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MEGA-AUTHORSHIP FROM A BIBLIOMETRIC POINT OF VIEW

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ABSTRACT

A research contribution by ten or more authors has been termed as the work of mega-authorship. The study conducted with a sample of 1294 papers published in the ***Proceedings of the National Academy of Sciences*** *of the United States of America during February - July 1996 shows that about 5% of the papers fall under the category of mega-authorship. Mega-authorship seems to picture better the international collaborative scenario in the field of scientific research. Attempts to identify the causes of mega-authorship and discuss its impact on author indexes, indexing services, citations, and the problem it may create in the identification of the principal contributor of a basic idea.*

Keywords: Authorship; Authorship pattern; Mega-authorship; Collaborative research; Bibliometrics; Indexes, Indexing services; Citations

INTRODUCTION

After the Middle Ages, Europe became the hub of scientific activity in the world. Till 1665 the contributions by the scientists were single-authored and predominantly in book form and some were in the form of letters e.g. Fermat's contributions. With the advent of *Journal des Scavans* (f.1665) and *Philosophical Transactions* (f.1665), the contributions started taking the form of articles.

No studies have been located which indicate the time when the era of multiple authorship began. However, the earliest instance of joint authorship found goes back to 1822 when two papers appeared in the 14th volume of *Asiatick Researches* (Sen, 1995). The bibliographical details of the papers are:

i) Diard and Duvancel. On the *Sorex Glis. Asiatick Researches* 1822, 14, 471-5.
ii) Hodgson J A, Herbert G D. Account of trigonometrical and astronomical operations for determining the heights and positions of the principal peaks of the Himalaya Mountains, situated between the latitudes of 31°53' 10" and 30° 18' 30'' N and the longitudes of 77° 34' 04'' and 79° 57' 22" E. *Asiatick Researches* 1822, 14, 187-372.

Instances of multiple authorship may be found even from an earlier date. From a study on zoological literature, it appears that even in the first few years of the present century single-authored articles were the order of the day (Vimala and Pulla Reddy, 1996). Price (1963) also found that in the beginning of the present century 80% of all papers in the field of chemistry were

single-authored. Since then the trend towards multiple authorship has been steadily growing. Silva (1990) analysed the authorship in the *Boletin de la Officina Sa-nitaria Panamericana* covering the period 1959 to 1988 and found that during 1959 to 1968, 62.77% of the articles were single authored, and 30.44% two- to four-author-ed. The scenario changed drastically du-ring 1979 to 1988, when only 30.80% of the articles were found to be single-author-ed, and 45.99 %. two- to four-authored. Rosenfeld (1991) found that in the field of otolaryngology single-authored contribu-tions have come down from 40% in 1969 to only 10% in 1989. Halperin, Scott and George (1992) also found 12% single-au-thored papers during 1983 to 1987. In the aforesaid study the authorship ranged from 1 to 27 which provides a clear indication of the foothold of mega-authorship in 1980s. Searching backwards it was possible to lo-cate a ten-authored article in 1962 (Dje-rassi, et al.). The article was contributed by the scientists of Stanford University (US), the University of Paris (France), and the Eli Lilly Research Laboratories (US). Further search can reveal the actual date of the beginning of mega-authorship.

MEGA-AUTHORSHIP

Definition

By the term mega-authorship, it is intended to connote that type of authorship which involves ten or more authors in a research paper where the contribution of a particu-lar author cannot be identified.

Objective

The primary objective of the study is to identify the causes responsible for this phenomenon, to examine the probable impact on author indexes, indexing services, citations, Lotka's law, and the problem it may create in the identification of the principal contributor of a basic idea.

Methodology

The study has been conducted basing on the *Proceedings of the National Academy of Sciences of the United States of America* (issue numbers 3-15 of 1996) because of its (i) classified contents page, (ii) wide coverage of subjects encompassing physi-cal sciences, biological sciences and social sciences, and (iii) very high impact factor (10.667 in 1994). In fact, it is the fourth ranked journal in Multidisciplinary Scien-ces in the world, the first three being *Na-ture*, *Science*, and *Faseb Journal*. More-over, the 1996 issues of the journal were readily available excepting the first two issues, which the supplier could not supply possibly because of late ordering.

All classified research articles were consi-dered for the study. Review and unclassi-fied articles were excluded. The contents page of each issue was scanned and author-ship pattern tabulated in separate sheets. Finally, the authorship pattern was deter-mined for each subject by combining the figures from all the sheets. Articles pertain-ing to mega-authorship were thus identified for further analysis. To study the collabo-rative scenario, the address of each of the authors was checked from the journal and tabulated

RESULTS

Authorship Pattern by Subjects

Table 1 depicts the authorship pattern where single-authored papers account for only 2.3%. Three-authored papers form the largest category with 17.4%, closely fol-lowed by four-authored papers (17.0%), five-authored papers (15.2%), and two-authored papers (14.2%). Three-, four-, and five-authored papers account for al-most 50% papers of the sample. The con-tributions of mega-authorship accounting for about 5% of the total sample is by no means negligible.

