RESEARCH PRODUCTIVITY OF TIBOR BRAUN : AN ANALYTICAL CHEMIST-CUM-SCIENTOMETRICIAN

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Researches on 'eminent individual scientist' as a unit of information generation has opened up diversified vistas in understanding the process of R&D innovation communications. Quantitative documentation on Tibor Braun encompasses his papers (single-authored 40; and multi-authored 140) during 1954-1995. Productivity coefficient is 0.78. Tibor Braun had 80 collaborators of which Schubert, Glanzel, Zsindely and Farag were the most active. Author productivity in the research group of Tibor Braun follows the trend of Lotka's Law. He had used 49 channels of communication to disseminate the results of his research of which Scientometrics (33 papers) tops the list followed by Anal Chim Acta (21 papers). The publication concentration is 10.2 and publication density 3.7. His core areas of work among others related to: foam, analytical chemistry, citation analysis, bibliographic indicators, cold fusion, research impact, chromatography, etc.

INTRODUCTION

There are not many individuals in the world who have made an indelible mark in the emerging field of scientometrics and shouldered the responsibility of running an international periodical almost in a virgin area like scientometrics for decades. Tibor Braun is one such individual who has nurtured and enriched the field of scientometrics substantially with his valued contributions.

Tibor Braun was born on 8 March 1932 at Lugos, Romania. After graduation, he joined V Babes University, Cluj and obtained his MSc degree in chemistry. His career began as a Research Chemist at the Medical University, Tirgu-Mures where he continued his research for sometime. In 1956, he joined the Institute of Atomic Physics at Bucharest as a Senior Research Fellow and continued there till 1963. Braun's career as a teacher began in 1964 when he joined the L

Eotvos University at Budapest as Assistant Professor and continued in the same University to become a full-fledged professor in 1984. While continuing his teaching in the aforesaid University, his research activity went on unabated and resulted in his PhD and subsequently his DSc degree from the Hungarian Academy of Sciences.

Tibor Braun's fame as a teacher crossed the boundary of his country and before long he was invited as a Visiting Professor by the Nuclear Research Institute, Lima, Peru in 1969 for two years. His teaching mission abroad continued and he was invited by the University of the West Indies, Kingston, Jamaica during 1975-76; and subsequently by Tohuku University, Tokyo Metropolitan University, Chinese Institute of Science of Science, and University of Octavio Mendez Pareia, Panama.

In 1978, Tibor Braun assumed the charge of Headship at the Information Science and Scientometrics Research Unit and became the Deputy Director General of the Library of Hungarian Academy of Sciences, Budapest in 1980.

Braun has acted in diversified capacities on a number of national and international bodies such as: Advisor to the International Atomic Energy Agency, Vienna; Member : Editorial Advisory Board, *Ion Exchange and Solvent Extraction*; Publication Committee, International Union of History and Philosophy of Science; and European Academy of Sciences and Arts.

The activities in which Tibor Braun has been involved include: teaching, research and journal

publishing. One may be surprised to know that he has been the founder editor of as many as four internationally reputed journals, i.e. *Journal of Radioanalytical and Nuclear Chemistry - Articles; Journal of Radioanalytical and Nuclear Chemistry – Letters; Scientometrics* and *Fullerenes, Nanotubes, and Carbon Nanostructures* (formerly called as *Fullerene Science and Technology*). It is but natural that the life of such a multifaceted personality has not gone unrewarded. He was one of the most deserving awardees of Derek de Solla Price Award. He has also been crowned with George Hevesy Award.

MATERIALS AND METHODS

Flagrant violations there may be, but on the whole, whether we like it or not, there is a reasonably good correlation between the eminence of a scientist and his productivity of papers. It takes persistence and perseverance to be a good scientist, and these are frequently reflected in a sustained production of scholarly writing [1]. Very rightly Kuhn [2] opined that exemplars of science and the social structure of science should receive greater attention. The Nobel laureate William Shockley was the first to propose the count of number of publications as an indicator of productivity of a scientist [3]. Scientometricians have been analysing the contributions of individual scientists and portray their bio-bibliometric scenario. Several studies have employed bibliometrics to produce biographical sketches of authors. These studies fall somewhere between evaluative bibliometrics and studies of writing [4-63]. Most significant impact of research may be in vogue as eponyms [64].

Items figuring within the personal bio-bibliography of the publications of Tibor Braun were inputted into the database with a view to analyzing the data from various angles. Well-known bibliometric methods [65-84] like normal count, collaboration coefficient, productivity coefficient, publication concentration, etc. were used to generate indicators (Appendix-1: Glossary).

