

Journal Citation Studies.
23. French Journals--What They Cite
and What Cites Them

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Recently I gave a paper on citation patterns of Soviet journals, which will be published in due course.¹ Lest we be accused of singling out our Russian colleagues for criticism, we've now done a comparable analysis of French journals.

I've described elsewhere the methodology used in this type of group analysis, but will summarize it briefly.² We treated the French journals indexed by the *Science Citation Index*[®] in 1974 as though they constituted a single journal. Then we determined which journals they as a group cited most frequently, and which journals cited them as a group most frequently. The French journals in question are listed in the 1974 *SCI*[®] *Guide*.³ There are 129 of them. They are journals *published in France*.

When we comment on a particular national scientific literature, we must first decide what reasonable questions to pose. For example, if all science is truly international then one would expect the French, or any other national literature, to conform more or less to certain broad patterns of the scientific literature as a whole.

Let me emphasize at this point that in this study we are talking about *journals published in France* and their 1974 issues. We cannot on that basis talk about French scientific literature with strict accuracy, nor about French articles--either from a linguistic or scientific standpoint. Many French scientists publish in international and other 'non-French' journals, and may or may not write their reports for these journals in French. And, of

course, there are many articles written in French for journals published outside France.

Nevertheless, dealing with this group of French journals as a whole probably gives a rough handle on French science and research. It also suggests some questions we might ask, and provides as well insight into methods needed to improve our analyses of national literatures.

The 129 French journals represent about 5.3% of the 2443 journals indexed by the *SCI* in 1974. The 2443 *SCI* journals produced 400,971 indexed source items in 1974, with 5,244,728 references. The 129 French journals produced 15,527 indexed items with 134,262 references. In other words, the 5.3% French journals produced 3.8% of the total items indexed, and 2.6% of the references. From these figures, one can see that the 'average' scientific article made reference to about 13 other articles, while the 'average' article in the French journals made only 8.8% such references.

Figure 1 on page 6 is a list of the fifty journals most frequently cited by the French journals. Figure 2 on page 7 is a list of the fifty journals that most frequently cited them. Each list shows for each journal the total citations it received or made, the number of citations made by or to the French journals, the number of self-citations, and percentages that relate these three figures to each other. The last column in each list gives the journal's impact factor--the average number of 1974 citations of articles published by the journal in 1972 and 1973.⁴

Figure 1. Journals that were Cited by French Journals. A = total citations by all journals. B = total citations by French journals. C = self-citations. D = B/A ('French citations' in terms of total citations). E = C/A (self-citations in terms of total citations, the self-cited rate). F = C/B (self-citations in terms of 'French citations'). G = impact factor.

	JOURNAL	A	B	C	D	E	F	G
1.	J. Amer. Chem. Soc. (1)	98995	2555	—	2.6	—	—	4.38
2.	B. Soc. Chim. France (95)	6671	2471	1700	37.0	25.5	68.8	0.77
3.	C. Rend. Acad. Sci.	8634	2106	626	24.4	7.3	29.7	—
4.	C. Rend. Acad. Sci. D Nat. (206)	3603	1758	1317	48.8	36.6	74.9	0.51
5.	Lancet (9)	37047	1451	—	3.9	—	—	6.67
6.	Nouv. Presse Medicale (365)	2908	145 0	323	49.9	11.1	22.3	0.60
7.	Nature (4)	59206	1403	—	2.4	—	—	3.63
8.	J. Biol. Chemistry (2)	81354	1341	—	1.6	—	—	5.84
9.	Biochim. Biophys. Acta (5)	51487	1125	—	2.2	—	—	3.11
10.	New England J. Med. (13)	26726	1125	—	4.2	—	—	8.36
11.	C. Rend. Acad. Sci. C Chim (272)	2857	1082	573	37.9	20.1	53.0	0.51
12.	Circulation (38)	14461	1081	—	7.5	—	—	6.83
13.	J. Chemical Physics (3)	62040	1029	—	1.7	—	—	2.91
14.	J. Clin. Invest. (14)	24768	920	—	3.7	—	—	6.99
15.	Science (8)	46488	887	—	1.9	—	—	5.25
16.	P. Nat. Acad. Sci. USA (7)	46916	836	—	1.8	—	—	8.98
17.	J. Organic Chemistry (21)	20539	799	—	3.9	—	—	1.49
18.	Brit. Med. J. (18)	20700	798	—	3.9	—	—	3.54
19.	J. Amer. Med. Assoc. (30)	17211	748	—	4.3	—	—	3.06
20.	J. Chemical Society (22)	19955	748	—	3.7	—	—	—
21.	C. Rend. Soc. Biol. (283)	2742	698	232	25.5	8.5	33.3	0.30
22.	J. Chim. Physique (306)	2532	657	367	25.9	14.5	55.9	0.88
23.	Amer. J. Medicine (56)	9779	633	—	6.5	—	—	4.41
24.	Physical Review (6)	50842	631	—	1.2	—	—	—
25.	C. Rend. Acad. Sci. A Math (705)	844	602	474	71.3	56.2	78.7	0.20
26.	Tetrahedron Letters (31)	16478	589	—	3.6	—	—	1.77
27.	Biochemical Journal (10)	31563	585	—	1.9	—	—	3.62
28.	Arch. Maladies Coeur (711)	835	569	221	68.1	26.5	38.8	0.64
29.	Amer. J. Cardiology (93)	6811	554	—	8.1	—	—	3.70
30.	J. Urology (135)	5031	542	—	10.8	—	—	0.72
31.	Semaine Hopitaux (645)	974	541	125	55.5	12.8	23.1	0.29
32.	Annals Surgery (84)	7459	512	—	6.9	—	—	2.12
33.	Radiology (99)	6311	492	—	7.8	—	—	1.19
34.	Annals Internal Med. (50)	10231	489	—	4.8	—	—	4.82
35.	Gastroenterology (70)	8693	487	—	5.6	—	—	5.39
36.	P. Soc. Exp. Biol. Med. (28)	18167	477	—	2.6	—	—	1.46
37.	J. Cell Biology (24)	19103	474	—	2.5	—	—	6.77
38.	Amer. J. Roentg. (133)	5038)	469	—	9.3	—	—	1.00
39.	Amer. Heart J. (102)	5994	456	—	7.6	—	—	1.79
40.	C. Rend. Acad. Sci. B Phys. (456)	1522	451	302	29.6	19.8	67.0	0.44
41.	J. Molecular Biology (15)	24209	446	—	1.8	—	—	7.50
42.	J. Physical Chemistry (29)	18086	445	—	2.5	—	—	2.03
43.	Cancer (60)	9498	440	—	4.6	—	—	2.36
44.	Amer. J. Physiology (17)	21519	424	—	2.0	—	—	2.41
45.	Bioch. Bioph. Res. Comm. (16)	23136	422	—	1.8	—	—	3.73
46.	Biochemistry (12)	27080	421	—	1.6	—	—	4.71
47.	Phys. Rev. Letters (11)	29229	401	—	1.4	—	—	5.05
48.	J. Exp. Medicine (19)	20699	400	—	1.9	—	—	11.87
49.	J. Bacteriology (26)	18369	391	—	2.1	—	—	2.72
50.	Amer. J. Obst. Gyn. (66)	8866	389	—	4.4	—	—	2.09