The mega-authorship contributions total 62 of which one paper (62nd paper in Table 2) being a correction to a paper published in 1993 has been excluded for the study of collaboration scenario of 1996. In the sample, ten-authored papers top the list with a tally of 24, followed by eleven-authored papers numbering 18. Twelve-, thirteen-, fourteen-, and fifteen-authored papers total respectively 3, 6, 5 and 5. The maximum number of authors found in a contribution is 29! The average number of authors per paper is found to be nearly five (4.89) which is more than the figures obtained by De Villiers (1984), (2.35 authors/paper in 1982), Rosenfeld (3.4 authors/paper in 1989), and Halperin, Scott and George (3.94 authors/paper in 1992).

The fields in which mega-authorship contri-butions have been observed pertaining to life sciences. The breakdown of the areas with corresponding number of papers is as follows: Biochemistry (7), biophysics (1), cell biology (2), developmental biology (1), evolution (2),, genetics (13), immunology (4), medical sciences (18), microbiology (2), neurobiology (6), pharmacology (4), physiology(1), and population biology (1). Notably, all the fields belong to biological sciences. The incidence of mega-authorship is found to be pretty high in genetics and medical sciences (Table 1).

Collaboration Pattern of Mega-Authored Papers

In the sample of papers listed in Table 2, non-collaborative papers i.e papers contributed by authors from one department of an organisation only number only 2, nationally collaborative papers 25, and internationally collaborative papers 34. Of the nationally collaborative papers, USA accounts for 19, followed by Italy (3 papers), and Australia, France, and Israel one each. In the nationally collaborative papers inter-departmental collaboration of the same institute (e.g. 3rd paper), academic body- research institute collaboration (e.g. 6th paper), academic body - commercial body collaboration (e.g. 7th paper), academic body - academic body collaboration (e.g. 14th paper) are observed. In the internationally collaborative papers two-country collaboration has resulted in 21 papers, three-country collaboration 9 pa-pers, four- and five-country collaboration 2 papers each.

International Collaboration Scenario

Table 3 and Fig. 1 depicts the international collaboration scenario. The countries colla-borating number 20. In terms of inter-nationally collaborative papers, USA tops the list with 26 papers, followed by UK (11), France (8), Canada and Japan (4 papers each), Australia, Denmark, Ger-

many, Italy, Sweden, and Switzerland (3 papers each), China, Finland, Netherlands, and Russia (2 papers each), and Belgium, India, Kenya, and Vietnam (1 paper each).

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In terms of collaborative partners, USA again tops the list with 17 partners, followed by UK (13), France (8), Canada and Denmark (6 partners each), and other countries. Table 3 indicates that the study

of mega-authorship papers might yield a better collaboration scenario.

DISCUSSION

Causes of Mega-authorship

The study provides a glimpse of the various types of collaboration going on in the field of scientific research which include inter-institutional, intra-national, and inter-national collaborations. International colla-boration seems to be outnumbering all other types of collaboration. The probable factors leading to the collaborations may be summarised as follows.

