatibility does not always depend on standards; ion some cases it can be reached by agreement on norms and methods of working.

Thus it can be concluded that compatibility is closely related to standardization. If two organizations adhere to common standards, it is likely that their activities and outputs will be compatible. If two information centres construct thesauri that adhere closely to the standards of the International Organization for Standardization (ISO), the two thesauri will be more compatible and therefore, more easily merged or converted one to another than the one which do not follow or adopt a standard.The adoption of common standards by several organizations is the most obvious way of achieving compatibility in the activities of these organizations. A major reason for seeking compatibility is to allow the interconnection of systems or networks.

RESOURCES SHARING

Computers, telecommunications and machine-readable data have made it possible for information centres to share resources. A number of possibilities exists :

1 The merging of machine-readable databases

2 Conversion of the bibliographic records of one organization to those of another. This might include the formation of a tertiary database (i.e. one in a specialized subject area formed by the extraction of records from several other databases).

3 Establishing a network that permits any centre to get online access to the data bases of all other centres.

4 By means of a single command language and possibly with a single vocabulary of index terms it allows a user to search any database by means of a single familiar tool.

SYSTEMS WITH COMMON STANDARDS

It is obvious that a single information system, however large, can achieve system-wide compatibility by requiring its various components to adopt a single set of standards. Classical examples are AGRIS and INIS-decentralized international systems achieving compatibility in input from the various component centres which may be national or regional centres through :

1 Standardized subject headings or description, together with a common input sheet to standardize content and format of bibliographic records (Annexure I).

2 Guidelines for bibliographic description, together with a common input sheet to standardize content and format of bibliographic records.

3 Specifications for magnetic tape formats, record formats and character sets.

4 OCR input instructions (for those centres submitting input in the form of pages to be read by optical character readers).

5 Specification for floppy diskette (for those centres submitting input in the form of floppy diskettes).

The regorous application of such standards throughout a network allows the AGRIS/INIS Coordinating centres to accept input from a multitude of centres including India, possibly in a variety of compatible forms (e.g. typed input forms, OCR sheets, magnetic tape, paper tape and floppy diskette). All of this may then be merged by computer at the Co-ordinating Centre to form a database, which may then be issued in printed an machine-readable form. Nevertheless, it is worth noting that standards, however well conveived, are open to various interpretations, especially in the area of cataloguing and subject classification. With any large network, careful training of personnel in the various centres is an essential element in the programme. Moreover, the Co-ordinating Centre must monitor the quality of cataloguing and classification performed by the various centres.

The type of information system is examplified well by AGRIS and INIS and to a lesser extent, other UN networks such as INFOTERRA. The fact that AGRIS and INIS have been made compatible in terms of records, tape formats and character sets allows both sets of records to be processed by related software at a common computer facility. In fact, the AGRIS Input Unit is located with the INIS Input Unit at the International Atomic Energy Agency in vienna

(Austria).

Both AGRIS and INIS have produced a wide range of internal standards to guide the operations of the input centres. These cover descriptive cataloguing, subject indexing, transliteration, abstracting and various other aspects of intellectual input like AGROVOC or INIS Thesaurus. Authority lists are produced for titles of journals, for names of corporate authors and for report number prefixes. Other standards apply to codes and character sets and to paper tape, magnetic tape and floppy diskette specifications and record formats.

A further advantage of the standardization that an international system such as AGRIS can achieve is the ability to generate compatible products at national or regional levels. Thus it was possible for the Indian AGRIS Input Centre i.e. the Agricultural Research Information Centre of ICAR, New Delhi to bring out a "Indian National Agricultural Bibliography" in four volumes covering the period 1975-84 containing 38551 references of Indian research workers reported in Indian and foreign journals. The content and presentation are fully compatible with the products of AGRIS.

But not all information services can establish standards in the way that AGRIS and INIS can. This is particularly true in the establishment of a network whose member centres have been in existance for some years and have long-established policies and procedures. The Indian AGRIS Input Centre, New Delhi, for example was set up in 1975 and has developed the necessary expertises in this field. The centre had also organised and imparted training particularly for the developing countries in the past on the methodology of standardization of information services.

In India some efforts have been made by the NISSAT of DSIR and DRTC of ISI to develop a format on the lines of ISO 2709 and Common Communication Format (CCF) which could be adopted by the information services community. The Bureau of Indian Standards (BIS) is also trying to develop an Indian standard which can take care of the uniformity in format and style with a view to standardize the information services in India. It is to be seen that how far it would be possible to bring the compatibility with other international databases and when? The answer lies with you, ladies and gentlemen.

INFORMATION ANALYSIS ON GROWTH CHARACTERISTICS OF A SCIENTIFIC RESEARCH INSTITUTE

R.K. BANERJEE & M.C. BAGCHI

P.& I,PME Division,
Indian Institute of Chemical Biology
Calcutta

SUMMARY

The present work identifies and analyzes the effect of factors that influence research activities in an organized research institute - factors that encourage the fulfilment of rewarding research. Data were collected for the Indian Institute of Chemical Biology (IICB), and its growth has been examined in relation to key indicators of performance, professional interaction, and availability of expertise. Investigation of their combined effect by conducting multiple regression analysis has shown the existence of a profound influence of these factors on growth.

INTRODUCTION

The growth of a scientific research institute depends to a large extent on factors which encourage the fulfilment of rewarding research, or, in other words, on parameters which revolve on performance, professional interaction, and availability of expertise and concomitant infrastructure, In the present investigation pertinent data were collected for the Indian Institute of Chemical Biology, and the effect of factors that have influenced its research activities and development has been identified and analyzed. Owing to the multiplicity of the explanatory variables, the analysis has been conducted on several dimensions through multiple regression. The growth is best reflected in the budget since zero-base budgeting has been embedded in the system where funds are allocated on the basis of merits of each programme in competition with others. The data on the number of research papers published, patents filed, Ph.D degrees awarded, and visitors served as indicators of performance and professional interaction, while those on the availability of manpower gave an indication of the institute's expertise which encouraged the development of infrastructure.

If then growth is affected by the factors enumerated above a correlation analysis of the variates may be used as a tool for assessing the relative influence of the variables. With these objectives in view, we carried out multiple regression analysis on the data, and were able to draw some generalized conclusions.

COLLECTION AND ANALYSIS OF DATA

Data were collected over eleven years (1976-1987) from annual Reports for budget (recurring and capital); manpower (scientific, technical and administrative); number of visitors from India and abroad; number of papers published, patents filed and Ph.D degrees awarded. These data were used as growth indicators in our investigation. The raw data presented in Table 1 have been analyzed using our Institute computer facility, and the computed regression coefficients matrix is shown in table 2 below.

Table 1

Data used for multiple regression analysis

Variables	Year										
	1976-77	77-78	78-79	79-80	80-81	81-82	82-83	83-84	84-85	85-86	86-87
Total budget (Rs lacs)	46.068	57.849	83.496	90.041	98.680	170.136	178.691	173.810	270.636	275.575	293.769
Manpower(No)	230	248	268	283	298	313	318	339	335	328	328
Visitors(No)	37	16	28	69	62	97	115	104	104	65	50
Papers published (No)	42	50	57	50	75	66	74	76	81	56	85
Patents filed(No)	1	0	1	2	2	1	9	5	6	5	3
Ph.D awarded(No)	3	4	1	3	3	3	10	10	4	5	3

Table 2

Computed regression coefficients matrix

	Budget	Manpower	Visitors	Publications	Patents	Ph.D
Budget	1.00	0.86	0.50	0.68	0.60	0.25
Manpower	0.86	1.00	0.76	0.81	0.69	0.48
Visitors	0.50	0.76	1.00	0.58	0.76	0.66
Publications	0.68	0.81	0.58	1.00	0.55	0.34
Patents	0.60	0.69	0.76	0.55	1.00	0.76
Ph.D	0.25	0.48	0.66	0.34	0.76	1.00

The test statistics were : coefficient of multiple determination $R^2 = 0.87$ and multiple correlation coefficient $R = 0.93$ with Durbin-Waston statistic equalling 1.38.

DISCUSSION

The variables representing data on manpower, visitors, publications, patents and Ph.D degrees are the independent, or explanatory, variables. The dependent variable is the annual budget. The value of R^2 was computed to be as high as 0.87 showing that increments in expertise and infrastructure, performance and professional interaction account for 87 percent of growth and affirming the appropriateness of the choice of variables. The Durbin-Watson statistic however indicates that further data would be useful for developing a truly and conclusively predictive model for this investigation.

DEFINING INFORMATION FOR INFORMETRICS, COMMUNICATION AND BIBLIOMETRICS

SUBIR K. SEN

85, Devinivas Road, Motijheel
Calcutta

INTRODUCTION

Information is every where. It is as if something like God is everywhere. On reflection such a similarity or analogy appears to be untenable. (However, one might probably indulge in an interesting discourse on relationships between God and subtleties of information). Saying Information is everywhere is like saying energy or gravitation is everywhere. Yet we have a feeling that information has something more subtle than other fundamental entities or concepts like energy, matter or force.

Everyone talks of information and apparently understands it. But it is not clear how information should be meaningfully defined.

One can now supply precise well formulated definitions to a number of fundamentally important concepts such as matte, energy, number etc. The answeres might not be philosophically fully satisfactory, but they are in most cases scientifically sound. By scientifically sound I mean that the concept has got an unambiguous, literal description (i.e. through a statement or proposition formed in natural language terms) and the concept goes into some mathematical relations as a functional or as a parameter in relation to other concepts. It is neither too general to be obvious, nor too specialised to be applied or useful only in a single context. In essence we search for reality to a concept and try to establish structural solidarity in a conceptual edifice for that reality. After making an attempt in defining information in line with the above observations, we shall indicate the relation of information thus defined with some of the definitions available in literature.

DEFINING INFORMATION

Following and modifying B.C. Brookes' observation we define 'Information' as an entity manifesting communicable knowledge capable of reducing or removing logical uncertainty and switching changes of action and/or pattern of organisational state of a system. The communicable knowledge or information is semantic in essence. However we use the attribute semantic in its broadest sense for want of a better term.

We say that (i) for information to be existent, communication and so, existence of material systems (matter) as generator, receiver, preserver through space & time and necessary ; (ii) any information process i.e. generation, transmission, documentation, receiving etc. is imbedded with some form of energetic process i.e. change of energy, but there exists no direct linear relatiohsip between amount of energy and amount of information.

For our purpose we consider that every system (from human being to an atom) has an inherent K-structure. At any space - time point the system is in a K-estate. Any output of information from the system does not necessarily change its K-estate, only changes the energy state. But any input of information may or may not change the K-state. K-structural activities within the system may change the K-state. The K-amount as an abstract subjective counter-part of information amount of a system may decrease or increase. the decrease is most easily related to memory loss or forgetting and increase as discovery or gaining new experience in a human system. These are K-state and K-amount changes within the system without having direct information imput from outside the system. Example of K-state change by information input is learning.

It is obvious that we have taken 'K' as representative of subjective knowledge in an abstract generalised manner. We know that what we know are not always possible to express or communicate i.e. not amenable to be transformed in objective information.

Communication is sharing meaning. In other words it is incorporation of information in different K-structures to give rise to change in K-states in equivalent way. Sharing meaning means the amount of K-state change of different systems can give rise to the same amount of information and vice versa.

Now information to be communicated requres to be coded in symbols transferred through channels or preserved in some material body in the form of messages. Messages are embedded in language (we again use such a term for lack of better one). The information can be shared only if the sharers can produce and r4eceive semantic elements in atomic information units (AIU or aiu). AIU's are information carrying concepts. There may be information units (IU or iu) or semantic elements which may carry meaning of a large string of aiu's. There are some very strong, stable higher level iu's or concepts called memes. And most of specialised communications (particularly in science and technology) revolve round such iu's or memes. We have dealt elsewhere what memes are (the term was has proposed by the zoologist R. Daukins of Oxford).

An iu or aiu may be transmitted on a string of message symbols in some code. If the symbolic string breaks up or gets disorganised, the semantic essence of the IU is lost. And one cannot divide an aiu and preserve the information. Information (and the K-state) is then a particular pattern or organisation of information elements based upon organisation and pattern (as well as state) of some symbols or representations imbedded on material and energetic elements (of molecules, atoms, larger objhects, accoustic waves, electromagnetic (EM) waves, movements of electrons etc. etc.).

By changing the organisation or pattern, information is chnged or lost. However due to redundancy and K-structural protentiatialities small corruptions can be interpreted.

Let's now represent information by I, information units by J, energy by E and K-state by K, measure of any parameter by much as m (i), information on or about information by I (I), uncertaintity by U etc. We shall use other symbols in common use with their common meanings.

Information equations and relations may be considered as follows :

(1) $\Delta I = |I_1 - I_2| = {*}Jpq\ ({*}jqr)$

*representing composition on p and r,

J are the memes or prominent information elements and j are the aiu's or supporting information elements.

(2) $m\ (\Delta I) = m\ ({*}J({*}\ j)$

$= m\ (a_p\ ar)$

a_p and ar representing values of aiu's equivalent to J and j. The values of a's are to be determined in regard to the pattern of arrangements in some units to be proposed.