RESULTS AND DISCUSSION

Productivity

The productivity of Tibor Braun indicates that he has published 40 single-authored and 140 multi-

authored papers during 1954-1995 (Table1). The multi-authored papers include: two-authored (66), three-authored (52), four-authored (17), five-authored (3), and six-authored (1) and nine-authored (1) papers. Table 1 shows that his first paper was published in 1954 when he was 23.

He had no publications during 1962, 1971 and 1976. The highest productivity was in 1990 with the output of 17 papers (at age 59), followed by 13 papers in 1989 (age 58), 11 papers each in 1991 and 1992 (age 60 and 61), eight papers each in 1986, 1993 and 1995; and seven papers each in 1973 and 1994. Thus the 58th to 61st years of his life were most productive. These four years had as many as 52 (29%) papers. The 50 percentile productivity life was 33 at 55 years of chronological age. The total productivity life of Tibor Braun under consideration in the present case study spans 42 years starting from his age 23. The overall productivity coefficient is 0.78. Quinquennial period-wise trend in Tibor Braun's publication of single-authored and multi-authored papers, and cumulative number of total papers along with the collaboration coefficients are depicted in Fig 1.

Collaboration

Braun has collaborated with 80 researchers till 1995 (Table 2). The publication productivity of Braun's research group in chronological order is depicted in Fig. 2. From Table 2 it is observed that Schubert has collaborated with Braun in the production of maximum number of 41 papers published during 1981-1995. Glanzel follows next with 27 papers published during 1986-1995, Zsindely with 19 papers published during 1982-1993 and Farag with 17 papers published during 1972-1983. Researchers collaborated with Braun only in one paper number 54; two papers each number 10; and three papers each number three only. The total authorship credit for 81 authors count 426, each collaborating author being given one authorship credit for each paper. Braun to his credit has 42.25 percent of total authorships.

The research group (81 members) under the leadership of Tibor Braun having 426 authorship credits follows the trend of author productivity expected as per Lotka's law (Fig 3).

Table 1 : Chronological publication productivity of Tibor Braun

NUMBER OF FOLLOWING AUTHORED PUBLICATIONS

PPL	YEAR	ONE	TWO	THREE	FOUR	FIVE	SIX	NINE	MT	TP	AGE
1	1954	1							0	1	23
2	1955	2							0	2	24
3	1956	2							0	2	25
4	1957	1							0	1	26
5	1958			1					1	1	27
6	1959			3					3	3	28
7	1960		1	1					2	2	29
8	1961		1	1					2	2	30
9	1962								0	0	31
10	1963		1						1	1	32
11	1964	2	2	1					3	5	33
12	1965		1	1	1				3	3	34
13	1966			1					1	1	35
14	1967	1		2					2	3	36
15	1968		1						1	1	37
16	1969				1				1	1	38
17	1970			1					1	1	39
18	1971								0	0	40
19	1972		3						3	3	41
20	1973		3	3		1			7	7	42
21	1974		4						4	4	43
22	1975		4						4	4	44
23	1976								0	0	45
24	1977	1		2					2	3	46
25	1978		1						1	1	47
26	1979		3						3	3	48
27	1980		1						1	1	49
28	1981		3	1	2				6	6	50
29	1982	1	2	3					5	6	51
30	1983	2	3	1					4	6	52
31	1984	2	1		2			1	4	6	53
32	1985		1	4	1				6	6	54
33	1986	3	3	1	1				5	8	55
34	1987	1	1	4					5	6	56
35	1988	2		2	1				3	5	57
36	1989	3	1	9					10	13	58
37	1990	6	8	3					11	17	59
38	1991	4	6	1					7	11	60
39	1992	3	4	1	3				8	11	61
40	1993	2	3	2	1				6	8	62
41	1994		1	1	4		1		7	7	63
42	1995	1	3	2		2			7	8	64
1-42	Total	40	66	52	17	3	1	1	140	180	