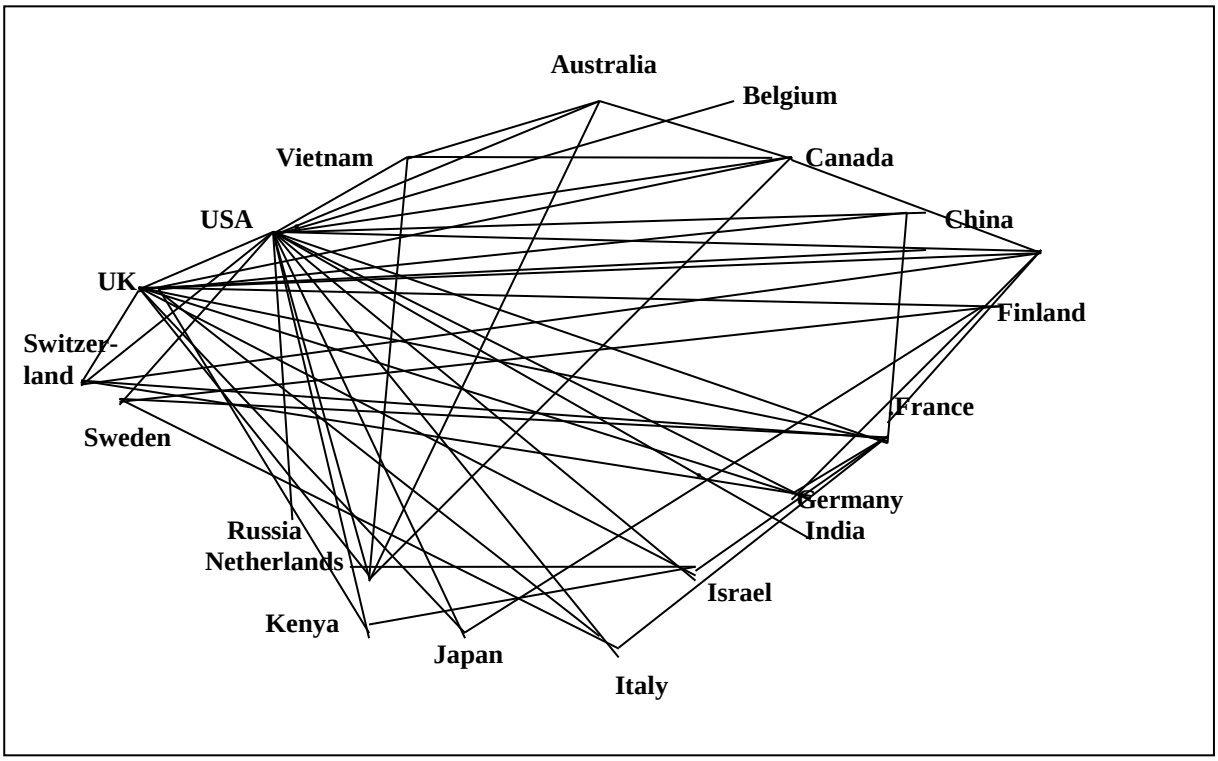
i) Multidisciplinary Research Activity

Numerous research projects of the present day world are multidisciplinary. The third paper in Table 2 devoted to the study of neuronal abnormalities in microtubule associated protein 1B mutant mice, involved

Table 3: International Collaboration Scenario

Name of the Country	**No. of collaborative papers**	**Collaborating partners** [Figures within brackets against the country indicate the number of papers with the country given in the first column. No figure against the country name indicates one paper]
Australia	3	Canada, Netherlands, USA (3), Vietnam
Belgium	1	USA
Canada	4	Australia, Denmark, Netherlands, UK, USA(3), Vietnam
China	2	France (2), UK, USA (2)
Denmark	3	Canada, France, Germany, UK, USA (2)
Finland	2	Japan, Sweden, UK
France	8	Germany, Israel, Italy, Sweden, Switzerland, UK (3), USA (4),
Germany	3	Denmark, France, Switzerland, UK(2), USA (2)
India	1	USA
Israel	4	France, Kenya, Netherlands, UK (2), USA (2)
Italy	3	France, Sweden, USA (2)
Japan	4	Finland, UK (2), USA (3)
Kenya	1	Israel, UK, USA
Netherlands	2	Australia, Canada, UK, USA, Vietnam
Russia	2	USA (2)
Sweden	3	Finland, Franch, Italy,USA (2)
Switzerland	3	Denmark, France (2), Germany, UK, USA
UK	11	Canada, China, Denmark, Finland, France (3), Germany (2),Israel (2), Italy, Japan (2), Kenya, Netherlands, Switzerland, USA (6),
USA	26	Australia (3), Belgium, Canada (3), China (2), Denmark (2), France (4), Germany (2),India , Israel (2), Italy (2), Japan (3), Kenya, Netherlands, Russia (2), Sweden (2), Switzerland, UK (6), Vietnam
Vietnam	1	Australia, Canada, Netherlands, USA

Figure 1: Scenario of Scientific Collaboration Among Different Countries



departments of such specialities as molecular genetics, pathology, neurosurgery, neuroscience, anatomy and neurobiology, and biochemistry. Such is the case in many other papers.

ii) Multidisciplinary Application of Research Results

The laser, for example, an outcome of the research on optics is now being used in many diverse fields such as surgery, communications, space technology, information technology, holography, diamond drilling, metal cutting, optical pattern making and numerous industrial processes.

iii) Resource Sharing

It is becoming more and more difficult for research institutions to be completely self sufficient in terms of expertise, equipment, and other facilities because of prohibitive costs and numerous other factors. Not every country can think of possessing a telescope like the one at Jodrell Bank Ex-perimental Station or Mt. Palomar Obser-vatory. This is leading to collaboration, to
share resources of one another to accomplish a project of common interest.

iv) Information Technology(IT)

IT has practically shrunk the globe into a globule. Using the email or Internet facilities, writing a paper with collaborators sitting thousands of miles apart has become as easy as writing a paper sitting at different tables in a room. Involvement of computer specialists for highly complicated calculations, designs, drawings, etc. has become commonplace in research projects. Justifiably they are also being given the credit of authorship.

All these and maybe, some other factors as well are contributing to the growth of mega-authorship.

Impact of Mega-authorship

i) Author Indexes

The average number of authors per paper used to be one or slightly more till the beginning of the present century. In this particular study the average number of authors per paper is found to be around five. Hence, the author index now will require about five times more space than it required at the beginning of the present century for the same number of papers.

ii) Indexing and Abstracting Services

The citations given in the abstracting or indexing services will many a time equal or exceed the size of an indicative abstract, requiring more printing space for the entry. No doubt it will add to the cost.

iii) Citations

Citations provided under References appended to an article will also demand more space. It is not surprising that the International Committee of Medical Journal Editors have recommended to list only the first six authors in all citations where the number exceeds six (International Committee of Medical Journal Editors, 1991).

iv) Lotka's Law

It is quite likely that mega-authorship will affect the Law as the number of authors per paper is increasing. Studies need to be conducted however to confirm this.

v) Basic Contributor

Scientists are rewarded, for example by being elected as fellows of prestigious societies, academies on the basis of their fundamental contributions. Now, the question arises as to how to identify the principal contributor of the basic idea of a research paper from amongst so many. It is known that the first named author is not always the principal contributor. Sometimes the last named author is found to be the principal contributor. Only the future will tell how to overcome this problem.