(3) $K \longrightarrow K + \Delta K \longrightarrow \text{output}\ \Delta I\ ,\ \Delta I \leq 0$

(4) $\text{input}\ \Delta I \longrightarrow K + \Delta K,\ \Delta K \lesseqgtr 0$

(5) $\Delta K = f(E), \Delta I = g\ (E); \Delta I > 0,\ \Delta E \gg 0, \Delta K \geqq 0$

(6) $m\ \{I(I)\} \ll m(I)$

If there is a decisional problem and uncertainty is say U_1, then

(7) $U_1 + \Delta I \rightarrow U_2 < U_1$

We have talked of logical uncertainty because uncertainties inherent in a system like that connected with uncertainty principle of quantum physics cannot be reduced or removed by any amount of information input into another system from or regarding that system.

By logical we have primarily meant 'inductive'. Information processing or output or input are essentially inductive. We should remember statistical accounting is inductive. Accopunting of pattern or arrangement is also inductive. Our approach is here only indicative and the research in question is at the preliminary stage.

INFORMATION IN DISCOURSE (R.L.DEER, IP & M 21 (6) 1985

Deer gives the requirements of the nature and property of the concept of information in ordinary discourse for defining it as :

Nature :

Information be a representation;

The representation be abstract;

It(representation) be meaningful;

It consists of determinations which have been made;

It should have been made or certain objects.

Properties :

Communicability ; Informing; Empowering; Quantitative.

Belkin (J.Doc. 34(i)1978) described information as the 'structure' of any text which is capable of changing image structure of some recipient.

Mackay (Information, Mechanism *& Meaning, MIT press, 1969) said information does logical work on the organisation orientation.

We may note that our definition can encompress all that have been said by Deer, Belkin and Mackay. Replace image structure of Belkin by our K-state and see the fitting in.

SHANNON INFORMATION

Information measure of information or communication theory is devoid of semantic elements directly. But it accounts for the pattern of symbolic elements in message and for redundancy and hence if the message elements for aiu's and iu's can be taken separately and if we generate a two step shannon type measure, first on message elements of each iu (and aiu) and then on iu's as elements then accounting is possible preserving the semantic import of the message. Shannon information measure can be accommodated in equation (2) above.

FUZZY INFORMATION (Sen, unpublished disertation, 1983)

Sen has defined non fuzzy information measure on a fuzzy subset and fuzzy information measure on a fuzzy subset as :

$m\ (I_f) = * P_i \log P_i/u$

$m\ (I_{nf}) = SP_i \log pi/u$

Where pi are the values of possibilities or the fuzzy membership grades, base of log is to be taken 'e' and * denates fuzzy composition where as S denotes summation or integration in the usual sense. There is no difficulty in accommodating these in present formulations.

Semantic information (J. Bar-Hillel, Language & Information,Addison wesley, 1964).

We shall not discuss this here as that would take a long time. Any one interested can go through the Bar-Hillel's and others works and compare our approach. But we discuss one offshoot of such theories.

In one form, concept of "semantic information" suggests that 'informing' and 'become informed' depend very much on the logical status of the receiver of the information. If for example, the receiver is well versed with formal logical apparatus, geometric figures, certain arithmetical rules, then it is infact same thing to inform the receiver with the basic exioms and certain rules of Euclindean geometry or all the theorems of Euclidean geometry spelled out. Because such a receiver would sooner or later (possibly very soon) be able to derive all the theorems himself by utilising the information of the basic oxioms and rules.

This version has a simple paradoxical result. Supplied with a premordial information set, every individual system can become sooner or later possesser of all possible knowledge in the universe. Information communication or exchange becomes an utterly redundant proposition then. So this approach of informing of certain basic information items and thereby providing all knowledge should be very carefully considered. But this is well accommodated if a system or systems or individuals is taken into consideration (such as public knowledge or all information taken together for the human species).

RESPONSE - STIMULUS

Baired, J-C. (I p & M 20(3) 1984) has discussed spychologists' approach to information processing if r is response to a stimulus s, then the uncertainties and conditional uncertainties are given by :

$$U(s) = -\sum p\ (S_i)\ \log\ p\ (S_i)$$
$$U(r) = -\sum p\ (r_j)\ \log\ p\ (r_j)$$
$$U(r/s) = -\sum p(S_i) \sum p(r_j/S_i)\ \log\ p\ (r_j/S_i)$$
$$U(s/r) = -\sum p(r_j) \sum p(s_i/r_j) \log\ p\ (s_i/r_j)$$

as information measures following Shannon. The transmitted information between stimulus and response sets is given by

$T = U(r) - U(r/s) \approx U(s) - U(s/r)$

However, Baird states that in the context of psychological experimentation meaning of 'information' is certainly closer to that used in computer science rather than to communication theory. He considers the most crucial assumption in such modeling as the possibility of unraveling of details of unobservable information processing by employing behavioural measures of performance. He then discusses his modeling of cognitive structure and information processing. A network model of though (content) similar to network models to represent concepts in semantic theory and it involves a Markovian process representing change of thought.

Thus we see that we can be able to accommodate such models from our approach as well. This is because in our definition information units are hierarchical in semantic content and response and stimulus are related to both energetic state (and organisation) and K-state (and organisation of K-structure) of the system through the patterns of information coding and structuring of response or stimulus.

ENERGY OR ACTION RELATED INFORMATION MEASURE

Glynn Harmon (IP & M 20(1-2) 1984 has proposed defining information as meta-energy. His basic is the idea that biological systems convert energy (stimuli) into information (neural ensembles). His measure of information is the basic information unit which, when acted upon results in one joule of work. His basic assumption is that information process involves a very minute amount of energy as a switching factor causing huge amoung of energy utilisation (i.e. conversion from one to another) as action. He also defines information impact as the differnce of amount of energy utilized to do a right work without having and having right kind of information.

Harmon's approach appears to be superficial to us, though we can establish a tangential relationship from our approach as our consideration of capability of information is switching energetic action.

NAVYA NYAYA & INFORMATION

We shall discuss the place of information in the light of Navya Nyaya or Indian logical system elsewhere. I want to make only one remark here. All logical systems of the West address to propositions and their relations. They are not epistemologies. Indian logic concerns itself with kinowledge and reality (or truth) although it has well formed syllogisms. It developed a blend of both deduction and induction. Informationally (especially from our approach) Navya - Nyaya system can prove to be interesting.

BIBLIOMETRICS AND INFORMATION

To me, bibliometrics is the tool of quantitative (and to some extent qualitative) accounting of information processes underlying the socio-cultural evolution of man. In bibliometrics we attempt of understanding diffusion of knowledge, growth and decay of invisible colleges, growth of subject fields, productivity of authors etc. We attempt these through word frequency counts, ranking of journals by counting articles on a topic, counting bibliographic references or theorems. In doing all these we are guided by an implicit hypothesis that all such items which we try to count are some how (expectantly linearly) related to cognitive knowledge vis-a-vis information per se. In effect we use the bibliometric parameters or variables as 'information units (IU)'. This is the most important espect; choosing of proper information unit. Otherwise we can never be sure whether our bibliometric analyses can have any relation with cognitive flow of information which is the basis of socio-cultural evolution.

By defining the 'aiu' as a semantic entity capable of engineering of sharing meaning, we have been able to correlate the status of cognitive information flow from head to head (i.e. person to person), from system to system and the flow of bibliometric iu's and ensuing bibliometric patterns.

REDUNDANCY & DIFFUSION OF INFORMATION

Redundancy is bad after a while when considered between the same two systems or individuals, but is very important when considered over different systems and individuals. For example an information 'I' exchanged several times between two individuals A and B in a community is boring but may be very essential for any new member, introduced to the community. In short 'I' requires to be generalised public knowledge. Hence every member may be sure that every other member of the community knows it and therefore every time a member meets another individual who are not known to each other already, each would ensure that the other 'knows' 'I'. Thus making exchange of 'I' of high redundancy.

For diffusion of any information, popularisation (say of science), advertisement through mass media, this sort of redundancy occurs.

Understanding or sharing meaning depends on both K-structure and K-state. We some times call it would view and educational level. Any new knowledge is first transmitted among a very few specialists. Then it is gradually goes into the learning systems and popularised in simpler terms being modified. Diffusion of information especially of science and technology can be accounted for by repitition of number of times of some key information units. This approach may be useful in analysing processes of science communication both at specialist and popuylar levels. We shall discuss bibliometrics of such analysing procedures elsewhere.

INFORMATION PHYSICS

We have already disputed the idea that information has relevance and meaning in the context of human social communication. We have tried to show that 'sharing meaning' is applicable to communication in non-human species as well as to other systems.

Let's look at the information processes in the contexts of inanimate physical systems.

Take for example our observation of an electron in presence of another electron. The electron behaves in a particular way towards another electron. The behaviour or response of the electron would be different in response to the presence of, say, a proton.

Response of an electron b6y behaving in a certain way, depends on the 'knowledge' of the other particle. Informationally it is possible only when (i) a coded signal is received, (ii) decoded, and (iii) feed back addressed back. It means an electron has a K-structure and its K-state is changed by incorporation of the message and one or more, energetic functions are switched on. Simultaneously the electrons E-state (energy state) is also changed.

In this case particular electromagnetic quanta do the job of message signalling. However, there is not only a single message channel. For an electron, we know that responses are at least of two types (i.e. electro-weak and gravitational). Hence it is informationally potent in respect of two message channels or languages. A photon or a graviton acta as an AIU.

Such an informational picture of the world leads us to the conclusion that a uniform universal K-structure, coding - decoding operations and response behaviours of elementary practicles had to be established with the creation of the universe. This again logically takes us to favour a particular cosmological model - the big bang. We can now associate logically existence of a premordial K-structure in Planek epoch at the begining of the big bang and development of further K-structures of more complex natures gradually at different levels of evolutionary progress.

THREE ATTITUDES TOWARDS INFORMATION

One basic difficulty in analysing information exists because of three widely different attitudes. First, information is existent or meaningful only in 'human' context. Only in human cognition and in human communication 'information' is relevant (if appears that Brookes recently shares this view).In otherwords, there cannot be any physics of information.

Second, information is just an expression or measure of organisation or orientation of elements in a set. Suppose some not all identical items were arrnged in certain way. It deplicts a pattern to an observer. By alteration of items the pattern is changed. Information in this view gives just an indication of the change, but not of the pattern or the elements (communication theorists' approach is this).

Third is the action oriented view. Information can only be considered in terms of a response to a stimulus. Information gives the idea of action or activity of a system being stimulated by an input. The input is the information.

There are other many many shades and levels of view points over and among these three attitudes. We have dealt in short some of them.

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ASSESSING INFORMATION REQUIREMENTS OF SCIENTISTS IN A RESEARCH INSTITUTE

I. N. SENGUPTA

Indian Institute of Chemical Biology
Calcutta

It is an old aphorism of library science that a book misplaced is a book lost. Following the explosion of knowledge in recent years and the huge increase in the number of periodicals, not to mention other physical forms of information storage, information which is not organised, indexed and stored in a form permitting ready retrieval is in the same manner information lost. The fundamental duty of the information scientist is therefore to encode, organise, retrieve, reproduce and disseminate information in specific subject areas to subserve the requirements of scholars active in that field. New technologies for preserving and transmitting aural and visual information have greatly increased his information processing capacity.And the computer together with its auxiliary equipment provides electromechanical capability for modifying and reprocessing stored information to produce vast new stores of information. It has been rightly pointed out that all of these technological advances have made information a new basic resource supplementing the familiar natural resources of matter and energy. Stores of information represent a new kind of transactable commodity, ranking in importance alongside material and energy resources. Control of information stores and processing facilities is thus likely to become a source of social and economic power; and hence the pivotal role of information science in economic and social progress. Easy access to knowledge also serves as an instrument to offset intellectual inequalities among competitors in scholarly pursuits. It is this latter potentiality of information science that necessitates and highlights the work of the information scientist in assessing and providing the information requirements of scientists in a research institute.

At this point it is well to stress the distinction that exists between a library and an information centre. It has been defined very broadly that a library is a collection of documents that serves more than a few people. On the other hand information centres generally cover a narrow field of science and technology and they cover it in depth. More than libraries, information centres are concerned with handling technical reports, and journal articles dealing essentially with current information. Centres also provide a greater range of user services than do most libraries.

Assessment of the requirements for information of the scientists in a specialised research institution and its dissemination in usable form as and when needed is evidently a task calling for close co-operation between the information scientist and research worker. The information scientist has to keep himself abreast not only of the on-going research programmes in the institute, but also the changing approaches of the working scientist to the problem he is investigating, as his research progresses. It is simple enough to compile and provide lists of correct journal articles of obvious relevance to the work being carried out in an institute. The maintenance of files on individual projects for ready reference as and when a scientist needs a bibliography on a particular aspect of his work or the methodologies available for a new experiment he wants to undertake is a more exacting job. The information scientist has to ensure that there is minimum redundancy in the information he supplies in computed form and no relevant item is omitted. To insure these requirements he needs to identify key words of direct applicability to the work in progress and keep adding to them as the work progresses and enters new areas or reaches the broder of a different subject discipline. The information scientist can perform his function effectively only if he keep in constant touch with the thinking and ideas of the research scientists whom he serves.