(PPL=Publication productivity life, MT=Multiauthored papers total in the year,
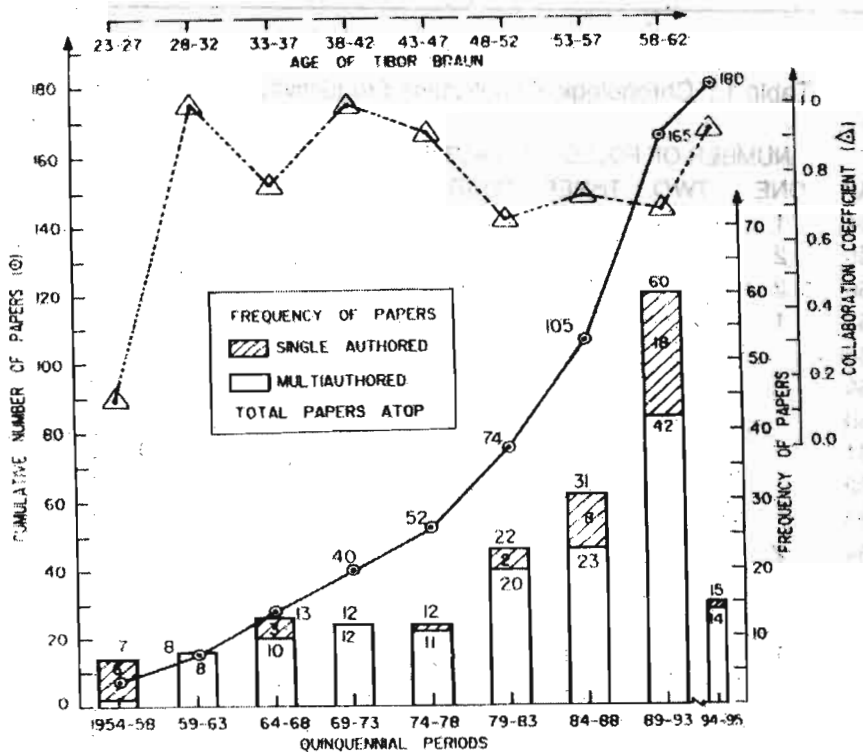TP=Total publication/s in the year, and AGE=Chronological age of Tibor Braun)

Fig. 1— Publication productivity of Tibor Braun

Authorship status in collaborative publications

For any researcher, the authorship status changes from paper to paper. In some papers he may be the first author, in some others his position may be second, third, fourth and so on. Table 3 depicts Tibor Braun's position as author in all his papers. He is the first or primary author in 142 papers, second author in 15 papers, third author in 19 papers, and fourth author in four papers.

In 38 collaborative papers Tibor Braun is secondary author. Collaborators who are the first authors in these 38 papers are listed in Table 4. Schubert is found to be the first author in 12 papers; Palagyi in 8 papers; Maxim in 3 papers; Bujdoso, Tolgyessy, Yoshihara and Zsindely in two papers each. The remaining seven authors were the first author in one paper each.

The authorship status among the core collaborators is documented in Table 5. In this group, Braun is the first author in 32 two-authored papers, 22 three-authored papers, 5 four-authored papers and one five-authored paper. Thus, out of the 74 papers published with core
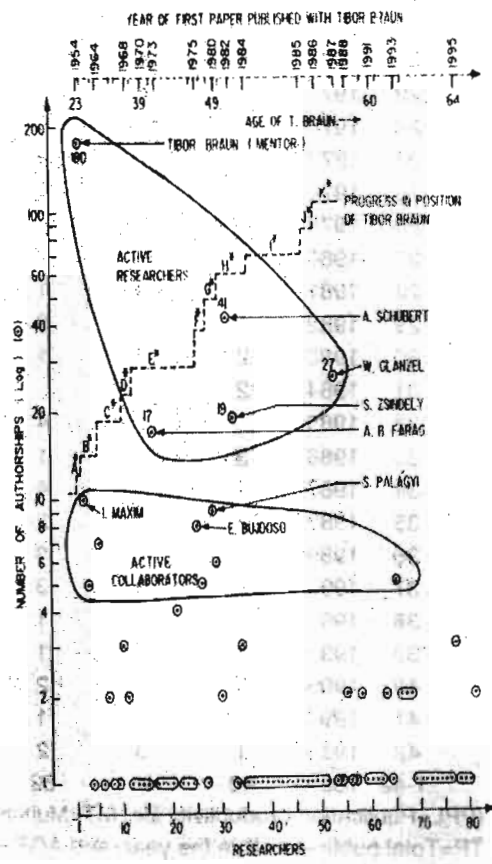

Fig. 2 — Publication productivity of the research group of Tibor Braun in chronological order