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Table 2: Data relating to Mega-authorship Papers

No.	Location of the Paper	Subject	No. of Authors	No. of Organizations	Countries with no. of Organizations
1	Proc Natl. Acad Sci USA 1996, **93**, 1032	Immunology	10	4	Israel 3, Netherlands 1, UK 1
2	Proc Natl. Acad Sci USA 1996, **93**, 1243	Genetics	11	7	Denmark 3, France 1, Germany 1, Switzerland 1, UK 1
3	Proc Natl. Acad Sci USA 1996, **93**, 1270	Neurobiology	10	7	USA 7
4	Proc Natl. Acad Sci USA 1996, **93**, 1340	Physiology	10	4	UK 2, Japan 1, USA 1
5	Proc Natl. Acad Sci USA 1996, **93**, 1366	Genetics	14	4	UK 3, Canada 1

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6	Proc Natl. Acad Sci USA 1996, **93**, 1453	Immunology	10	6	Italy 6
7	Proc Natl. Acad Sci USA 1996, **93**, 1585	Biochemistry	11	3	USA 3
8	Proc Natl. Acad Sci USA 1996, **93**, 1759	Biochemistry	14	3	USA 2, Italy 1
9	Proc Natl. Acad Sci USA 1996, **93**, 1945	Neurobiology	13	5	USA 4, Israel 1
10	Proc Natl. Acad Sci USA 1996, **93**, 2025	Medical Sciences	16	4	UK 3, Australia 1
11	Proc Natl. Acad Sci USA 1996, **93**, 2054	Medical Sciences	11	6	USA 6
12	Proc Natl. Acad Sci USA 1996, **93**, 2149	Biochemistry	13	4	USA 3, Belgium 1
13	Proc Natl. Acad Sci USA 1996, **93**, 2186	Medical Sciences	10	1	USA 1
14	Proc Natl. Acad Sci USA 1996, **93**, 2339	Medical Sciences	11	4	USA 4
15	Proc Natl. Acad Sci USA 1996, **93**, 2442	Medical Sciences	12	4	USA 3, Switzerland 1
16	Proc Natl. Acad Sci USA 1996, **93**, 2523	Biochemistry	14	6	Australia 6
17	Proc Natl. Acad Sci USA 1996, **93**, 2528	Biochemistry	10	3	Italy 1, Sweden 1, USA 1
18	Proc Natl. Acad Sci USA 1996, **93**, 2576	Cell Biology	10	4	Finland 3, Sweden 1
19	Proc Natl. Acad Sci USA 1996, **93**, 2719	Neurobiology	10	1	Japan 1

20	Proc Natl. Acad Sci USA 1996, **93**, 3016	Evolution	10	8	USA 3, Australia 2, Canada 1, Netherlands 1, Vietnam 1
21	Proc Natl. Acad Sci USA 1996, **93**, 3068	Pharmacology	11	2	Canada 1, USA 1
22	Proc Natl. Acad Sci USA 1996, **93**, 3132	Microbiology	10	3	France 1, Sweden 1, USA 1
23	Proc Natl. Acad Sci USA 1996, **93**, 3149	Genetics	15	5	USA 4 , Germany 1
24	Proc Natl. Acad Sci USA 1996, **93**, 3232	Developmental Biology	10	3	France 3
25	Proc Natl. Acad Sci USA 1996, **93**, 3269	Medical Sciences	16	8	Japan 6, England 1, Finland 1
26	Proc Natl. Acad Sci USA 1996, **93,** 3624	Genetics	13	4	China 1, England 1, France 1, USA 1
27	Proc Natl. Acad Sci USA 1996, **93**, 3704	Medical Sciences	11	4	USA 4
28	Proc Natl. Acad Sci USA 1996, **93**, 3937	Genetics	10	6	USA 5,

					France 1
29	Proc Natl. Acad Sci USA 1996, **93**, 3953	Genetics	29	5	France 4, Israel 1
30	Proc Natl. Acad Sci USA 1996, **93**, 4120	Medical Sciences	10	6	USA 6
31	Proc Natl. Acad Sci USA 1996, **93**, 4386	Immunology	12	1	USA 1
32	Proc Natl. Acad Sci USA 1996, **93**, 4403	Medical Sciences	10	5	Italy 5
33	Proc Natl. Acad Sci USA 1996, **93**, 4442	Evolution	11	5	USA 4, Japan 1
34	Proc Natl. Acad Sci USA 1996, **93**, 4492	Medical Sciences	11	4	Israel 4
35	Proc Natl. Acad Sci USA 1996, **93**, 4879	Pharmacology	11	4	USA 4
36	Proc Natl. Acad Sci USA 1996, **93**, 4913	Genetics	11	3	USA 1, Russia 1
37	Proc Natl. Acad Sci USA 1996, **93**, 5084	Genetics	17	6	USA 5, India 1
38	Proc Natl. Acad Sci USA 1996, **93**, 5203	Neurobiology	12	2	France 1, Switzerland 1
39	Proc Natl. Acad Sci USA 1996, **93**, 5307	Genetics	11	5	USA 4, UK 1
40	Proc Natl. Acad Sci USA 1996, **93**, 5539	Medical Sciences	14	10	USA 8, Canada 1, Denmark 1
41	Proc Natl. Acad Sci USA 1996, **93**, 5556	Genetics	11	5	USA 5
42	Proc Natl. Acad Sci USA 1996, **93**, 5705	Medical Sciences	10	2	USA 2