A special problem faced by scientists in our country and generally by scientists outside the USA and Europe is the time-lag between the publication of original work and the receipt of the concerned journals usually obtained by surface mail. A practical way in which this problem has been circumvented is by the collection of reprints from workers in the same area of interest after consulting anticipatory secondary sources like Current Contents which list titles of papers scheduled for publication. The information scientist can play a valuable role in identifying such publication and obtaining reprints by air mail. In order that the files maintained by the information group is complete, the reprints may be kept on file and xerox copies provided to the concerned research scientist who will thus be enabled to maintain a file covering his special interest.

A more difficult problem from the point of view of the information scientist arises from the long time many scientific periodicals take to publish articles submitted to them. By the time new work gets into print, the ideas and techniques presented in it may already have found wide follow-up in laboratories in touch with the author of the work. It has consequently become common practice among scientists to exchange pre-prints of work submitted for publication. Programmes of preprint exchanges are usually arranged among scientists working in the same and peripheral areas of interest. They are most effective when scientists maintain personal contacts with their confreres in other laboratories. But preprints are of importance also in the files of the information group, to insure that the information group covers all relevant preprint mat erial it should have an arrangement with the Institute's scientists that all preprints are made available to it for xeroxing and inclusion in its own files. This is just one more aspect where mutual co-operation between the information scientist and the research worker is essential in the interests of both.

Many journals at the present time, for example the Journal of Biological Chemistry, exclude detailed experimental data from the text of the papers they publish, if such data are of limited interest and likely to be required only by a few scientists engaged in the particular and specialised aspect of the work. Such material is preserved by the concerned journal and made available in microfilm or other form on request. In assessing the information requirements of the research scientist, the information group has to identify the requirements for such unpublished material and keep it available for reference if need for it is anticipated.

Ordinarily the information scientist in a research institute will compile information files relating to the Institute's on-going and anticipated interests by scanning primary, secondary and indexing journals of relevance; this will cover work published from the time of inception of a research programme and will grow as the work advances. But as a base for an individual information file, a survey of work already published will have to be made. Such a survey is not difficult to carry out with the aid of abstracting periodicals going back to a reasonable period of time. But to insure that all information of relevance to the proposed programme on the lines the research scientist has planned is covered, the information group should follow the common practice that scientists adopt when they engage in literature search; that is, begin with a single paper or article of seminal importance to the proposed work and use the references cited there as a guide to other articles of importance. These, in turn, will cite others, and it is not difficult, following this procedure, to compile a considerable segment of the literature on the subject. At this stage, again, the base can most soundly be built if the work is done in consultation with the research scientist and utilizing his judgement.

Even with the best effort on the part of the information group in a research institute, the need may still arise for the acquisition of information or a bibliographic search for which outside help has to be sought from time to time. To provide for such contigencies it is advisable for the information group to establish standing arrangements with outside organisations of repute like National Medical Library, in case of a biomedical research institute, who through MEDLARS maintains comprehensive mechanised storage and retrieval systems.

The information file maintained by the Information Group, to fully serve its purpose must include besides original articles and scholarly papers, trade and technical literature pertaining to scientific instruments and rare chemicals likely to be of interest to the institute's research workers, their sources of manufacture, price and technical specifications. Similarly, it will be of great help to the research workers if information is collected and kept in an organised form about other laboratories with common interests, their staff and lists of forthcoming scientific meetings and seminars. News of scientific interest, usually available from science news journals and journals published by learned societies, about awards and honours, fellowships, elections to learned societies and changing priorities in the science policy of different countries also form a legitimate part of the information material to be collected.

I shall not go into the organisation of the information service of a research institute in further detail because it is for the individual information scientist in charge to determine exact requirements depending on the objectives and nature of the institute's work, and draw up on his own expertise to introduce necessary variations. However I should like to enter a plea here that the information scientist takes on the responsibility for training newcomers to research in the methodology of literature search and the preparation of bibliographies for his own use. It should be an essential part of the training of a research student to teach him the sources of information available in his own speciality, the secondary and indexing journals, the techniques of scanning, search and selection of relevant information and methods for filing the information he may need. Unfortunately the research student in our country is oftener man not left to his own devices in this matter and learns by a process of trial and error. This is a task that the information scientist may take up; he can organise lectures and workshops for beginners and save them the nightmare of grouping for literature without system. By pasrticipating in such a programme the information scientist will also build up a rapport with the research scientist which will last through their working life.

I started by saying that access to information may often counteract the disadvantage of intellectual inequality among competing scholars. But this is true only upto a point. Information made available in time and complete in coverage will certainly promote sound research. It can be invaluable in technological and applied research. But it is well for us information scientists to bear in mind that in the final analysis the gifts of intellect, in intuition and creativity of the scientist himself are the foundation for seminal contributions to knowledge that effect the intellectual climate of the whole world. Pasteur said that chance favours the prepared mind. The conjunction of chance and receptivity is a circumstance beyond the control of outside agencies. Consider the labour and thought we devote to the preparation of ranking lists in the expectation that the time of the working scientist can be saved and he can keep abreast of work in his field by regularly reading a dozen or so important journals in his field of interest. But no ranking list of periodicals would have included the Transactions of the Brunn Society for the study of Natural Sciences in which Gregor Johann Mendel published his work in 1866. Even botanists completely overlooked his work till 1900 till three other European botanists independently obtained similar results. Let us remember also that Mendel's work was based on his own intuition, not stimulated by existing sources of information.

Let us also consider how unpredictable are the items of information that stimulate great minds to epoch-making discoveries. The central problem to which Darwin addressed himself in the Origin of Species was the machinery that over the millenia had been pushing life onward from one specification to the next. Darwin's answer was natural selection, a process that enabled the fittest to survive. To Alfred Russel Wallace, the first man to plan an expedition in search of material related to the species question, Darwin wrote in 1839: I came to the conclusion that selection was the principle of change from the study of domesticated productions; and then, reading Malthus, I saw at once how to apply this principle'. In Darwin's autobiography written many years later, he noted that it was "for amusement" that he turned to Malthus's famous book, Essay on the Principle of Population; or, a view on Human Happiness; with an enquiry into our prospects respecting the Future Removal or Mitigation of the Evils which it occasions. How could any information scientist by the wildest imaginable possibility linked Malthus's book with the work on speciation that Darwin was pursuing?

Which brings me to the last point I want to make before closing this address. Most of our research institutes have excellent libraries and their research scientists easy access to all the significant periodicals in their field. But regrettably, the resources of our library are but seldom put to good use. The most important role the information scientist can play is to nurse and encourage the habit of reading, even discursive reading, among the scientists of his institute.

TECHNICAL REPORTING

RAM D TANEJA

Formerly Chief Editor and Dy. Director General, ISI
New Delhi

Technical Reporting belongs to an area of communication which differs greatly from other forms of technical literature like research or review papers, general articles, proposals, theses, treatises, etc. In fact, reports constitute a distinctive group of documents requiring special treatment in their preparation and presentation. The large part they play in research, industry and management as valuable sources of information underscrores their importance. No wonder, company managements today firmly believe that success in engineering and research depends as much upon the ability to present an idea convincingly (in writing or orally) as it does upon the ability to perform calculations and experiments.

Scientists and engineers must, therefore, acquire a minimum level of skill and efficiency in technical reporting. It is important to remember that it is through technical reports that the company or the institution projects its image, and promotes and sells its ideas and expertise. And the report writer earns prestige reputation and recognition which enhance his or her career development and promotion prospects.

Information Officers' Involvement

Apart from scientists and engineers or technical workers in science and engineering, information workers - librarians, information scientists, archivists, indexers, bibliographers, database managers, information officers and all the other titles by which such workers may be known - are also required to produce reports for many different purposes and within a variety of subject environments. This paper also sets out to suggest some guidelines for the production of reports in those information - oriented environments; in most cases the principles are the same, no matter what the context - but a particular situation may demand a certain emphasis, selected set of actions or specific content features.

Report Writing - Decisions Involved

The writing of a report involves decisions concerning :

a) the purpose for which it is being written
b) the specific topic
c) the precise message to be delivered
d) the appropriate structure and organisation (reports are expected to have a prescribed recognizable shape and development)
e) suitable length and format
f) the right vocabulary, style and tone
g) supporting evidence and data

Characteristics of Reports

The above decisions concerning various aspects of writing reports invest them with certain well defined characteristics such as the following :

a) Audience - oriented

b) Objective

c) Factual

d) Formal in language and tone

e) Good presentation. Easy to read so as to save reader's time.

f) Well-documented, complete with information sources; references tabular and graphic material, acknowledgements,etc.

Guiding Principles

The following guidelines will help produce reports incorporating the characteristics noted in (2) above:

a) Keep your reader in mind; remember the reader's needs

b) Organize and outline

c) Emphasize and discriminate Underline the capitalize for emphasis. Know what to include and what not to include (relevance)

d) Be clear, concise and complete.

e) Emphasize findings and conclusions.

Structure and Content

The aim should be to produce the finished document by :

a) starting with a section which sets the scene and engages the interest of the reader;

b) gradually introducing - in a logical sequence - other material to inform, explain and justify;

c) finishing with a summarising, reminding or rounding off section - which may contain a statement of recommendations or conclusions.

The exact structure and sequence of sections is determined, in each case, by the charact eristics and circumstances pertaining to the individual report. Some typical arrangements of major sections are :

A) Summary
Background
Scope of study
Method
Conclusions
Glossary
Bibliography

b) Abstract
Context
Objective
Issues raised
Proposals
Appendixes

c) Introduction
The present situation
Options for change
Recommendations
References

d) Preface
System requirements
System available
Criteria for selection
The final choice
Appendix : System data sheets.

The structures above do not cover all requirements, but are intended to show broadly how text can be divided into meaningful sections.

Language and Style

When preparing a report, it is important to use the right style, language and tone. But what is more difficult to say exactly how this is to be done. Writers must develop a sensitivity to the meanings of words, the effects of placing words in a particular order, and the nuances and connotations carried by these phrases and sentences. They must be aware of the potential effects of their composition upon readers. The result should be 'user-friendly', assisting - comprehension, not getting in the way by creating communication barriers.

For this reason, writing reports is best done with plenty of time to spare for consideration of what is provisionally put down, for assessment, revision and re-assessment; this ideal cannot always be achieved, but it is imperative that at least the final draft be read through in an attempt to catch serious errors and mis-constructions.

Here are some useful hints :-

i) Wisdom goes arm-in-arm with simplicity. Therefore,strive for simplicity and readability.

ii) Be brief; save reader's time.

iii) Do not write to impress; write to express.

iv) Use direct, simple, clear, short and concrete words. Big words are ego things.

v) Exaggerations and overstatements are out of place in technical reporting. Your style must show restraint.

Special, Technical Language

In the selection of vocabulary, care should be taken in the use of words which have specialised meanings particular to the field of information work. What is contemptuously labeled as 'jargon' is often the exact vocabulary needed to refer unambiguously to a set of related concepts. In documents relating to information work, terms such as <u>acquisition</u>, <u>recall</u>, <u>file</u>, <u>store</u>, <u>database</u>, <u>issue</u>, <u>bibliography</u> and <u>memory</u> will be encountered. If writers are sure of their readers familiarity with such terms, there may be no need for any further explanation; but if not then elaboration is essential either in the text or in a separate glossary of terms which is usually placed at the end of the main text.

IDENTIFICATION OF THE SIGNIFICANCE OF CARTOGRAPHIC COMMUNICATION

SALIL CHANDRA KHAN

National Atlas & Thematic Mapping Organisation
Calcutta

INTRODUCTION

The term 'Cartographic Communication' was defined in the 'Multilingual Dictionary of Technical Terms in Cartography', in 1973, as "the process of transmitting Cartographic information". The definition seems now to be too narrow and not precise enough. It seems to be necessary to attempt at a more accurate definition of the concept of cartographic communication.

Information Theory

Information theory had a fundamental influence on the formulation of a modern approach to the role and tasks of cartography, a new research trend called cartographic communication. The French scientist A.A.Moles (1964) was the first to define cartography as specific instance of transmission theory. M.K. Bocharov (1966), who defined cartography as a science concerning a carrtographic form of information transmission, can be claimed to be a pioneer.

Features of Cartographic Communication

Is Cartographic Communication limited to the process of elaborating and reading a map, or to the map maker - map user relation?

Some realisations of the system of Cartographic Communication '- models and communication strings - have been proposed in information theory. But in all of them, independently of terminological differences, the same unchanged arrangement was always preserved : reality map maker map map user image of reality. The fact that in Cartographic communication a map is a career of information entails various semiotic, dodelling and cognitive implications.