Figure 2. Journals that Cited French Journals. A = total citations of other journals. B = total citations from journals in the French group. C = self citations. D = B/A ('French citations' in terms of total citations). E = (self-citations in terms of total citations, the self-citing rate). F = C/B (self-citations in terms of 'French citations'). G = impact factor.

JOURNAL		A	B	C	D	E	F	G
1.	C. Rend. Acad. Sci. D Nat.	11129	1952	1317	17.5	11.8	67.5	0.51
2.	B. Soc. Chim. France	11102	1379	869	12.4	7.8	63.0	0.77
3.	C. Rend. Acad. Sci. C Chim.	4762	1151	573	24.2	12.0	49.8	0.51
4.	Semaine Hopitaux	5603	882	125	15.7	2.2	14.2	0.29
5.	Nouv. Presse Medicale	4900	801	323	16.3	6.6	40.3	0.60
6.	J. Organomet. Chem.	22699	655	—	2.9	—	—	2.38
7.	C. Rend. Acad. Sci. A Math.	1924	588	474	30.6	24.6	80.6	0.20
8.	J. Chim. Physique	4489	556	367	12.4	8.2	66.0	0.88
9.	C. Rend. Acad. Sci. B Phys.	2243	466	302	20.8	13.5	64.8	0.44
10.	Analytical Chemistry	27658	435	—	1.6	—	—	3.29
11.	Tetrahedron	13059	404	—	3.1	—	—	1.57
12.	Ann. Chirurgie	1916	394	79	20.6	4.1	20.0	0.16
13.	C. Rend. Soc. Biol.	1926	367	232	19.1	12.0	63.2	0.30
14.	Lyon Medical	2771	365	49	13.2	1.8	13.4	0.24
15.	Arch. Maladies Coeur	2466	358	221	14.5	9.0	61.7	0.64
16.	J. Amer. Chem. Soc.	46267	343	—	0.7	—	—	4.38
17.	J. Chem. Soc. Perkin	20327	342	—	1.7	—	—	1.34
18.	J. Organic Chemistry	21976	326	—	1.5	—	—	1.49
19.	Revue Rhumatisme	1543	315	103	20.4	6.7	32.7	0.48
20.	Tetrahedron Letters	11178	269	—	2.4	—	—	1.77
21.	Pathologie Biologie	2866	252	49	8.9	1.7	19.4	0.56
22.	Lille Medicale	1842	249	41	13.5	2.2	16.5	0.13
23.	Canad. J. Chemistry	12685	240	—	1.9	—	—	1.39
24.	Biochimie	4677	236	154	5.0	3.3	65.3	1.63
25.	Neuro-Chirurgie	1363	230	66	16.9	4.8	28.7	0.36
26.	J. Radiol. Electrol.	1264	223	65	17.6	5.1	29.1	0.21
27.	Arch. Fr. Pediatrie	1642	215	72	13.1	4.4	33.5	1.01
28.	J. Chirurgie	1265	215	14	17.0	1.1	6.5	0.15
29.	J. Microscopie (Paris)	1634	212	129	13.0	7.9	60.8	1.60
30.	Eur. J. Med. Chem.	1541	207	112	13.4	7.3	54.1	—
31.	Brain Research	19626	198	—	1.0	—	—	3.10
32.	Ann. Cardiol. Angeiol.	1132	192	13	17.0	1.1	6.8	0.35
33.	Deut. Med. Wschr.	—	187	—	—	—	—	—
34.	Biochim. Biophys. Acta	45366	185	—	0.4	—	—	3.11
35.	Coeur Med. Interne	1308	184	30	14.1	2.3	16.3	0.53
36.	Physical Review B	27280	181	—	0.7	—	—	2.86
37.	Ann. Radiologie	1122	180	24	16.0	2.1	13.3	0.39
38.	J. Urologie Nephrol.	1171	180	107	15.4	9.1	59.4	0.18
39.	Cell Tissue Research	—	177	—	—	—	—	—
40.	J. Physique	1749	177	110	10.1	6.3	62.1	1.84
41.	Arch. Fr. Mal. App. Dig.	1556	172	58	11.1	3.7	33.7	0.72
42.	J. Chemical Physics	33404	172	—	0.5	—	—	2.91
43.	Uspekhi Khimii	12319	172	—	1.4	—	—	1.07
44.	Nouv. Revue Fr. Hemat.	1675	170	98	10.1	5.9	57.6	0.94
45.	Gen. Comp. Endocrinol.	3715	169	—	4.5	—	—	2.03
46.	Humangenetik	3820	165	—	4.3	—	—	1.70
47.	Revue Chir. Orthop.	688	157	70	22.8	10.2	44.6	0.17
48.	Therapie	1352	148	32	10.9	2.4	21.6	0.40
49.	B. Soc. Zool. France	—	147	30	—	—	20.4	—
50.	J. Electroanal. Chem.	6769	147	—	2.2	—	—	1.56