43	Proc Natl. Acad Sci USA 1996, **93**, 5797	Population Biol.	13	8	USA 5, Israel 1, Kenya 1, UK 1
44	Proc Natl. Acad Sci USA 1996, **93**, 5872	Biophysics	14	2	USA 2
45	Proc Natl. Acad Sci USA 1996, **93**, 5877	Medical Sciences	10	4	USA 4
46	Proc Natl. Acad Sci USA 1996, **93**, 5883	Cell Biology	10	3	USA 3
47	Proc Natl. Acad Sci USA 1996, **93**, 5910	Genetics	15	4	China 2, France 1, USA 1
48	Proc Natl. Acad Sci USA 1996, **93**, 6025	Biochemistry	11	3	USA 2, Russia 1
49	Proc Natl. Acad Sci USA 1996, **93**, 6258	Medical Sciences	11	5	USA 4, Denmark 1
50	Proc Natl. Acad Sci USA 1996, **93**, 6297	Genetics	10	3	USA 2, UK 1
51	Proc Natl. Acad Sci USA 1996, **93**, 6361	Neurobiology	10	7	USA 7
52	Proc Natl. Acad Sci USA 1996, **93**, 6393	Medical Sciences	11	5	USA 5
53	Proc Natl. Acad Sci USA 1996, **93**, 6687	Microbiology	19	6	USA 5, Japan 1
54	Proc Natl. Acad Sci USA 1996, **93**, 7269	Medical Sciences	11	2	USA 2
55	Proc Natl. Acad Sci USA 1996, **93**, 7381	Pharmacology	15	4	USA 4
56	Proc Natl. Acad Sci USA 1996, **93**, 7464	Biochemistry	11	3	USA 2, Australia 1
57	Proc Natl. Acad Sci USA 1996, **93**, 7811	Genetics	10	6	USA 3, Germany

					2, UK 1
58	Proc Natl. Acad Sci USA 1996, **93**, 7821	Immunology	10	5	USA 5
59	Proc Natl. Acad Sci USA 1996, **93**, 7923	Medical Sciences	13	3	USA 3
60	Proc Natl. Acad Sci USA 1996, **93**, 7933	Medical Sciences	11	5	Italy 5
61	Proc Natl. Acad Sci USA 1996, **93**, 8028	Neurobiology	13	5	Italy 2, UK 2, France 1
62	Proc Natl. Acad Sci USA 1996, **93**, 8154	Pharmacology	10		correctio n to a paper of 1993

International Collaboration Scenario

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Denmark	3	Canada, France, Germany, UK, USA (2)
Finland	2	Japan, Sweden, UK
France	8	Germany, Israel, Italy, Sweden, Switzerland, UK (3), USA (4),
Germany	3	Denmark, France, Switzerland, UK(2), USA (2)
India	1	USA
Israel	4	France, Kenya, Netherlands, UK (2), USA (2)
Italy	3	France, Sweden, USA (2)
Japan	4	Finland, UK (2), USA (3)
Kenya	1	Israel, UK, USA
Netherlands	2	Australia, Canada, UK, USA, Vietnam
Russia	2	USA (2)
Sweden	3	Finland, Franch, Italy,USA (2)
Switzerland	3	Denmark, France (2), Germany, UK, USA
UK	11	Canada, China, Denmark, Finland, France (3), Germany (2),Israel (2), Italy, Japan (2), Kenya, Netherlands, Switzerland, USA (6),
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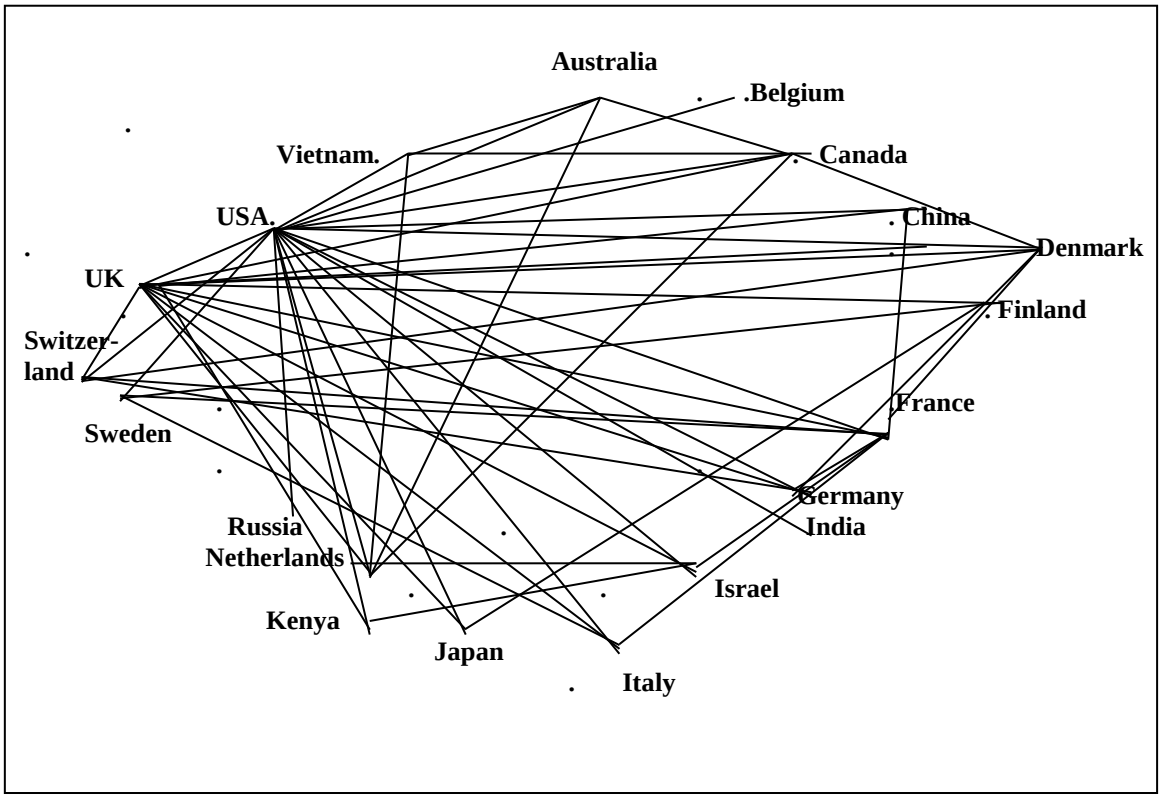
Vietnam	1	Australia, Canada, Netherlands, USA