The central element in the system is a map, the specificity of which influences the character of other elements. From the point of view of informatics it is treated as a channel with a given capacity. This capacity apart from its material-physical aspects, is conditioned by the user's ability to apply the system of Cartographic signs and method of Cartographic presentation, i.e., generally speaking to make use of a map language on one hand and on the other hand - by receptive ability of map user. That is where semiotic component which regulates the method of enclding information, i.e., of construction of Cartographic expressions, starts to operate. In order for the communication to be realised the semiotic knowledge of a Cartographer must be known to the receiver in sufficient degree. Semiotic efficiency of a cartographic language has strong influence on the capacity of a map. In cartographic communication the information transmission is of intentional character, i.e., a cartographer aims at evoking proper cognitive effects in the receiver. The fact allows us to treat a map as a model; it is thus basically conditioned by two elements : Structure and Content.

Generally in the fields of Library and Information Science the expression 'Cartographic Communication' does not appear in their

their tables, and is not detected among the key words in a cartographic publication.

If we try to set up a Venn diagram of Cartographic Communication (Fig.1), we can see three fields of activities, delimited by the intersection of large fields of interests such as Cargography, Communication and theory to each of which corresponds to a category of specialists.

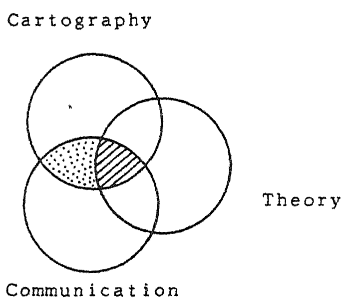

Fig.1 Venn diagram of cartrographic communication

Communication System

In a Communication System there is an input of information which is transmitted by one means or another to a receiver which in turn produces an output. A human being receives information through the senses. This is duly processed in some way, which leads to a change in state or activity. A Computer is supplied with an input of data, which is duly processed according to a program, through which an output can be obtained. Map is a source of information which can be perceived by an user, then presumably it should be possible to analyse the input, transmission, and reception of map information as a 'system'.

Map as Communication System

In this system the messages are transmitted from the Cartographer to the receiver by means of channel of transmission i.e., by means of map.

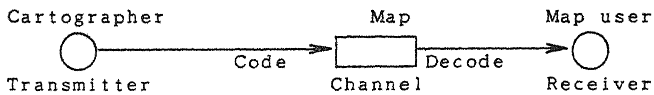

Fig.2 Basic concept of Cartographic Communication

It might be argued that cartographers are in fact involved in the transmission of information as well as meanings. If this position is accepted, the implication is that the communication system analogy is an inadequate model, because it fails to include a major aspect of cartographic communication. A fundamental question relating to the use of maps is not whether they are effective in transmitting information but whether the information communicated is meaningful.

Maps and Meaning

It seems logical that only information which is potentially meaningful to a map user ought to be included on a map. A criterion of meaning can therefore, be considered a first principle of data selection and generalisation for maps; this criterion immediately poses the question of just how a piece of information acquires meaning for a specific map user or group. The more appropriate the context of specific information to the needs or purpose of the user, the more meaningful it becomes.

Maps are essential in military operations, they are no less essential in other activities in which an understanding of interrelationships in space is important. In all kinds of planning and environmental work such understanding is central to the making of good decisions. A map is invaluable in many situations, because it enables a user to see interrelationships among phenomena and to comprehend the meaning or significance of particular elements in relation to the whole; that is their geographic context.

Conclusion

The model of cartographic communication which includes cartographer's conception of reality as an integral element is more appropriate to statistical or thematic maps. A good thematic map is designed to illustrate a specific relationship. The cartographer creates a map to bring out the meaning of specific information. Thematic map is a concerned with conveying meaning or understanding to a potential user, not simply information. A good map is not simply concerned with transmitting information but with enhancing the map user's understanding of reality. Such understanding is possible when the meaning of information is concerned by cartographers.

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COMMUNICATION CHANNEL OF LECTIN LITERATURE

LALITA KUMARI AND SENGUPTA I N

Indian Institute of Chemical Biology
Calcutta-32

INTRODUCTION

Lectins are sugar specific cell agglutinating proteins occurring in large quantities in seeds of various plants and also in animals and micro-organisms. The availability of a large number of lectins with different carbohydrate specificities is the reason for their emergence as well known tools in glycoconjugate and mammalian cell research. The areas where lectins may be utilised are as diverse as bacterial typing to bone marrow transplantation.

The recognition of lectins as a useful and inexpensive tool in biomedical and immunological fields has resulted in the sudden upsurge of lectin literature. It is estimated that since 1973, nearly 15,000 articles (Lis and Sharon 1986) were published on lectins. Though the term 'Lectin' was introduced by Boyd, way back in 1954, upsurge of lectin literature could be observed only after 1975. Development of new methodologies and instrumentation are some of the reasons for this upsurge which were discussed in our previous communication (Kumari and Sengupta 1987).

METHODOLOGY

Bibliography of lectin literature was collected mannually from secondary periodicals, namely, Biological Abstracts, Chemical Abstracts, Current Contents - Life Sciences. To offset the variation in terminology only those articles listed under key word 'Lectin' were collected. The articles published in books, symposia, workshop procedings were shown separately from journal articles. The multi-faced utilisation of lectins in biological and medical research has resulted in the wide scattering of these articles in journals of remotely related disciplines of science. The scattering makes it difficult to trace the relevant literature for scientists and to keep himself abreast of current results. Hence we have attempted to isolate the most productive journals with an aim to aid scientists, documentatists and librarians.

DISCUSSION

The quantitative output of lectin literature shows an ascending curve during 1983-1986 (vide Table I). The explosion of biomedical information regarding lectins during this period has shown the following featurtes (i) definite shift has taken place in the direction of lectin knowledge. (2) Interaction among various disciplines resulting in the thriving of multiple authorship papers. (3) The scattering of information in many specialist journals because of their relevance to many areas like biochemistry, microbiology, immunology, diagnostic pathology and many more areas.

Table I presents the annual output of lectin literature during 1983-86 along with authorship trend. It may clearly be observed that the yearly increase in number of lectin articles is totally reflected in multiple authored articles, whereas single and two authored papers remained almost cnstant. The modern era is the era for collaborative research which is well exemplified in the lectin research papers. Biomedical tools like lectins calls for active interaction among different branches of biology leading to multiple authorship of the resultant research contributions.

The subject contents of some of the prominent reviews on lectins were analysed to understand the growth point of lectin literature. After 1980, the focus no longer seems to be the isolation and characterization, of new lectins but towards unveiling of fundamental molecular processes like translation, location and transportation. Efforts are also being made to understand their physiological function. Lectins have recently gained importance as recognition determinants in various biological systems and hence are generating interest to study pathogenesis of human cancer. Labelled lectins have been proved valuable in their application in histopathology and thereby in surgical pathology. In addition the recent isolation of bacterial lectins become useful in the study of initiation of infection.

In course of our study 2417 articles are found to be scattered in a total of 564 journals devoted to different disciplines ranging from biochemistry, immunology, histochemistry to nephrology, dental

.research and even veterinary science. The severe subject scattering and seepage of lectin articles indicated the wide application of this biological tool in different areas of knowledge. From 1980, it is observed that the number of journals publishing lectin literature has almost doubled by 1986 (vide table II). A close scrutiny of these journals reveals the fact that the growth in the number of journals publishing lectin related articles is not due to the inception of new journals but because of ever increasing scope of application of lectins in various disciplines and as a result more and more journals begin to accept lectin articles.

Table III provides a list of twenty five most productive journals publishing articles on lectins. The predominance of biochemical and immunological journals indicates the importance of lectin in these two branches of biomedical sciences.

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Table I

Authorship trend in Lectin Literature

	No of Articles with 1 Author	No of Articles with 2 Authors	No of Articles with 3 or more Authors	G.T.
1983	62 (11.8%)	153 (29.2%)	309 (59%)	524
1984	82 (14.3%)	163 (28.3%)	330 (57.4%)	575
1985	62 (10%)	162 (26%)	399 (64%)	623
1986	52 (7.5%)	170 (24.5%)	470 (68%)	695
	258 (10.7%)	648 (26.8%)	1511 (62.5%)	2417

Table II

Increasing in the number of journals publishing Lectin Literature during 1980-1986

	No of journals	%age increse from 1980
1980	160	
1981	169	5.6%
1982	181	13.1%
1983	200	25%
1984	264	65%
1985	271	69.4%
1986	315	96.9%

Table III

Most Productive Journals,publishing Lectin Literature

No	Rank	1983-1986 Title of the Journal	No articles published during 1983-1986
1	1	J Biol Chem	60
2	2	Biochem Biophys Acta	41
3	3	J Histochem Cytochem	36
4	4	Biochem Biophys Res Comm	34
5	5	Histochemistry	33
6	6	J Immunol	29
7	7	Biochem J	28
8	8	FEBS Lett	27
9	9	planta	26
10	10	Plant Physiol	23
11	11	Arch Biochem Biophys	22
12	11	Eur J Biochem	22
13	12	Acta Histochem Cytochem	21
14	12	Infec Immun	21
15	13	Biochemistry	20
16	13	Carbohyd Res	20
17	13	Expt Cell Res	20
18	14	Devt Comp Immunol	19
19	14	J Biochem	19
20	15	Biol Chem Hoppseyler	17
21	16	Brain Res	16
22	16	Cell Immunol	16
23	16	Proc Natl Acad Sci	16
24	17	J Immunol Methods	15
25	18	6 Journals with 14 x 6	84
31	19	4 Journals with 13 x 4	52
35	20	4 Journals with 12 x 4	48
39	21	7 Journals with 11 x 7	77
46-51	22	6 Journals with 10 x 6	60

51 Journals (9% of total journals) — G.T. 738 (34.6% of total journal articles)

AUTHOR'S IDENTITY - HOW TO MAINTAIN?

B. GUHA

Former Professor of Lib & Inf Science
Benaras Hindu University
Varanasi

Authorship of published works has been considered something venerable at all times in all societies. Among the most respected personalities of most of us, surely quite a few names will be authors who have produced philosophical, literary or scientific works of some significance. Some persons are truly immortal because of their authorship. This is very much true of authors of books wherein some ideas or studies were expounded in considerable detail. In certain cases a single book often contained the findings and observations of the life long work of the author. In fact, most of the earlier scientific books were of this nature. This tradition must have contributed greatly in creating the immense respectability that is usually attached to authorship.

This practice of putting everything in the form of a book has changed. Scientific communications appear more often now in shorter forms as articles in periodicals, papers for conferences, technical reports, or even as short communications and letters in scientific periodicals. This change in the nature and format of contribution was necessary, as is well known, because the scientific community needed a quicker medium of communication, wanted quicker response from the peers, and also was eager to have method for establishing priorities in specific areas of research. Although the nature and format of communications changed, the respectability of authorship has largely been maintained. In fact, some will even maintain that the authorial respectability has increased now and this is directly reflected in the publish or perish culture in the scientific community.

Authorial respectability is also reflected by the fact that many documents that are produced are intimately associated with the names of their respective authors. Very often they are asked for and retrieved by the names of authors. Most of the cataloguing codes, therefore, provide detailed rules on the choice and rendering of names of authors.

Apart from providing a sure and unique identification tag for a document, the name of the auhtor has to perform another important function. For those who want to follow or study the development of a subject more closely, it is necessary to identify the significant contributions made, assess the impact of each one of them and establish their sequence, so that a pattern of orderly brick laying is brought into relief. This is best done when each contribution or new idea and its subsequent modification is clearly linked with the name of a person or author. It is for this purpose that the healthy practice of referring a new idea or invention by the name of its contributor or inventor has come to stay. Raman Effect,. Parkinson's Disease, Kahn test are all good examples of such eponymic names.

This function has attained considerable importance with the advent of citation indexes, where the main approach to retrieve relevant and recent papers on a subject is through the name of an author and a known document. To be able to do this it has become all the more necessary that the identity of a document is clearly established. Only then the approach of the citation indexes can work effectively. In this context it would be worthwhile to consider here the impediments that are being faced in the clear identification of authors.

Firstly, scientific research, as is well known, has become mostly team work . This is very much reflected in the presence of more number of authors per document, especially in articles in periodicals. One can argue that the credit for authorship is equally shared between all the authors in such cases. But, for retrieval purposes the name that is mentioned first assumes greater importance.Hence, it is expected that authors should take care to mention first the name of their colleague in the team whose involvement in the work has been significant. Secondly, it is also desirable that the name of the person who is likely to continue the study of the subject in the future should consistently be mentioned first. This will allow easy retrieval of a group of papers on the same subject by the same name. This is of special significance in the context of citation indexes.

However, the prevailing practice on the above issued appears to be different from what is desirable. Very often the names of multiple authors in a document are mentioned in a sequence which suggest more the hierarchy or status of the authors than their actual involvement in the work. Thus, the name of the head of a research institution or a senior person, a teacher or research guide is often mentioned as the first author. The name of a junior worker whose involvement in the work has been substantial may appear towards the end of a team of authors. Such a practice hides the identity of authors in two ways. Firstly, documents are tagged with a name on whom the authorial responsibility does not rest in the true sense. Secondly, because of this practice, the same person becomes associated with a number of teams and hence a number of documents whose contents are not exactly in the same specific field. From retrieval point of view this means author approach to related documents will become less effective. This will be specially so in citation indexes, where this is the only approach available. A group of cited documents coming together under the name of an author may not be found all relevant for the purpose of search on a very specific topic.