Table 2 : Authorship credits to researchers collaborating with Tibor Braun,
in chronological order of occurrence

| NO. | RESEARCHER | NUMBER OF FOLLOWING AUTHORED PUBLICATIONS | | | | | | | | PERIOD |
		ONE	TWO	THREE	FOUR	FIVE	SIX	NINE	Total	FPY-LPY
1	TIBOR BRAUN	40	66	52	17	3	1	1	180	1954-1995
2	I. MAXIM		3	7					10	1958-1963
3	I. GALATEANU			5					5	1958-1960
4	M. NACHMAN			1					1	1961-1961
5	J. TOLGYESSY		2	4	1				7	1964-1967
6	G. GLANZ			1					1	1964-1964
7	V. JESENAK			1	1				2	1965-1965
8	E. KOROS		1						1	1965-1965
9	M. HRADIL				1				1	1965-1965
10	J. KONECNY			3					3	1966-1967
11	L. LADANYI		1		1				2	1968-1968
12	M. MARTOHY				1				1	1969-1969
13	I. OSGYANI				1				1	1969-1969
14	C. RUIZ DE PARDO			1					1	1970-1970
15	C. SALAZAR I.			1					1	1970-1970
16	A. B. FARAG		15	2					17	1972-1983
17	O. BEKEFFY					1			1	1973-1973
18	I. HAKLITS					1			1	1973-1973
19	K. KADAR					1			1	1973-1973
20	G. MAJOROS					1			1	1973-1973
21	L. BAKOS			2	2				4	1973-1981
22	ZS. SZABO			1					1	1973-1973
23	A. KLIMES-SZMIK			1					1	1973-1973
24	E. HUSZAR			1					1	1973-1973
25	E. BUJDOSO		5	3					8	1975-1983
26	W. S. LYON		1	3	1				5	1977-1992
27	M. P. MALONEY			1					1	1977-1977
28	S. PALAGYI		8		1				9	1979-1994
29	M. N. ABBAS		2	1	3				6	1980-1982
30	A. ELEK				2				2	1981-1981
31	A. SCHUBERT		10	26	4	1			41	1981-1995
32	S. ZSINDELY		8	8	3				19	1982-1993
33	J. I. NAGY		1						1	1982-1982
34	A. VERTES			1	1	1			3	1982-1995
35	S. TOROK				1				1	1984-1984
36	Z. SZOKEFALVI NAGY				1				1	1984-1984
37	P. BULL							1	1	1984-1984
38	J. FARDY							1	1	1984-1984
39	I. HAIDUC							1	1	1984-1984

NO. RESEARCHER	NUMBER OF FOLLOWING AUTHORED PUBLICATIONS								PERIOD
	ONE	TWO	THREE	FOUR	FIVE	SIX	NINE	Total	FPY-LPY
40 P. MACASEK							1	1	1984-1984
41 W. J. MC DOWELL							1	1	1984-1984
42 N. Z. MISAK							1	1	1984-1984
43 J. D. NAVRATIL							1	1	1984-1984
44 T. SATO							1	1	1984-1984
45 A. TELCS				1				1	1984-1984
46 B. C. GRIFFITH				1				1	1985-1985
47 M. J. MORAVCSIK				1				1	1985-1985
48 N. C. MULLINS				1				1	1985-1985
49 SZ. TOROK				1				1	1986-1986
50 P. VAN DYCK				1				1	1986-1986
51 R. VAN GRIEKEN				1				1	1986-1986
52 W. GLANZEL	3	20	3	1				27	1986-1995
53 H. IMURA		1						1	1987-1987
54 N. SUZUKI		1						1	1987-1987
55 K. YOSHIHARA		1	1					2	1988-1988
56 M. HIRAGA			1					1	1988-1988
57 G. IZAWA			1					1	1988-1988
58 A. PALOS		2						2	1989-1990
59 T. SEKINE			1					1	1989-1989
60 STELLA NAGYDIOSI-ROZSA	1							1	1991-1991
61 I. GOMEZ				1				1	1992-1992
62 A. MENDEZ				1				1	1992-1992
63 A. KLEIN	1			1				2	1992-1992
64 Z. HAMONNAY				1				1	1992-1992
65 HAJNALKA MACZELKA		2	3					5	1993-1994
66 AGNES BUVARI-BARCZA		1				1		2	1994-1994
67 L. BARCZA		1				1		2	1994-1994
68 ILONA KOKOLY-THEGE					1	1		2	1994-1995
69 MARTA FODOR						1		1	1994-1994
70 B. MIGALI						1		1	1994-1994
71 M. MANCIU				1				1	1994-1994
72 R. MANAILA				1				1	1994-1994
73 A. DEVENYI				1				1	1994-1994
74 P. BERENYI				1				1	1994-1994
75 A. ILLENYI				1				1	1994-1994
76 SABIRDJAN SAKIEV				1				1	1994-1994
77 H. RAUSCH		2			1			3	1995-1995
78 K. SUVEGH					1			1	1995-1995
79 H. BROCKEN					1			1	1995-1995
80 E. RINIA					1			1	1995-1995
81 H. GRUPP			2					2	1995-1995
Total (1-81)	40	132	156	68	15	6	9	426	1954-1995

(FPY= First paper year and LPY=Last paper year)

collaborators Braun is the first author in 60 papers which is the unfailing proof of his leadership in the domains of analytical chemistry and scientometrics.