Fig. 1 - Scenario of Scientific Collaboration among Different Countries



DISCUSSION

Causes of Mega-authorship

The study provides a glimpse of the various types of collaboration going on in the field of scientific research which include inter-institutional, intra-national, and international collaborations. International collaboration seems to be outnumbering all other types of collaboration. The probable factors leading to the collaborations may be summarised as follows.

i) Multidisciplinary Research Activity

Numerous research projects of the present day world are multidisciplinary. The third paper in Table 2 devoted to the study of neuronal abnormalities in microtubule associated protein 1B mutant mice, involved departments of such specialities as molecular genetics, pathology, neurosurgery, neuroscience, anatomy and neurobiology, and biochemistry. Such is the case in many other papers.

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Table 1: Authorship Pattern in Various Subjects in 1996

No. of Authors/ Subject	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	17	19	29	Total Papers
Agric. Sci.			1	1		1													3
Anthropology	2	1	1	1	1														6
Appl. Biol. Sci		2	1	2	1	3	1		1										11
Appl. Math	1	2	2	1															6
Appl. Phys Sci.		1																	1
Astronomy	1	1																	2
Biochemistry	4	54	56	61	51	31	22	16	5	1	3		1	2					307
Biophysics	1	13	8	8	10	5	3	1	1					1					51
Cell Biology		11	18	17	19	14	9	5	6	2									101
Chemistry	1	3	1	5	3	4													17
Developmental Biology		8	8	10	8	4	3	2	2	1									46
Ecology	1	3	2	1	1	4		1											13
Economic Sci.	1																		1
Evolution	8	10	15	8	3	1	2	2	1	1	1								52
Geology	1		1																2
Geophysics				1		1													2
Genetics	1	10	23	25	14	11	6	3	7	3	4		1	1	2	1		1	113
Immunology		7	17	11	17	10	17	7	7	3		1							97
Mathematics	2	1																	3
Medical Sciences	2	11	21	19	23	20	24	24	10	5	8	1	1	1	2				172
Microbiology	1	4	12	11	11	3	1	3	1	1									48
Molecular Biology		1																	1
Neurobiology	1	25	23	16	17	20	7	9	2	3		1	2				1		127
Pharmacology	1	2	2	2	3	1	3	4	1	1	2				1				23
Physics	0	1	0	2															3
Physiology	1	4	6	5	6	5	4	3	1	1									36
Plant Biology	0	7	4	9	8	6	2	2											38
Population Biology			1										1						2
Psychology	0	2	3	3	1														9
Statistics				1															1
TOTAL	30	184	226	220	197	144	104	82	45	22	18	3	6	5	5	1	1	1	1294

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Table 2: Data relating to Mega-authorship Papers