The citation indexes, in which the identity of authors is so important, and also a number of other indexes that are computer produced have unfortunately introduced another element of uncertainty in the identification of authors names. For ease of handling in the computer very often a fixed field of about 15 to 20 character spaces is used for accomodating the names of authors. This necessitates naturally the conversion of all forenames into base initials only and even after this drastic economy the surname or the substantive name of the author may get truncated in some cases. Consider, for example, a name like 'PVR Anantapadmanabhasayanam'. Surely this will be truncated beyond recognition when made to squeeze into a fixed field of 16 characters or so. Even when the names are fully accomodated, with forenames as initials, there still remains a source of confusion. Consider, for example, a simple and unsuspecting name like AK Bose. This form of the name can actually stand for one Arun Kumar Bose, who works in the area of nuclear physics, or for Ashok Kumar Bose, whose area of specialization is thin film physics, or for Anil Kumar Bose, who is well known for his work in the field of Immunology. Thus, the rendering AK Bose hides the identity of several authors.

In the light of the above discussions, it would be evident that to maintain the identity of authors, the scientific community or the authors themselves, the publishers and editors, and all those who handle bibliographic data and produce bibliographic tools have certain responsibilities. The scientific community or the authors have to change the prevailing practice of mentioning the names of a team of authors. Apart from creating difficulties in retrieval of documents, this practice is likely to devalue the authorial responsibility also. The authors should mention also their names in full. Publishers and editors can, perhaps, suggest the authors about possible change in the sequence of the names at the time of acceptance of a contribution. Those who handle bibliographic data and produce bibliographic tools should give more importance to the names of authors in the entire citation by fully accomodating the names. Identity of authors is much more important than the slight benefit that may be gained by the use of a fixed field of very limited length.

EFFECTIVE PRIMARY COMMUNICATION - A CASE STUDY OF THE JOURNAL OF SOLAR ENERGY SOCIETY OF INDIA

IDRISA PANDIT AND ASHOK GADGIL

TERI, NEW DELHI

INTRODUCTION

Focus and techniques of Effective Communication :

Without proper communication of new ideas, inventions and discoveries, science would forever be static. Science is called so essentially because it is always in a state of flux. The two principal objectives of research and development programmes are concentrated towards two principal objectives :

1 Advancement of science and technology

2 The expression of scientific thought

One of the primary end products of most research is publications in the form of technical reports, proposals, technical manuals and scientific papers. These publications represent the visible results of r esearch activities. The quality of these publications also depends on the effective communication of their message as well as in the competence of the research results which they embody.

There are several ways and means of communication. Apart from the informal media and in visible colleges, which are a quick way of disseminating new-found knowledge, there are other means which are more effective and permanent, having an archival value.

Effective communication performs a significant role in achieving this-technical communicators and technical editors in particular have a very important role to play. "Technical communication is the bridge between those who crate ideas and those who use them".(1)

The task of a technical communicator is to express coherently and precisely the truth of discovery; i.e. to make the complicated scientific investigations and experiments easily understandable.

The award-reward system in science is inextricavbly linked with effective communication. Publishing in good professional journals not only gives scientists recognition but also earns them feedback on their work, thereby by allowing them to improve/alter orrevolutionize research.

Realising the importance of a good primary source of communication, the Solar Energy Society of India decided to launch a journal, called the "SESI Journal". The aim for starting this journal was to have a good quality referred publication in the field of renewable energy, the first of its kind in India. We hope the quality and standard as well as broad readership will ensure that the senior scientists in the field of renewable energy would publish their significant results in their journal rather than publishing them in foreign journals. SESI Newsletter, a quarterly publication (also published from TERI) serves as a current awareness tool which complements the SESI Journal.

For the last 10 to 15 years, the community of Indian solar energy scientists was relatively small and the exchange of ideas primarily took place in invisible colleges, of which not many young enterprising scientists of today were members. Since the membership in the invisible colleges is exclusive, new young scientists were often left out of the picture. This resulted in their being unaware of the status of Indian Solar energy research, success or failure of new concepts under Indian field conditions, thinking in the higher echeleons of the government regarding country's renewable energy policies, funding opportunities for new research projects and so on. The only communication channel available to most of the young solar scientists was in terms of either participantion in the annual convention of SESI or by subscribing to international solar energy journals. Attending the annual SESI Conference is often expensive which they cannot easily afford particularly if she or he has no professional standing in the field. International solar energy journals are expensive and are not easily available in most libraries. The Indian Journal, however, is inexpensive, 'available' to all members of SESI, and we hope affordable to most libraries. This journal thus will not replace the invisible college but will allow a very large group of scientists and practitioners, access to some of the first rate solar energy research in the country. The authors of papers in the journal also enjoy a much wider audience within India.

SESI has approximately 600 members, most of them within India. Most of the members of SESI are extension workers, practitioners, engineers in renewable energy industries, decision makers, policy makers and so on. The journal hopes to intensify and broaden the interaction within the community of SESI members and other solar energy scientists, to improve upon dissemination of research to extension workers and policy makers, as well as to improve the interaction between themselves and with the research scientists.

The SESI Journal covers all aspects of renewable energy, including basic science, technology, policy, economics, extension and field monitoring issues. Contributions ranging from research papers to brief notes, letters, and state of the art reports.

The National Solar Energy Convention provides us an opportunity to solicit manuscripts for publication. Most of the authors of good quality papers presented at the Conference are requested to submit expanded manuscripts. To obtain material for the first issues, we wrote to about 200 selected authors soliciting manuscripts regarding their briefly reported research at the recent annual conventions of SESI. Howeve, the flow of contributions since then has been very smooth, particularly after the dissemination of the first issue of the journal.

To initiate the journal involved, writing to several researchers regarding their interest in on-going research policy known to us, based on papers presented at the Convention.

The next difficult task was to prepare a roster of referees. We found that the choice of referees is one of the crucial requirements for the success of the journal. Most of the academic scientists and researchers who acted as referees not only provided good and critical reviews of the manuscripts, but also helped in promoting the journal. The appraisal form accompanying ech manuscript required the referee to answer several questions, in addition to provide a critique in his or her own words. This appraisal form required the referee to assess the manuscript in terms or originality, computational accuracy, soundness of assumptions, clarity of presentation and style, repetition of previously reported work and to identify whether or not a particular manuscript qualifies for an honour award.(in top 10 per cent of the publications the referee has read in the last 12 months). Several referees wrote us complimenting in the thoroughness required in the referee process and expressed interest in submitting manuscripts themselves. There were, however a few instances of bad refereeing delays in returning the manuscripts on time, neither reviewing the paper nor intimating promptly their inability to do so, and personal conflicts and ego problems. Spineless refereeing where absolutely no specific critique of the manuscript is made, and on the other hand refereeing with a vengeance where a referee tries to run down not only the manuscript but the author, are some of the problems we have already faced. As a journal policy, the authors' names are supplied to the referees along with the manuscript to enable them to place the work in context. However, the referees names are carefully guarded from the authors. The authors do have an opportunity to provide rebuttals to the referees critique and in case of conflict the editors either refer the manuscript to a third referee or take a decision based on their judgement and experience. There have been a few cases where the referees identity has become known to the authors. In one case the referee's critique went into such a personal detail of the author's style of work that the author could easily guess the referee's identity. In another, the referee met the author at a conference and tried to win the author's fvour by decribing how favourably he had reviewed the manuscript.

The rarest manuscripts which we receive are those which have good content and good English. These are usually authored by researchers who already have experience in submitting papers to international journals. The second kind of manuscripts, most common for SESI-Journal, are those with good content but poor style of writing. We almost rewrite these manuscripts as required. Some of them have to be entirely rewritten while others may need major editing. In every case, the revised manuscripts are sent back to the authors for their approval. So far we have never come across the third kind of manuscript which have had content and good style. The fourth kind of manuscripts with bad content and poor style are fortunately rare.

The objectives of the journal, as wee see them, are manifold. Most important of all, the journal accelerates and broadens the exchange of information among solar energy scientists and practitioners. Another important function of the journal, as we see it, is to help young scientists and practitioners of solar energy in improving their standard of work, analyses, and technical communication.

'It gives respectability and prestige to analyses of dissemination efforts which otherwise would have remained in journals of social scientists and would never have come to the attention of policy makers in the government. For this reason, the editorial team tries, as far as possible not to reject manuscripts outright. If the problems with the manuscript are merely of presentation and style, we spend the necessary effort and time to state the message clearly and succinctly. If the manuscript suffers from lacunae in the research method or analyses, we encourage the author(s) to either tone down their claims and conclusions to be consistent with their analyses or to submit the manuscript after undertaking the necessary additional work. As far as possible we encourage the authors to resubmit their manuscripts (if necessary several times) rather than reject them outright.

Sometimes authors may get discouraged by an excessively critical comment by a referee to the point of wanting to withdraw the manuscript, even if the referee has in the end recommend it for publication. In such cases, we have written to the authors not to take the referee's remarks personally, and should only consider what is technically relevant. They should not withdraw the manuscript since the decision of the editors regarding suitability for publication is final.

The solar energy exploitation in a country cannot become successful by academic research alone. For this purpose, the journal has endeavoured to give a place in its pages to reviews and critiques renewable energy policy, dissemination efforts, and monitoring and maintenance programmes for renewable technology equipment in the field. The renewable energy industry also plays an important role in solar energy exploitation. For this purpose, the journal has decided to accept a very limited number of advertisements from the renewable energy industry so as to help it grow.

From the numerous letters received by the editors, and by various personal discussions with solar energy researchers and practitioners, the response to the first issue of the journal has been very positive. Since the first issue was disseminated, the rate of submission of manuscripts has increased. We have also received favourable remarks regarding not only the quality of work reported in the journal but also on its technical style, the thorohghness of the review process and even on the get up.

Inspite of our best efforts it is certainly possible that a few manuscripts reporting results already published elsewhere, and a few manuscripts of perhaps less than the desired quality would find their way in the journal. This is possible because of the necessarily limited exposure of the referees and the editors to everything that is being published. We shall try our best , however, to maintain quality and standard of publications in SESI-Journal in the future.

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MAKING EFFECTIVE PRESENTATION

SPEAKER : MR. T. SURESH KUMAR
REGIONAL MANAGER

Technova Graphic Systems Pvt Ltd.
Lakshmi Villa (1st floor)
100, Park Street, Calcutta-700 017

Before giving a presentation we should be aware of the type of people we are communicating with. What they already know, what they need to know and how they are likely to react.

The best way of making an interesting presentation is to present the points we are going to speak on in a logical sequence and by using visual aids to gain their involvement.

A lot depends on one's appearance and dress, stance, voice and pronunciation. All these help to keep the interest of the group alive.

The theme should be presented in terms of audience needs and the main points to be covered should be outlined. Examples and stories should be quoted with a bit of humour. Visual aids should be used and the audience involved where possible. The talk should end with punch and precision.

THE PERFORMANCE OF MODERN SCIENCE AND TECHNOLOGY IN INDIA : THE CASE OF SCIENTIFIC AND TECHNOLOGICAL JOURNALS

C.N. KRISHNAN and VISVANATHAN
I.I.T., Madras

It will be merely stating the obvious to say that the overwhelming majority of researchers in the leading scientific and technological institutions, laboratories and universities of our country have a rather poor opinion of our Science and Technology (S and T) journals. Most of them would not think of publishing their findings in Indian journals if they have any way of getting them published in journals abroad. It would be generally believed that if some one has published a paper in an Indian journal, it is because the same could not be published in any foreign journal; in other words the quality of the paper should be quite poor. While there undoubtedly are exceptions to this, the above would generally be the opinion about Indian S and T journals shared from the juniormost research scholar to gthe seniormost professor. It also seems to be the case that many of our better-known scientists would not at all think of it as an honour to be associated with most of our journals as a referee or member of the editorial board. No data or analysis is needed to establish the veracity of the above statements as a rule, and it is something of a mystery as to why we continue publishing these journals when most people involved with it - those who write for it, those who edit it, those who publish it and finally those who read it - have such a low opinion of it!

This is not to say that we have done nothing significant in this regard so far. Like in most other fields, India since independence has made, in quantitative terms, remarkable strides in the area of S and T journal publishing. S and T journals in India are published largely by Academies, Institutions, Universities, Research Laboratories and Government Departments, and this is believed to be an important activity of our S and T community as a whole. From about 725 in 1964, the number of S and T periodicals in India has steadily grown to 1593 in 1975, and 1891 in 1982. It is believed that we were publishing about 2000 of them in 1985[1]. This number includes popular science magazines, reports of R and D establishments etc, and by a stricter definition of scientific-periodicals India produced 488 of them in 1985. These journals are the ones covered by Indian Science Abstracts (ISA). The 22,000 papers published in them in 1984 have a break up as follows; 29% in agriculture, 21% in medical sciences and 16% each in biological sciences, physical sciences and engineering sciences. India alone produces about half of the S and T output of the entire third world in terms of publications. And unlike many third world countries, India's research publications covered all areas in which research was being conducted in the advanced countries. A recent publication of the CSIR [1] notes :

"India accounts for about 3% of the world's scientific literature output, and about half of the entire Third World's. In terms of the numbe4r of papers published in more than 4000 of world's leading scientific and technical periodicals, India occupies the eighth rank after the USA, the UK, the USSR, Japan, France, West Germany and Canada. Clearly, India is not merely the undisputed leader of Third World Science, but also occupies a respectable place in the world of science as a whole".