Out of 41 papers wherein Schubert has collaborated with Tibor Braun, he is the first author in 12 papers, second author in 10 papers, third author in 15 papers, fourth author in 3 papers,

Table 3 : Tibor Braun's Authorship Status

Publications	Position of Tibor Braun				Total
	I	II	III	IV	
Single-authored	40	-	-	-	40
Two-authored	53	13	-	-	66
Three-authored	32	1	19	-	52
Four-authored	12	1	-	4	17
Five-authored	3	-	-	-	3
Six-authored	1	-	-	-	1
Nine-authored	1	-	-	-	1
Total	142	15	19	4	180

(I = 1st Author, II = 2nd Author, III = 3rd Author, and IV = 4th Author)
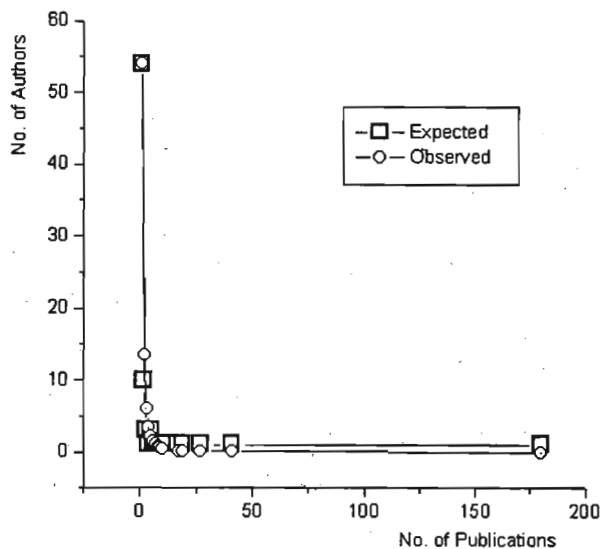
Fig. 3— Author productivity observed in the publications of Tibor Braun and expected author productivity as per Lotka's Law

and fifth author in one paper. Glanzel never appeared as the first author while collaborating with Braun. He was the second author in 26 papers, and third-author in one paper. Zsindely collaborated with Braun in 19 papers in which Zsindely is the first-author in two papers, second author in 12 papers, third author in 4 papers, and fourth author in one paper. Farag's name appeared in the bylines of 17 collaborative papers with Tibor Braun, in which Farag figures as second author in all the seventeen papers.

The distribution of collaborating authors is given in Table 6. Thirty collaborators were associated with Tibor Braun during 1984-88, followed by 22 during 1994-95, 16 during 1989-93, and 15 during 1969-73. In other quinquennial periods the collaborating authors were less than 15.

Bradford distribution

In all, Tibor Braun has contributed 180 papers during 1954-1995. To test whether or not his contributions follow Bradford distribution, each zone should have around 60 papers. The first two journals account for 54 papers, and first three 71 papers. As 54 is closer to 60, hence 54 papers fall in the first zone (Table 7). The remaining papers fall in the second and the third zones.

We find from the number of journals in the first two zones that the Bradford multiplier is 7÷2 = 3.5. According to this multiplier the number of periodicals in the third zone should be 2x3.5x3.5 = 24.5 which is far from the actual number 40. The papers and the journals can also be distributed in the three different zones as in Table 8.

In this case the Bradford multiplier is 4. According to this multiplier the number of journals in the 3rd zone should be 32. In reality, it is 39. In both the cases we find that the number of journals in the third zone goes much beyond the actual number.