No.	Location of the paper	Subject	No. of authors	No. of organi-sations	Countries with no. of organisations
1	Proc Natl. Acad Sci USA 1996, **93**, 1032	Immunology	10	5	Israel 3, Netherlands 1, UK 1
2	Proc Natl. Acad Sci USA 1996, **93**, 1243	Genetics	11	7	Denmark 3, France 1, Germany 1, Switzerland 1, UK 1
3	Proc Natl. Acad Sci USA 1996, **93**, 1270	Neurobiology	10	7	USA 7
4	Proc Natl. Acad Sci USA 1996, **93**, 1340	Physiology	10	4	UK 2, Japan 1, USA 1
5	Proc Natl. Acad Sci USA 1996, **93**, 1366	Genetics	14	4	UK 3, Canada 1
6	Proc Natl. Acad Sci USA 1996, **93**, 1453	Immunology	10	6	Italy 6
7	Proc Natl. Acad Sci USA 1996, **93**, 1585	Biochemistry	11	3	USA 3
8	Proc Natl. Acad Sci USA 1996, **93**, 1759	Biochemistry	14	3	USA 2, Italy 1
9	Proc Natl. Acad Sci USA 1996, **93**, 1945	Neurobiology	13	5	USA 4, Israel 1
10	Proc Natl. Acad Sci USA 1996, **93**, 2025	Medical Sciences	16	4	UK 3, Australia 1
11	Proc Natl. Acad Sci USA 1996, **93**, 2054	Medical Sciences	11	6	USA 6
12	Proc Natl. Acad Sci USA 1996, **93**, 2149	Biochemistry	13	4	USA 3, Belgium 1
13	Proc Natl. Acad Sci USA 1996, **93**, 2186	Medical Sciences	10	1	USA 1
14	Proc Natl. Acad Sci USA 1996, **93**, 2339	Medical Sciences	11	4	USA 4
15	Proc Natl. Acad Sci USA 1996, **93**, 2442	Medical Sciences	12	4	USA 3, Switzerland 1
16	Proc Natl. Acad Sci USA 1996, **93**, 2523	Biochemistry	14	6	Australia 6
17	Proc Natl. Acad Sci USA 1996, **93**, 2528	Biochemistry	10	3	Italy 1, Sweden 1, USA 1
18	Proc Natl. Acad Sci USA 1996, **93**, 2576	Cell Biology	10	4	Finland 3, Sweden 1
19	Proc Natl. Acad Sci USA 1996, **93**, 2719	Neurobiology	10	1	Japan 1
20	Proc Natl. Acad Sci USA 1996, **93**, 3016	Evolution	10	8	USA 3, Australia 2, Canada 1, Netherlands 1, Vietnam 1
21	Proc Natl. Acad Sci USA 1996, **93**, 3068	Pharmacology	11	2	Canada 1, USA 1
22	Proc Natl. Acad Sci USA 1996, **93**, 3132	Microbiology	10	3	France 1, Sweden 1, USA 1
23	Proc Natl. Acad Sci USA 1996, **93**, 3149	Genetics	15	5	USA 4 , Germany 1
24	Proc Natl. Acad Sci USA 1996, **93**, 3232	Developmental Biology	10	3	France 3
25	Proc Natl. Acad Sci USA 1996, **93**, 3269	Medical Sciences	16	8	Japan 6, England 1, Finland 1
26	Proc Natl. Acad Sci USA 1996, **93,** 3624	Genetics	13	4	China 1, England 1, France 1, USA 1
27	Proc Natl. Acad Sci USA 1996, **93**, 3704	Medical Sciences	11	4	USA 4
28	Proc Natl. Acad Sci USA 1996, **93**, 3937	Genetics	10	6	USA 5, France 1