There is no doubt that we have built up considerable expertise and infrastructure in the area of publication of S and T journals; it can be said that we have become quite mature in this field. We can now take stock of our performance in this field by asking certain questions: How good are our S and T journals as compared to those of other countries? How do our S and T workers as well as the world S and T community evaluate them? What is the picture of India's S and T activity that these journals portray? To what extent do our S and T workers communicate with one another through the medium of our journals? Do these journals help in giving a national identity to our S and T community? And so on. The present situation is that, unfortunately we do not possess any satisfactory answers to these questions at all; we have done very little analysis and investigation in our country on these questions. We have not even built up a data base of our own regarding the output of our scientific research in various areas. Even the Indian Science abstracts only give data about publications in Indian journals, and there is no way to know as to what has been the total output of research work done in India in any given field. In the absence of a comprehensive data base we do not have a realistic assessment of what it is that we have achieved in scientific research so far. While pointing out the urgent need for building up such a data base and undertaking extensive analysis of such data, the purpose of the present paper is limited to a critical examination of the conclusions that seem to follow from the already existing data and analysis on the question of Indian S and T journals.

Scientific and technological journals are universally accepted to be a vital element of modern S and T activity. This is the single most important medium through which researchers communicate and interact with one another, and they have great influence on the nature and direction of S and T research being carried out. they play a major role in defining a community of research workers - according to their field of specialisation, language and nationality. As the journals are, like Academies etc, organised largely on a national basis, they also serve the purpose of giving a national identity to the different scientific communities. It is generally the case that the productivity, purposefulness and originality of the S and T research done in a country can be quite relably gauged from the S and T journals in a country. thus an analysis of the quality of journals in a country is a very important way of comprehending certain vital aspects of the S and T activity of that country. It is with this purpose in mind that the present investigation of Indian S and T journals is being attempted.

The present study deals primarily with the question of how good our S and T journals are, and what can be done to make them better. We are not addressing ourselves here to questions of the relevance or otherwise of much of the S and T research work being undertaken in our country at present. While such questions are undoubtedly important and should be dealt with in detail, we are here limiting ourselves to looking into the question of how well we have been doing in whatever we seem to have set out to do - specifically on the issue of our and T journals.

As mentioned earlier, there are only a few studies that, to our knowledge, deal with the question of our S and T journals [2-9]. All these studies have been patterned after the methodology of citation analysis evolved by Eugene Garfield and his Institute for Science Information (ISI), U.S.A., who are also the publishers of "Current Contents" and "Science Citation Index". In fact it is not only the methodology that has been supplied by Garfield, but also the data base used in these studies of our journals is largely the one assembled by ISI. The methodology of citation analysis relies primarily on three parameters for the evaluation of an article or a journal - the impact factor, the immediacy index and the percentage citedness.* ISI makes it clear that the primary purpose of its analysis is to determine how well a paper or a journal or a country is able to make contributions to what it calls the international body of scientific knowledge. It should also be clear at the very outset that ISI is not concedrned primarily with S and T in the third world; its concern is with what it calls the international science. A look at the 1973 data base of the

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* The impact factor of an article is the number of times that article is cited by other articles in a specified time period. The impact factor of ajournal is the averge value of the impact factor of all the articles in that journal. The immediacy index of an article is the number of times that article is cited in the same year of its publication. The percentage citedness of a journal is the ratio of the articles in that journal that are cited to the total number of articles, expressed as a percentage.

Table - 1

1973 ISI Data Base : Data from [2]

Country or Region	% of articles by country of publication	Impact of Journals	% of authors by nationality	Impact of authors
U.S.	48	6.9	43	6.9
Developed Commonwealth	16	5.5	16	5.9
Western Europe	15	3.4	17	4.6
Japan	3	2.9	4	4.1
Scandinavia	2	7.6	3	7.4
U.S.S.R	6	1.4	7	1.6
Eastern Europe	3	1.9	4	2.5
Third World	2	0.8	5	2.3

ISI, for example, makes this quite clear. During this year, the ISI scanned a total of 3000 journals, of which only 52 (less than 2%) were from the third world; of the 353,000 articles it analysed in that year only 16,000 (less than 5%) were from the third world.* Columns 2 and 4 of Table 1 give the composition of the ISI data base as of 1973, and it is quite certain that there would not have been any major change in this pattern since then. as seen from this table, about 80% of the articles came from the USA, the Developed Commonwealth, Western Europe and Scandinavian Countries - it is the science done in these regions that is termed international science** As far as the representation

* All the data and analysis cited here are with the exclusion of China.

** That this so called international science is completely dominated and controlled by a few countries is quite well known and well documented, See, for example, Frame, Narin and Carpenter [12].

of India in this data base is concerned, it amounted to about 30 journals out of a total of 52 journals from the third world; of the 16,000 articles from the third world included in this data base. 7888 were from India, thereby making India the eighth largest country in terms of scientific output. It is significant that only about 35% of the 16,000 third world articles were actually published in third world journals; the rest were published in journals of the developed countries.

Whatever be the criterion used in generating it, it is a fact that the SI data base under represents the scientific output of India (and also of Japan, USSR and the entire third world) and is skewed in favour of the USA and UK. This should be borne in mind while evaluating Indian S and T journals on the basis of this data. The important conclusions that seem to have been arrived at on the basis of analysing this data are briefly summarised below [2-9].

1 India stands eighth in the world in terms of the quantum of scientific output and contributes about 3% of the world scientific output. Half of the scientific output of the entire third world comes from India; India also accounts for more than half of all scientific journals published in the third world. The range and scope of problems tackled by Indian scientists are way ahead of those done by other third world countries and comes very close to those of the advanced countries.

2 In terms of its impact on world science, India's scientific output is of rather poor auality. An impact factor of 2 (calculated for the period 1973-78) that an average Indian paper had, was not only low in comparison with advanced countries (US had 6.9, UK 6.3 FRG 4.6 and Japan 4.1), it was even lower than those of about 30 other third world countries. There were over 27 countries from the third world whose output, though numerically small, had an impact factor more than 2.5.

3 Even though Indian journals had the highest impact factor (1.1) amongst all third world journals, it was quite poor compared with most journals of the developed countries. U.S. journals had an impact of 6.9, Developed Commonwealth journals 5.5, West European journals 3.4 and Japanese journals 2.9 (see column 3 of Table 1).

4 The poor quality of Indian journals was also evident in many other respects. For example, (i) most of the references made to Indian journals are only by Indians, and the rest of the world S and T community hardly seemed to take any serious notice of them, (ii) more than half of the references made in Indian journals are to papers that are more than 10 years old and (iii) Indian journals have very poor inter-disciplinary content.

There are two broad aspects to these conclusions - one, that the quality of our scientific output is itself quite poor, and two, that our journals are quite poor. Regarding the first point - from what has been said about the nature of the data base and the methodology of analysis employed, it should be clear that the above judgement of India's scientific output is only from the point of view of contributions made to the so called international science. That our scientific research or our scientific journals do not have any significant impact on world science, or that the world scientific community does not perhaps think too high of our work, need not by itself have caused us much worry if our S and T community had seen itself as working towards some other identified goal. For example, if it were the case that our S and T community saw itself primarily as working towards fulfilling our country's needs and not being overly concerned with making contributions to world science, then such an evaluation could perhaps have been dismissed as being of no great consequence. But as is well known, this is perhaps not the case, and being a part of the international scientific enterprise and making significant contributions to it have all along been claimed to be a vital dimension of all our S and T efforts. It is for this reason that our S and T community has all along stressed the need to have English as the language of S and T education, have intimate links with Western S and T establishments, have our scientists pay frequent visits to foreign S and T institutions and laboratories, have foreign experts to advise us on our S and T matters and train our scientists, have the latest facilities imported from abroad, publish mainly in foreign journals, etc. For the sake of being considered a part of the international S and T community, we even choose most of our reserch problems from abroad!* Such being the case, an assessment that our contribution to international science is of rather poor quality ought to be a matter of serious concern. It ought to make us take a fresh look at our notions about modern S and T being a truly international activity in which all can participate equally and from which all can benefit equally. It certainly calls for efforts to have a proper comprehension of the true nature of the modern S and T order so that we are able to work out ways and means by which we can participate in it on not so unequal (and even disgraceful) terms as exist now.

There is one thing however that, needs to be pointed out regarding such conclusions on the quality of India's scientific output. Even though the 8000 Indian papers as a whole had an impact factor of only 2.0, about half of them were in Indian journals with an impact factor of only 1.1. This means that the nearly 4000 Indian papers appearing in foreign journals had an impact factor of about 3. In a similar way, it can also be seen from data given in Ref.(2) that even though Indian articles as a whole had a percentage citedness of only 58, those published in foreign journals alone had percentage citedness of over 66.

* A recent study has shown that about 90% of all references cited in Indian journals are to articles in foreign journals [3].

Thus our research output as such is perhaps not as bad as it is often made out to be. Moreover the extent to which these factors are adequate measures of the worth of the S and T output of a country is also an open issue. for example, it will be seen that on the basis of such an analysis the scientific output of say USSR is shown to be of much poorer quality than those of even the entire third world!(See table 1). Further, the fact that countries like Bermuda, Liberia, Jamaica and thailand had impact factors higher than those of US and UK would not possibly be interpreted to mean that these countries are doing better modern science than US or UK. It is quite evident that they ideal internationalism and democracy of science, devoid of any bias, do not perhaps operate here, and the question of who cites whom is obviously influenced by considerations other than pure merit. It is necessry to remember these limitations and baases that are inherent in such analysis while interpreting their results.

The second conclusion, viz. the one relating to our S and T journals, should however be examined more seriously.

III

As far as the third world journals are concerned Table 1 again has an interesting message. It shows that even though about 5% of the research work came from the third world, only 2% appeared in third world journals. That is, about 60% of the scientific output of the third world finds its way to journals of the advanced countries. In contrast, only 5%, 12%, 20% and 33% of the scientific outputs of France, Western Europe as a whole, Japan and Germany were sent to journals published outside these countries [11]. No other country or region suffers such high a drain of its scientific output.

A consequence of this drain is also evident from Table 1. While the third world scientist as such had an impact factor of 2.3, the third world journals had an impact facgtor of only 0.8*. Data for central and South America is even more revealing [11] - 85% of the output of these regions went to foreign journals and this resulted in their own journals having a poor impact factor of 0.6 while the scientists from these regions themselves had an overall impact of 2.9

As far as India is concerned, our journals received only 44% of our scientific output - the rest went to foreign journals [2]. The consequence of this was that while Indian research output published abroad achieved an impact factor of about 3 our own journals could achieve only 1.1. Studies have consistently shown that more than half of India's scientific output is sent abroad. Rangarajan and Gupta [7] for example have shown that in Physics. about 62% of our output goes abroad.In this regard at least, the undisputed leader of third World Science[1] is not setting an example worthy of emulation!

It should be quite obvious from the above that Indian S and T journals are quite poor today not because the science done in India is as such very poor; this is so because most of the output of our research is denied to our journals. This is indeed a situation that ought to be, and can be, improved significantly.* for that we should find out more details about how such a situation has come about. For example is it that our younger researchers are more "foreign crazy" and they are refusing to follow the patriotic examples set by the senior scientists? Is it a case of our younger generation going astray?

* It is also seen from [2] that while 19 journals from the developed world published more than 50 articles each from the third world, 17 of them had an impact lower than the impact of the third world articles published in them. That is, contributions from the third world went into boosting the impact of these advanced country journals.

What sort of traditions were being set up by the peers of Indian science and leaders of our scientific community? We present some representative data that throws some light on these questions.