Table 4 : First Authors in the Collaborative Papers where Tibor Braun is the Secondary Author

Collaborative Papers	Names of Collaborators with no. of papers as First Author in parenthesis	Total
Two-authored	S Palagyi (7), A Schubert (4), E Bujdoso (1), I Maxim (1)	13
Three-authored	A Schubert (7), I Maxim (2), J Tolgyessy (2), S Zsindely (2), MN Abbas (1), E Bujdoso (1), Agnes Buvari-Barcza (1), I Galateanu (1), J Konecny (1), M Nachman (1), K Yoshihara (1)	20
Four-authored	M Manciu (1), S Palagyi (1), A Schubert (1), Sz Torok (1), K Yoshihara (1)	5

Table 5 : Authorship Status among the Core Authors

No. of following authored publications and authorship status

Core Authors	Two		Three			Four				Five				
	I	II	I	II	III	I	II	III	IV	I	II	III	IV	V
Tibor Braun	32	4	22	-	9	5	-	-	1	1	-	-	-	-
A Schubert	4	6	7	4	15	1	-	-	3	-	-	-	-	1
W Glanzel	-	3	-	20	-	-	3	-	-	-	-	1	-	-
S Zsindely	-	8	2	3	3	-	1	1	1	-	-	-	-	-
A B Farag	-	15	-	2	-	-	-	-	-	-	-	-	-	-

(I = 1st Author, II = 2nd Author, III = 3rd Author, IV = 4th Author, and V = 5th Author)

Hence, the data comes close to Bradford distribution but does not strictly follow Bradford law. This might be due to the fact that Braun has contributed in two distinctly different fields of knowledge, i.e. analytical chemistry, and scientometrics.

Invalidity of Bradford's Law has been observed by Bonitz [85] in case of individual scientists. Bradford distribution is not usually observed in most cases in small data sets [86]. Thus, data on Tibor Braun for preferences towards channels of communication follows trend of Garfield's Law of Concentration. Publication concentration is 10.2 and publication density 3.7. Bradford-Zipf bibliograph is shown in Figure 4.

Channels of communication

Tibor Braun has used 49 channels of communications (Table 9 and Fig 4) to disseminate his research results during 1954-1995. Top ranking journals with number of publications are: *Scientometrics* (33), *Anal Chem Acta* (21), *Trends Anal Chem* (17), *J Radioanal Nucl Chem Letters* (16), and *Freseniu' Z Anal Chem* (7). Fifty percent of his research papers are published in these top ranking five journals. The cumulative of the number of publications as per the usage of the core journals over a period is depicted in the inset of Fig 4. In the multidisciplinary journal *Nature* having very high impact factor and immediacy index, he has

Table 6 : Periodic Group Dynamics by Distribution of Collaborating Authors

Periods	Authors	No.	Age
1954-58	**T Braun**, I Galateanu, I Maxim	3	23-27
1959-63	**T Braun**, I Galateanu, I Maxim, M Nachman	4	28-32
1964-68	**T Braun**, G Glanz, M Hardil, V Jesenak, J Konecny, E Koros, L Ladanyi , I Maxim, J Tolgyessy	9	33-37
1969-73	**T Braun**, L Bakos, O Bekeffy, AB Farag, I Haklits, E Huszar, K Kadar, A Kilmes-Szmik, L Ladanyi, G Majoros, M Martohy, I Osgyani, C Ruiz de Pardo, C Salazar I, Zs Szabo	15	38-42
1974-78	**T Braun**, E Bujdoso, AB Farag, WS Lyon, MP Maloney	5	43-47
1979-83	**T Braun**, MN Abbas, L Bakos, E Bujdoso, A Elek, AB Farag, WS Lyon, JI Nagy, S Palagyi, A Schubert, A Vertes, S Zsindely	12	48-52
1984-88	**T Braun**, MN Abbas, A Schubert, E Bujdoso, P Bull, P van Dyck, J Fardy, W Glanzel, R van Grieken, BC Griffith, I Haidue, M Hiraga, H Imura, G Izawa, WS Lyon, P Macasek, WJ McDowell, NZ Misak, MJ Moravcsik, NC Mullins, JD Navratil, S Palagyi, T Sato, N Suzuki, Z Szokefalvi-Nagy, A Telcs, S Torok, Sz Torok, K Yoshihara, S Zsindely	30	53-57
1989-93	**T Braun**, W Glanzel, I Gomez, Z Homonnay, A Klein, WS Lyon, H Maczelka, A Mendez, S Palagyi, A Palos, A Schubert, T Sekine, Stella Nagydiosi-Rozsa, A Vertes, K Yoshihara, S Zsindely	16	58-62
1994-95	**T Braun**, L Barcza, P Berenyi, H Brocken, A Buvari-Barcza, A Devenyi, M Fodor, W Glanzel, H Grupp, A Illenyi, I Konkoly-Thage, H Maczelka, R Manaila, M Manciu, B Migali, S Palagyi, H Rausch, R Rina, S Sakiev, A Schubert, K Suvegh, A Vertes	22	63-64

(Age=Chronological age of Tibor Braun)

published three items. The contribution of Braun to scientometrics and information science lies in the 36 papers published in *Scientometrics* (33) and *Journal of Information Science* (3). All other publications belong to analytical chemistry.