29	Proc Natl. Acad Sci USA 1996, **93**, 3953	Genetics	29	5	France 4, Israel 1
30	Proc Natl. Acad Sci USA 1996, **93**, 4120	Medical Sciences	10	6	USA 6
31	Proc Natl. Acad Sci USA 1996, **93**, 4386	Immunology	12	1	USA 1
32	Proc Natl. Acad Sci USA 1996, **93**, 4403	Medical Sciences	10	5	Italy 5
33	Proc Natl. Acad Sci USA 1996, **93**, 4442	Evolution	11	5	USA 4, Japan 1
34	Proc Natl. Acad Sci USA 1996, **93**, 4492	Medical Sciences	11	4	Israel 4
35	Proc Natl. Acad Sci USA 1996, **93**, 4879	Pharmacology	11	4	USA 4
36	Proc Natl. Acad Sci USA 1996, **93**, 4913	Genetics	11	2	USA 1, Russia 1
37	Proc Natl. Acad Sci USA 1996, **93**, 5084	Genetics	17	6	USA 5, India 1
38	Proc Natl. Acad Sci USA 1996, **93**, 5203	Neurobiology	12	2	France 1, Switzerland 1
39	Proc Natl. Acad Sci USA 1996, **93**, 5307	Genetics	11	5	USA 4, UK 1
40	Proc Natl. Acad Sci USA 1996, **93**, 5539	Medical Sciences	14	10	USA 8, Canada 1, Denmark 1
41	Proc Natl. Acad Sci USA 1996, **93**, 5556	Genetics	11	5	USA 5
42	Proc Natl. Acad Sci USA 1996, **93**, 5705	Medical Sciences	10	2	USA 2
43	Proc Natl. Acad Sci USA 1996, **93**, 5797	Population Biol.	13	8	USA 5, Israel 1, Kenya 1, UK 1
44	Proc Natl. Acad Sci USA 1996, **93**, 5872	Biophysics	14	2	USA 2
45	Proc Natl. Acad Sci USA 1996, **93**, 5877	Medical Sciences	10	4	USA 4
46	Proc Natl. Acad Sci USA 1996, **93**, 5883	Cell Biology	10	3	USA 3
47	Proc Natl. Acad Sci USA 1996, **93**, 5910	Genetics	15	4	China 2, France 1, USA 1
48	Proc Natl. Acad Sci USA 1996, **93**, 6025	Biochemistry	11	3	USA 2, Russia 1
49	Proc Natl. Acad Sci USA 1996, **93**, 6258	Medical Sciences	11	5	USA 4, Denmark 1
50	Proc Natl. Acad Sci USA 1996, **93**, 6297	Genetics	10	3	USA 2, UK 1
51	Proc Natl. Acad Sci USA 1996, **93**, 6361	Neurobiology	10	7	USA 7
52	Proc Natl. Acad Sci USA 1996, **93**, 6393	Medical Sciences	11	5	USA 5
53	Proc Natl. Acad Sci USA 1996, **93**, 6687	Microbiology	19	6	USA 5, Japan 1
54	Proc Natl. Acad Sci USA 1996, **93**, 7269	Medical Sciences	11	2	USA 2
55	Proc Natl. Acad Sci USA 1996, **93**, 7381	Pharmacology	15	4	USA 4
56	Proc Natl. Acad Sci USA 1996, **93**, 7464	Biochemistry	11	3	USA 2, Australia 1
57	Proc Natl. Acad Sci USA 1996, **93**, 7811	Genetics	10	6	USA 3, Germany 2, UK 1
58	Proc Natl. Acad Sci USA 1996, **93**, 7821	Immunology	10	5	USA 5
59	Proc Natl. Acad Sci USA 1996, **93**, 7923	Medical Sciences	13	3	USA 3
60	Proc Natl. Acad Sci USA 1996, **93**, 7933	Medical Sciences	11	5	Italy 5
61	Proc Natl. Acad Sci USA 1996, **93**, 8028	Neurobiology	13	5	Italy 2, UK 2, France 1
62	Proc Natl. Acad Sci USA 1996, **93**, 8154	Pharmacology	10		correction to a paper of 1993

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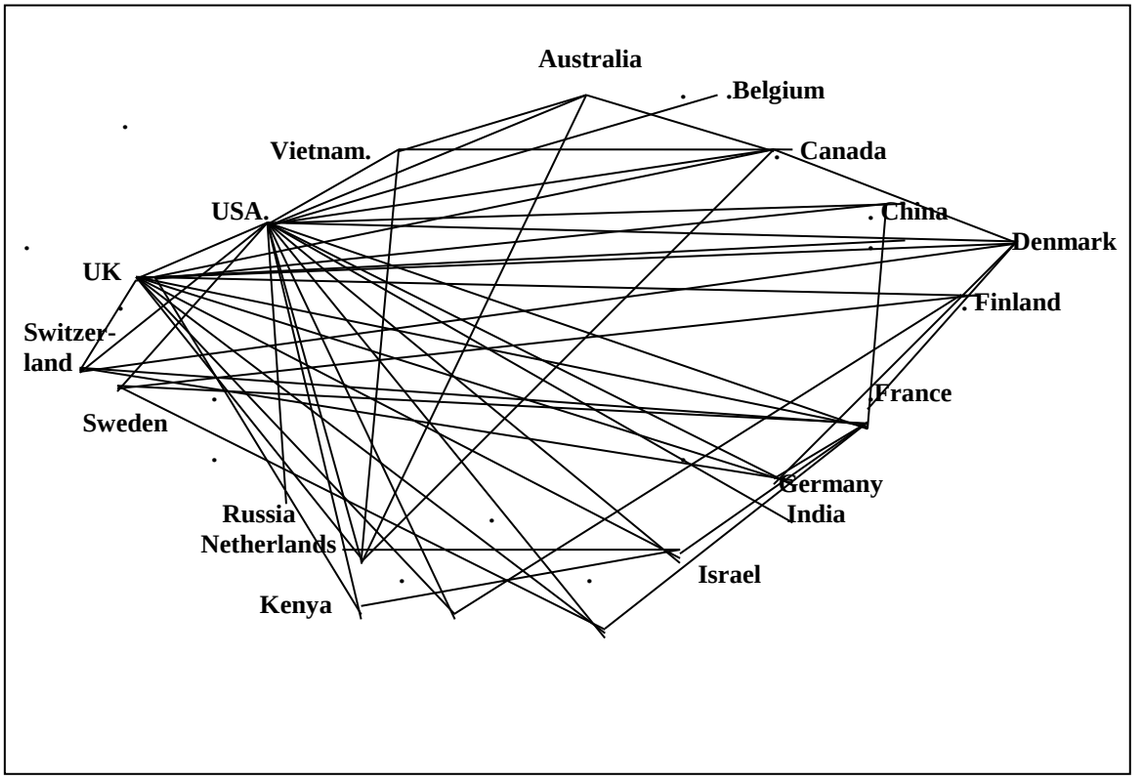
Australia
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Vietnam.
Canada
USA.
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France
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Kenya

Mega-Authorship from a Bibliometric Point of View

Japan

. Italy