Indian National Science Academy (INSA) has brought out data relating to the publications of those scientists who were its Fellows in 1986 [13]. Each Fellow was asked to give a list of what he or she considered to be their important contributions to science. Out of a total of 530 Fellows, 441 responded, each giving a list - about 15 papers on an average. Table 2 gives the result of an analysis of this data. It is seen that in no discipline did the Fellows contribute even half of what they considered to be their important papers to Indian journals, the average figure being 34.4% which is even considerably poorer than the national average of 44%. This data is quite significant

TABLE - 2
Publication Profile of 1986 Fellows of INSA
(Numbers in bracket are percentages)

Subject	No of Scientists	Total Publications*	Indian Publications	Foreign Publications
Mathematics	37	527 (100)	159 (30)	368 (170)
Physics	64	966 (100)	201 (21)	765 (79)
Chemical Sciences	67	1091 (100)	283 (26)	808 (74)
Engineering & Technology	43	670 (100)	245 (37)	425 (63)
Earth Sciences	41	660 (100)	327 (49)	333 (51)
Plant Sciences	47	846 (100)	353 (42)	493 (58)
Animal Sciences	30	509 (100)	174 (34)	335 (66)
Medical Sciences	44	792 (100)	284 (36)	508 (64)
Agriculture, Animal Husbandary Fisheries	37	616 (100)	272 (44)	344 (56)
Total	410	6677 (100)	2298 (34.4)	4379 (65.6)

*See Text for explanation.

for two reasons; one, the data refers to what the authors themselves thought to be their important papers. Thus, even though the national average is 44%, it is likely that these do not include the more significant contributions.* The second significant thing about this data is that it refers to 441 of the top scientists of our country who are playing a major role in providing guidance and leadership to all our S and T activities.

We also gathered some representative data regarding our scientists who are associated with some of our journals. This is shown in Table 3. For Physics, the sample was those scientists who were on the board of editors of two of India's leading Physics journals - Pramana and Indian journal of Pure and Applied Physics - for the period of 1975-85. The data pertains to their publications during the period 1983-85 (3 years). For Chemistry, the sample was those scientists who are presently on the board of editors of two of India's leading Chemistry journals - Indian Journal of Chemistry (Section A) and Indian Journal of Chemistry (Section B). this data pertains to their publications during the period 1984-85 (one and a half years). It is seen that these two groups of scientists contributed only 32% and 30% respectively of their papers to Indian journals. In other words, even those who are in charge of improving the standards of our journals do not seem to have any larger commitments towards them. It should also be remembered that editors of journals are generally senior scientists who are leaders in their respective areas.

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* Here again, it is pointless to expect that meaningful suggfestions in this direction would be given by others. In this connection it is worth noting that one of the suggestions given in Ref.(2) for improving the impact of third world science is that they include a scientist from the advanced countries in all their research teams! Other suggestions are equally helpful - Latin americans should publish their journals from New York for Philadelphia; the French and the Russians should stop publishing in their respective languages and switch over to English, etc. [10].

TABLE - 3

(See Text for Explanation)

Subject	No of Scientists	Total Papers	Indian Publications	Foreign Publications
Physics	68	514 (100)	169 (32)	345 (68)
Chemistry	23	213 (100)	64 (30)	149 (70)

IV

That our S and T journals are in a poor shape is not merely a matter of national prestige; it has serious repurcussions on the functioning of our entire S and T community. in a sense it merely reflects the state of affairs on our S and T front. For one thing, our journals today do not serve as an effective medium of communication among our S and T workers, which is what the primary role of a journal is meant to be. Whatever communication exists amongst our scientists seem to be routed through the medium of foreign journals. Such a situation does not help in the emergence of an S and T community with a national identity. Secondly, the present situation of our research output being scattered all over the worlds journals prevents us from having an overall view of what exactly is being achieved by our scientists. For example, if most of our output in any area, say computer science, were available in a few Indian journals devoted to this area, then it should have been easy to make an assessment of what our capabilities in this sphere are. It would then have been easy to identify our strengths and weaknesses, and take corrective actions required if any. In fact it appears that because our research outputs in all areas are lying scattered the world over, we often end up having a much poorer assessment of what we are doing than is genuinely warranted. There is no doubt that if our journals gave a true picture of the state of our research output, our S and T community as a whole would have a better image of itself. The world too would probably have taken a different attitude to us.

Today, research problems are mostly chosen from the consideration that the results of working on them can find acceptance in foreign journals; in other words, the problems are of relevance to them. Once such a compulsion is removed, it is likely that we might turn our attention to those problems which are of greater concern to our country. In the process it is also likely that we might be initiating research work along altogether new directions and thus making fundamentally new contributions to the pool of world's knowledge. Another consequence of changing over to publishing primarily in our own journals would be that our scientists would begin to take one another more seriously. By making Indian scientists more responsible in assessing one another's work, this would also enhance the collective sense of dignity and self respect of the entire community as such.* And lastly, it is quite obvious that through this process we would be able to change the present situation of having hardly any journal of international standing. If the substantial part of our research output is presented through the medium of Indian journals, there is no doubt that in a short while we would be having a number of Indian journals of high international standing. In short it can be argued quite convincingly that if our scientists become seriously committed to publishing primarily in our own journals, we would be heralding a major change in our entire S and T activity.

There is no doubt that there are serious difficulties associated with publishing primarily in our own journals now. One major problem is their very poor circulation. The circulation figures pertaining to the journals published by the Indian academy of Science will be quite representative in this regard.** For a comparison, the circulation figures of "Nature" and "Science" are in excess of 60,000 and 150,000 respectively.

Other difficulties include lack of proper and rigorous refereeing procedures, uncertain periodicity, absence of journals devoted exclusively to highly specialised areas, long delay between the communication of a result and its appearance in print, poor quality of production, etc. Publishing in Indian journals today does not get one the recognition that one gets by publishing in foreign journals,

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* It is generally believed that many of our scientists are not too fair and unbiased when it comes to assessing the work of one another - it is often believed that refereeing is much fairer and objective when done by a foreign scientist.

** This data is as on Dec. 1985. We are grateful to the Indian Academy of Sciences, Bangalore, for making this data available to us.

Table 4

Journal Circulation Figures

Sl	Name of the Journal	Subscribers Ind.	Subscribers For.	Exchange Ind.	Exchange For.	Fellows etc.	Total
1	Proceedings (Chemical (Sciences)	197	195	69	146	120	727
2	Proceedings (Earth and Planetary Sc.)	190	195	74	147	74	680
3	Proceedings(Mathematical Sci.)	183	195	74	147	71	670
4	Proceedings(Animal Sc.)	221	185	70	138	80	694
5	Proceedings (Plant Sc.)	280	185	77	139	95	768
6	Sadhana	156	95	33	16	104	404
7	Pramana(Journal of Physics)	219	145	49	67	208	688
8	Journal of Biosciences	171	85	84	16	204	560
9	Bulletin of Materials Sc.	90	85	74	13	98	360
10	Journal of Astrophysics and Astronomy	50	245	73	26	98	492
		1757	1610	677	855	1152	6043
	Current Science	1280	260	100	60	-	1700
	Total	3037	1870	777	915	1152	7743

while all this is true, it is equally obvious that things will not improve unless something is done about them. And it is equally obvious that the initiative for this will have to come from our senior scientists. That we do not give the better part of our research output to our journals is not merely the consequence of our journals being poor; it is the very cause of it. While it may be true that our junior scientists would be taking greater risk by not publishing abroad, the same cannot be said of our senior scientists - they have already acquired international standing and recognition. They should be willing to make the 'sacrifice' of increasingly diverting their publications to Indian journals. Once a sizable number of our senior scientists start publishing more of their important works in our own journals, there is no doubt that the appearance of our journals would change dramatically. Once the leadership of our S and T community start taking greater interest in our journals, there should be no difficulty in getting the required financial and other support for the better running of at least some of our major journals. Once an analysis of our current levels of productivity and resources in different areas of scientific research is made, it should be possible to arrive at an assessment of how many journals of high standing, and in which fields, we can aim for immediately if the major portion of our output in these fields are made available to them. We should also examine the factors that have made at least some of our journals better known today. Why a journal like Pramana that was started with high hopes did not fulfill all the expectations should also be examined. Learning from our past experiences, both positive and negative, it should be possible for us to make a major beginning in this direction now. We should also be able to learn from the experience of other similarly placed countries such as China who have steadfastly strived to achieve a national outlook in all their S and T efforts. It is quite likely that nothing dramatic will happen overnight. We may have to go through a period when we may even be accused of "putting the clock back", "cutting oneself off from the international main stream", etc. But there is no doubt that if our S and T community (particularly its leadership) shows the vision, confidence and patriotism, we would within a few years time be producing a substantial number of S and T journals that the world would be compelled to take note of. After all, the fact that countries like France, USSR or China publish their journals in their own languages (and not in English) does not stop their significant scientific achievements from being known the world over. We have less to fear on this count as we are already doing all our scientific work in English. Whatever may be the price that we may have to pay in the interim period. there is no getting away from the fact that without such bold and determined measures, there is no way in which the condition of our S and T journals can be improved significantly.

V

Having stated the above in such detail, it should be immediately admitted that none of these are particularly new revelations! In fact the case for having our own journals and our scientists publishing in them can perhaps not be better expoused than in the words of C.V. Raman himself. While founding the first of our modern scientific Academies, viz. the Indian Academy of Sciences, Raman wrote in the "Current Science" of May 1933:

> "It is true that individual scientific workers in India have by their indefatigable industry achieved great distinction for themselves, but the prestige of both official and non-official research is still slow in attaining that status of international importance reached by most European countries. This unsatisfactory position is in our opinion partly due to the tendency of many scientific men to export their more important contributions for publication in foreign journals, with a proportionate impoverishment of Indian archives. Perhaps if the resources of an all India journal such as we contemplate in connection with the academy of Science had been available for giving Indian scientific work suitable international publicity, the outflow of memoirs from the country would have been more restrained and less voluminous. Continuance of this practice will retard the process of building up a scientific tradition for India and keep her in a position of semi-dependence in the world of science. While the foundation of the scientific reputation of a country is established by the quality of work produced in its Institutions, the superstructure is reared by the national journals which proclaim their best achievement to the rest of world. Manifestly the edifice of science in India is incomplete. If scientific contributions from countries which possess national journals are also sent abroad, let it be remembered that they represent a surplus, broadcasting the embellishments of their own national organisations. It is true that the spirit of science and its service are international but is it not also true that every nation has its own academies, learned societies, magazines and journals? India will have to organise and develop her national scientific institutions before she can enter

into the commity of international scientists". (emphasis added)

That our S and T activity should be organised primarily as a national enterprise for it to be productive and creative seems to have been abundantly clear to Raman. That such an attitude did make our scientific journals achieve high standards internationally is evident from the following statement by one of our information scientists [5]:

> "A generation ago, when C.V.Raman was alive and active, proceedings of the Indian Academy of Sciences used to be among the most quoted journals of the world: Section-A was ranked 30th and 52nd in the 1944 and 1954 lists, respectively, of the most-cited physics journals of the world. Indian journal of Physics, also founded by Raman, was 73rd and 44th in the list of most cited physics journals in 1944, 1954 respectively. Both Indian journal of Physics (36th) and Proceedings of the Indian Academy of Sciences, Section-A (60th) also figured in the list of most cited chemistry journals in 1944, and in fact, were ahead of the journal of the Indian Chemical Society (77th). Incidentally, Raman had also played an important role in the growth of India's leading letters journal Current Science".

In this context it would be quite interesting to see how the scientists oı an earlier era, during the period of our independence movement, saw this question. From the Biographical Memoirs of its Fellows published by INSA [14], we have collected the following data pertaining to the publication pattern of 33 of its Foundation fellows covering different disciplines*:

Nof of Scientists	Indian Publications	Foreign Publications	Total
33	2398 (77)	716 (23)	3114 (100)

It is seen that even in those dys when our journals were ill-supported and ill-developed, these scientists published 77% of their papers in them. And it would be farfetched to conclude that these Foundation fellows of INSA were less reputed scientists than say our present day top scientists. The conclousion seems fairly obvious.

VI

What has been said above on the issue of our S and T jopurnals would by and large apply equally well to all other aspects of our S and T endeavour. The point seems to be that at least a section of our leading scientists of the days of our independence struggle were indeed influenced by a spirit of nationalism in all their thinking on S and T matters. The explicitly imperialist and even racist outlook of the West in the pre-independence days, even in the field of knowledge, seems to have compelled many of even the most modernised and internationalist of our scientists to take such a position. The coming of political independence however seems to have deluded our S and T community into believing that the days of Western domination in this sphere also are over, and that hereafter they can deal with their Western counterparts on terms of equality, comradeship and genuine internationalism. Considerations of nationalism and patriotism soon became unfashionable and unacceptable in all thinking on S and T matters, and an all pervading mist of a naive and unreal internationalism seems to have settled on all our thinking. Labouring under this delusion, our S and T community soon enough found itself reduced to undertaking largely peripheral tasks, and also having to be satisfied with crumbs of recognition and patronising appreciation thrown in now and then. Even though we have in the process built up a huge edifice of modern S and T here, it seems that much of what we have created over these year appear

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* INSA was founded in 1935 by 125 scientists who are referred to as the Foundation Fellows of INSA.

rather unimpressive and peripheral not only to the rest of the world but even to ourselves. Apart from the question of how the world at large as well as our own elite perceive it, it is also quite doubtful whether all this is having any substantially positive impact on the lives of our ordinary people; our S and T community as such seems quite unable to relate itself and its concerns to our society at large in an organic manner. Even though a realisation perhaps exists that something serious has indeed gone wrong somewhere, there is great confusion as to how things can be set right at least now.