Synchronous Self Citation Rate

Only core journals selected by Tibor Braun for his research publications were considered to study synchronous self citation rate and it varied from 19% to 70% as following:

Fresenius Zeitschrift fur Analytische Chemie, changed to *Fresenius Journal of Analytical Chemistry* (19%); *Analytica Chimica Acta* (22%);

Scientometrics (28%); *Trends in Analytical Chemistry* (30%); and *Journal of Radioanalytical and Nuclear Chemistry Letters* (70%). High synchronous self citation rate is the indicator of expertise.

Title tomography

Natural languages share some gross scaling properties as noted by Zipf. High frequency title keywords [87] that figured in the articles of Tibor Braun are placed in Table 10. Top ranking keywords are found to be Foam/s; Analytical; Chemistry; Analysis/Analyse; Citation/Cited; Indicators; Bibliography/Bibliographic; Cold Fusion; Research Impact; etc.
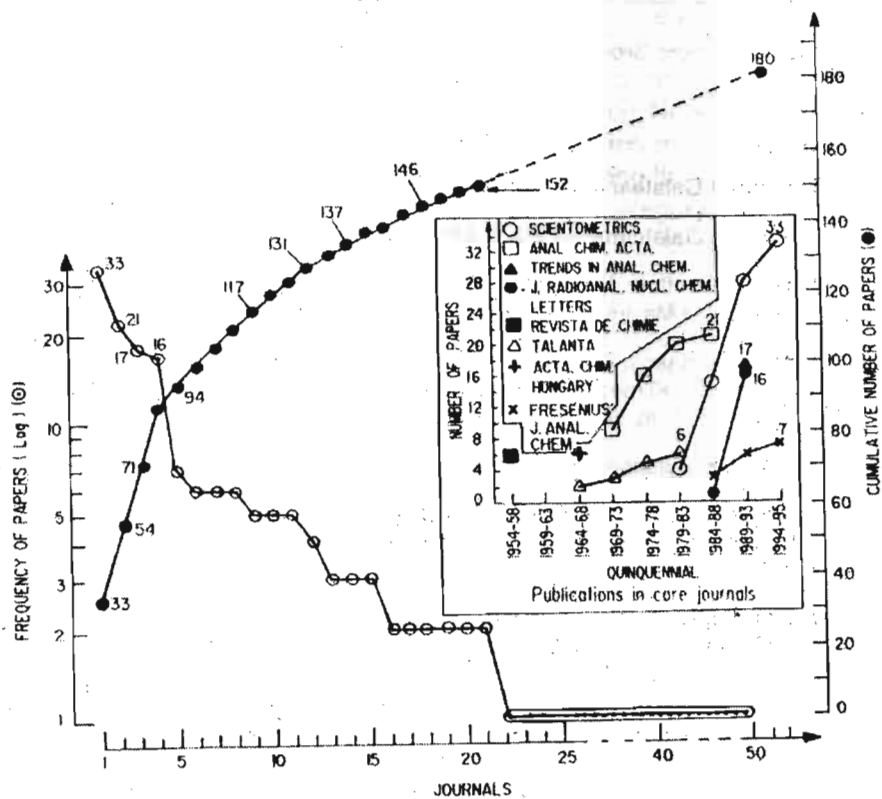
Fig. 4— Bradford-Zipf bibliograph on publications of Tibor Braun and inset showing cumulative of publications channelised preferentially in core journals

Table 7 : Distribution of Papers and Journals according to Bradford Zones

Zone	I	II	III
Papers	54	63	63
Journals	2	7	40

(I = 1st Zone, II = 2nd Zone, and III = 3rd Zone)

Table 8 : Distribution of Papers and Journals according to Bradford Zones

Zone	I	II	III
Papers	54	68	58
Journals	2	8	39

(I = 1st Zone, II = 2nd Zone, and III = 3rd Zone)