With the experience that has been gained by us over the last forty years, we should now be in a position to take stock and make a fresh beginning on the S and T front. The fact that inspite of all our efforts our S and T community hs been assigned a largely peripheral role in the enterprise of modern S and T activity, should make us undertake a serious evaluation of the institution of modern S and T as such, as well as its position in the contemporary world order. We have to acquire a critical understanding of our own regarding the problems and possibilities associated with the institution of modern S and T. We should also acquire a clearer assessment of our resources and capabilities in this regard as well as our present and future needs. Once such an understanding exists, it is possible that even our relatively fragile and unimpressive edifice of modern S and T could be turned into a source of strength, utility and satisfaction for us. An essential and minimum precondition for this would be that the centreof all our S and T activities and concerns would have to be rooted within our country. This requires primarily that our S and T community has to acquire an Indian identity; whatever links it wishes to have with the international S and T community cannnot be at the expense of such a national identity. Far from weakening it, it is certain that such an identity alone can give it the strength and confidence to deal effectively and profitably with the so called international S and T community. This is also the only way our S and T community as a whole can hope to acquire greater esteem and impact internationally. Such an identity would also help it to relate better to our own society by bringing about a greater overlap between the concerns and the idioms of both. Given the background of the heritage in Science and Technology that we have inherited, as well as the talents, resources and concerns of the newer generation of our scientists and technologists, we should be able to bring about such a healthy transformation in a relatively short time period.

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Address for correspondence :

C N Krishnan, PPST Foundation,
No.18, Sri Ram Nagar Main Road
Near IIT Main Gate
Madras 600 113

and

B. Visvanathan, Asst. Professor
Department of Chemistry
Indian Institute of Technology
Madras 600 036

SCIENTIFIC COMMUNICATION IN PUBLIC LIBRARY SYSTEM

V. K. THOMAS

Raja Rammohun Roy Library Foundation
Calcutta

ABSTRACT

Scientific Communication is concerned with the popularisation of science for the general public. Information sought for or disseminated to the rural area, which is the real India and which is catered for by the public library system, is basically scientific. It is because they are mostly on the fundamentals of health, family planning, farming, tools, environment etc. So it is to be stated that communication to rural area through public library system is essentially scientific.

There is, however, a fundamental difference between communication in the special and public library systems. In the case of special library system communication is sophisticated, in-depth and subject-specific. In public library system communication is less sophisticated, broad-based and people-specific. The former is a system of concentration and the latter one of dispersion in nature.

In this piece an attempt is made to examine the various communication forms and techniques used and are usable to reach out to the teeming millions to develop a basic reading habit.

The various forms and techniques used are printed words, audio-visuals,

electronic communication, computerised information, and various forms of cultural programmes and extension works. The article deals also with their advantages and disadvantages. It also highlights services rendered by the Raja Rammohun Roy Library Foundation, a premier promoter of public library system, towards development of communication in public library system.

Though India is much behind compared to develop nations in the theme discussed, this paper should serve to say what is the ideal at present which definitely is not unattainable.

SCIENTIFIC COMMUNICATION AND LANGUAGE BARRIER

A. R. CHAKRABORTY

Chief Librarian, Jadavpur University
Calcutta

Due to growing importance of periodicals published in other languages, scientists knowing only English are facing problem of language barrier. As it is not possible for all the scientists to know different languages different steps have been taken to overcome the barrier. Individual translation of required document is one such measure. Individual translator and translating agencies are performing this function. As the translation is an expensive exercise, translation banks with the announcement mechanism have been established for repeated use of translation and to reduce the costs. Other than the ITC at international level, national agencies have been established in different countries including India.

Another important step has been taken at some editorial offices considering this problem. Some of the important items in the paper are being translated by the editorial staff in different languages with this objective in mind. Such items include title of the papers, table of contents, Headings, keywords, abstracts, captions for figures etc. Other than these come peridoicals are using classification number, mainly U.D.C., to denote the subject of the paper.

But a very significant development has taken place in the form of a publication, known widely as cover-to-cover translation. These periodicals are costly and lag behind the original periodicals due to known reasons. But other than cost factor an important consideration for these journals should be real use of these periodicals in an information centre. It has been observed that many scientists are not awarte of existence of such periodicals in theif fields. Even there are examples when a document in a different language was sent for translation, when it was already available in cover-to-cover translated form. Thus other than making provision of such tools, it is important to see how far these costly productions are being used in the information centres. It may be that a large section of users are not well informed about these periodicals. It may also be a habit or tradition for getting an individual item translated without making much effort to locate the availability of it in translation banks or cover -to-cover translated periodicals. Information scientists should take special care in this aspects so that repeatation of time consuming translation can be avoided, much economy achieved and translated version of the document can be handed over to the user within a short time.

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SCIENCE, SCIENTIFIC DISCIPLINES, SCIENTIFIC COMMUNICATION

DR PIYUSH KANTI MAHAPATRA

Head
Department of Library Science
Calcutta University

The aim of science is to account for what goes on, to interpret and discover the laws of nature, and a step further, to establish certain principles and invent certain things on the basis of acquired accumulative knowledge by which wondering achievements can be done ever unknown to mankind. Although science deals with facts, known or unknown, it does not consist of a collection of facts, rather science uses facts to suggest and support explanations of natural phenomena. The focus on explanation is evident in the language of scientific discourse using the terms as concepts, theory and law. All these terms signify the relationships between facts and their meaning. Broadly speaking, a concept is an abstract term that seems to summarise some aspects of reality in a meaningful way. Concepts in the categories within a branch of knowledge which serve to guide the selection and ordering of facts in a systematic manner. They provide the scientist with a frame through which he can look at the vast range and diversity of observable facts. This helps him to interpret the phenomenon. A theory is the explanatory statement expressing some relationships as observed in natural phenomena. The connotation of these terms may vary with the circumstances of their use, but these terms refer to ways of explaining and interpreting what may have been observed. In any scientific communications these are the focal points on which information may be sought.

The scientist offering an explanation of what he has observed must intimate other scientists that the facts really are as he has reported them, and that all the facts pertinent to the situation have been considered. At this stage the scientist may face certain questions such as, should the observations be repeated, or whether anybody also observed the same phenomenon, or whether the scientist did not consider unknown factors which might be more important or essential? These considerations lead to a number of procedural requirements and customary experiments associated with a scientific investigation. These maty be referred to as scientific method, which is the fundamental rationale of inquiry and explanation.

It is obvious that there is no single scientific method. The term really means whatever methods and procedures scientists accept as adequate to assure that the same results would always be obtained under like conditions, and that the expla nation rests on appropriate observations. This situation affects the scientific literature. In each research report descriptions and justifications of the procedures employed in the experiments are to be given. Other scientists may repeat the procedure and verify the observations. It strengthens the arguments for the validity of the explanation that the observations on which it is based are accurate and sound. In this way scientific literature grow.

The explanation of scientific observations of a scientist is not a singular phenomenon. The problem he selects, the idea that it is worth-investigating, the methods and procedures of the experiment and observation, are much influenced, directly or indirectly, by the observation of the past. In this sense, any knowledge in science is cumulative, and thus knowledge in science advances. The explanation of new scientific observations is not only the investigator's personal insight, but it is a part of the gamut of scientific knowledge, arising out of past knowledge and contributing in its turn to the further development.

The most significant attribute of scientific knowledge is the cumulativeness, and this particular attribute distinguishes science from other branches of knowledge. Because the scientific knowledge is cumulative, new discoveries have been predicted before they were actually made. Moreover, similar and identical works have sometimes been done almost at the same time and at the same direction by scientists in different parts of the world who were not even aware of each others existence. Scientific ideas depend for their value and validity on their meaning in relation to the larger body of knowledge. There might be incompatible ideas in the historical development of scientific knowledge, but it is always assumed that such inconsistencies will be resolved eventually when additional knowledge is gained and the matter in question comes to be better understood.

The cumulativeness in scientific knowledge does not mean always additions to knowledge, but also replacements and deletions, because science is not static, but dynamic. Now scientific knowledge serves as a spring board for further study and development. In general, a scientific idea is discarded only when a more fruitful replacement is put forward. Any scientific idea is liable to be altered at some time in the future. This very nature of cumulatveness in science characterises scientific knowledge.

The attribute of cumulativeness in science has several effects on scientific literature, which may be summarised as follows :-

1 It has important influence on the subjects treated in scientific publications. Since existing knowledge is considered in scientific investigations. Scientist chooses his problem for study in the hight of issues brought forward by previous investigations. These investigations do not necessarily limited to the specific area of investigation of a scientist.

2 It relates to the differing approaches that several disciplines might take to the same subject, and thus to various aspects of a topic treated in each discipline's literature.

3 It means that scientific explanations are put forward and considered at several levels, from the specific and limited inferences drawn from a single research study to successively broader and more generalised ideas. Because of this situation scientific publications take several forms, each designed to serve as the vehicle for a particular level of discussion, a particular phase of the development and formulation of cumulated knowledge. It is thus possible to view the publications as differentiated in terms

of their functions, and to see scientific literature as a coherent system of communication.

4 It strongly affect the scientific literature by the passage of time. Thus, the meaning and importance of a work must always be seen in relation to the current state of knowledge, and not to the scientific environment to which the work originally addressed itself. In science, particularly, a work considered as useful and highly authoritative at the time of its publications, cannot be assumed years later to have retained these attributes.

The various branches or areas of science figure very importantly in the literature organised along disciplinary lines. The existence of these divisions should be recognised, but at the same time the meaningfulness of these divisions should be examined. In the generalised sense all the explanations of all the research findings constituting the scientific enterprise embrace all scientists, past and present, and all the areas of science in its entirely. For most purposes, the world of science consists of a number of specialised areas having specialised members of scientific community working in a limited range of scientific concerns. These different fields or areas are often assumed to be distinguishable in terms of their subject matter. For example, human brain is an element of the study of physiology. At the same time, it can be a factor in human behaviour, so also an element of study of psychology. A given subject can be viewed as part of the subject matter of several branches of science. It is to be noted that what distinguishes one field from another is not subject matter as such, but a distinctive approach that relates paricular concepts and ideas to the subject and gives the subject its interest as a focus of inquiry.

The division of the scientific enterprise into separate, limited areas serves a practical end. It is only in this way scientific work is possible at all, since the basic scientific activity is observation and experiment. It is also a fact that the work of ech of the scientists may have relevance and implications for the other. In this sense the division of science and scientific knowledge into different areas are wholly arbitrary and artificial, and there is constant crossing of the bounderies as scientists attempt to apply to their work insights derived from other areas of study. In this way there is a constant development in broader generalisation and increased range as well as narrower specialisation and increased precision.

The constant and increasing tension among the interrelationships of the subject fields cause to emerge stable and enduring divisions which significantly generate scientific literature on major fields of study, or academic disciplines such as, mathematics physics, chemistry or biophysics, biochemistry, and so forth. It is usually in terms of their disciplines that scholars, identify themselves. A man will seldom identify himself as a scientist, but likely to say instead that he is a physicist, or a biologist. In doing so he also indicates the range of concerns with which he belongs, the arena of deliberation and judgement he regards himself as qualified to enter, and, in turn, the group of scholars to whom his own work is addressed.

A number of factors, social and institutional as well as intellectual, account for the importance and pervasiveness of the academic disciplines as the main structural units of the scientific system. Thus the disciplines become the main basis on which advancement of scientific works are organised, research institutions, and laboratories are functioning. The discipline is the major source from which the scholar receives acceptance and recognition of his research work. The scientific community at large tends to look to each discipline for evaluation of the work of its members.

On one hand the knowledge in science is cumulative and on the other hand it is collective. The knowledge in science is collective in the sense that scientific literature is the communication transmitted to fellow scientists with the aim to get achieve the recognition of the scientific community. The collective character of the scientific enterprise is extremely significant, ont only in the sense that the work of each participant is guided by and responds to the works of others, but also because the content of scientific knowledge rests on the consensus judgement of the community of scientists.

The gamut of knowledge in science is characterised by continuing cumulation of reporting research findings and consideration of explanations of such findings. The prime importance of scientific communication is thus apparent. For this reson, scientific communication began virtually simultaneously with modern scientific investigation during seventeenth century. At the early stage the communication was mainly informal. These engaged in scientific work exchanged letters describing experiments and results. Then scientific societies were formed and research reports replaced informal letters and other records.

Because of the exponential growth of scientific literature in modern times, the scientific activities have become institutionalised and professionalised. The scientific community comprises the scientists of university fculties, staff of special research institutions and laboratories, research enterprises of the governments and industries. A great many scientific organisations in a multitude of specialised fields are engaged in research. The research reports, conference proceedings, seminar reports and numerous publications in print and nonprint media in many physical forms are available, which are increasing enormously in number and character.

The scientific literature, as a whole, serves the sscientific community in a dual capacity. It is both working instrument and repository. As working tool, it is the medium by which scientists communicate with each other. Communication is acquired for the creative processes of science to go forward, and for the scientific consensus to form. It is fact that publication is not the only medium of scientific communication. The discussions of the scientists, exchanges of ideas in meetings, private correspondences, etc. are also important communication. But publication is the principal medium by which permanent and public record is created. The scientific literature, thus, serves as repository for the collective intellectual property of the scientific community.