Table 9 : Ranking of the Channels of Communication used by Tibor Braun

Rank	Title	No. of Papers	Cum. No. of Papers	FPY-LPY
1	*Scientometrics*	33	33	1981-95
2	*Anal Chim Acta*	21	54	1972-84
3	*Trends Anal Chem*	17	71	1989-93
4	*J Radioanal Nucl Chem Lett*	16	87	1986-92
5	*Fresenius Z Anal Chem*	7	94	1984-94
6	*Rev Chim*	6	100	1954-55
6	*Talanta*	6	106	1964-83
6	*Acta Chim Hungary*	6	112	1964-95
7	*Anal Proc*	5	117	1982-93
7	*J Radioanal Chem*	5	122	1969-81
7	*J Radioanal Nucl Chem Articles*	5	127	1984-92
8	*Anal Chem*	4	131	1977-95
9	*J Info Sci*	3	134	1988-93
9	*Nature*	3	137	1958-90
9	*Radiochem Radioanal Lett*	3	140	1970-82
10	6 Periodicals with 2 papers each	12	152	1960-95
11	28 Periodicals with one paper each	28	180	1959-95

(FPY=First paper year and LPY=Last paper year)

Table 10 — High frequency keywords in the titles of the publications of Tibor Braun

Keyword	Freq.				
Foam(s)(ed)	44	Countries	5	Transport	4
Analytical	32	Field(s)	5	Advances	3
Chemistry	32	Figures	5	Buckminsterfullerene	3
Analys(is)(e)	21	International	5	Complexes	3
Cit(ed)(ation)	17	Water	5	Datafiles	3
Indicators	16	Application(s)	4	Distribution	3
Basic	13	Approach(es)	4	Effort(s)	3
Bibliograph(y)(ic)	13	British	4	Exchange	3
Cold Fusion	13	C60	4	Fullerene	3
Impact	13	Cobalt	4	Hungarian	3
Annotat(ed)(ion)	12	Collection	4	Index	3
Chromatography	12	Database	4	Inorganic	3
Journal(s)	12	Diethyl-Dithiocarbamate	4	Ion(ics)	3
Element(s)	10	Environmental	4	Iron	3
Physics	9	Gold	4	Life	3
Determination	8	Induced	4	Mercury	3
Evaluati(on)(ng)(ve)	8	Ion-Exchange	4	Metal(s)	3
Instrumental	8	Irradiation	4	Neutron	3
Column(s)	7	Loaded	4	Plasticized	3
Effect(s)	7	Method(s)	4	Polyether	3
Extraction	7	Radiation(s)	4	Polyurethane	3
Compar(ative)(ison)	6	Reaction(s)	4	Quantitative	3
Fact(s)	6	Relational Charts	4	Redox	3
Growth	6	Scientific	4	Reflect(ed)(s)	3
Cataly(sis)(tic)(sed)	5	Solution(s)	4	Source(s)	3
Catalytimetric	5	Statistic(al)(s)	4	Universal Matrix	3
		Support(ing)(ed)	4		

CONCLUSIONS

Analytical chemists are well-trained to undertake analysis work. Tibor Braun had an excellent record of achievements. His interdisciplinary analytical activity for scientific advancements has benefited information analysts by introducing new tools and techniques. Multidisciplinary, interdisciplinary and extra-disciplinary interactions are essential for exploring state-of-the-art and advancements of frontiers of knowledge.

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Appendix-1 : Glossary

Authorship status is the position of the author, i.e. first, second, third, etc. sequence in byline.

Channels of communication are the sources chosen by the author to communicate research.

Collaboration coefficient is the ratio of the number of collaborative papers to the total number of papers published during a fixed period of time.

Core collaborators are those authors who have made substantial contribution (in terms of the number of papers) in association with the principal author.

Immediacy index of journal J is calculated as: the number of all citations received in the year y divided by the total number of source items published in the journal J in the same year y.

Impact factor for the journal J is calculated as: the total number of citations received in the year y to all source items published in journal J in the previous two years (y-1 and y-2), divided by the total number of source items published in the journal J in those two years (i.e. y-1 and y-2).

Normal count is one score for every occurrence of the same author in the bylines of publications or the same source channel of communications used or the same keyword, etc.

Principal author is the one common author among the authors forming a collaborative group in byline of all publications.

Productivity is the measure of the number of publications brought out by the author.

Productivity coefficient is the ratio of the productivity age (corresponding to the 50 percentile productivity) to the total productivity life.

Productivity life (age) is the count from the year in which first paper by an author was published till the latest year of publication under consideration.

Publication concentration is the percent ratio of number of source channels having 50 percent of the publications and total number of channels used.

Publication density is the number of publications per channel.

Secondary author is any author in a collaborative publication other than the first author.

Synchronous Self-Citation Rate is the percentage of self citations in an article divided by total number of citations in the same article.