As in all other studies of this type we've made, the law of concentration seems to hold true.⁵ Of the approximately 5000 journals cited by the French group, 1%--the fifty listed in Figure 1--accounted for 30.1% of the total citations (40,800/134,262). Likewise, the French journals were cited by 1747 different journals, but the fifty journals listed in Figure 2 accounted for 37.3% of the total citations (18,087/52,500) received by the French journals. If the two lists were extended to include the top seventy-five journals in each case, the corresponding numbers would be only 36.7% (49,821) and 42.2% (21,289) respectively. In other words, adding half again as many journals produces relatively few additional citations.

If the French literature is a characteristic segment of an international scientific literature, the list of most-cited journals in Figure 1 should correspond fairly well to the list of journals most highly cited by the scientific literature as a whole in 1974. But there are telling differences, both in ranks and in citation totals.

In 1974 the most highly cited of scientific journals was the *Journal of the American Chemical Society*. All things being equal, it should be the first on the list, and it is. As noted above, the French journals contributed 2.6% of the references processed for the *SCI*, and again--all things being equal--they should account for 2.6% of the citations received by *JACS* in 1974. As a matter of fact, they account for 2555, or just about 2.6%.

Second on the list in Figure 1, however, is *Bulletin de la Societe Chimique de France*. It was cited by all journals 6671 times. The expected 2.6% 'French citation' total would be 173. The actual number is 2471. Indeed, by scanning column D in Figure 1, it is possible to discover by how much 'French citation' of the cited journals varies from the expected norm of 2.6%. Most of the per-

centages in column D--the percentage of 'French citations' in terms of total citations--vary one way or the other, but it would be difficult to determine how statistically significant the variation is in most cases. In cases where it must obviously be significant--where the percentage is greater than 10--the journals are all French journals, most of them with greater than average self-citing rates,⁶ and less than average impact factors.

It would be understandable to conclude that the eleven French journals on the list of journals most cited by French journals are there because they're French, and let it go at that. But if it's merely a case of language preference and language barrier, why aren't there *more* French journals. And why isn't 'French citation' and heavy self-citation more effective than it is in raising the low impact factors of most of these journals.

I don't think the answer is a simple matter of language, though language undoubtedly plays a part. In Figure 1, the number in parentheses after the journal title abbreviation is the rank of the journal when all scientific journals are listed in order of total citations received in 1974. The *SCI*'s excellent coverage of French clinical journals may explain the appearance among the fifty journals in Figure 1 of clinical journals that rank low in an overall list. One can assume that the language factor has played a significant role in raising (*Nouvelle*) *Presse Medicale* from 365th on the overall list to 6th on this French list. but the language factor theory receives a blow when one sees that just above, in 5th place on the French list, is *Lancet*, cited by the French journals relatively heavier than by the literature as a whole (3.6% instead of 2.6%).

The year-by-year citation record of *Lancet* and (*Nouvelle*) *Presse Medicale* (*NVP*) gives a clue to how the language factor may operate. Clearly *NVP* is on the list because it is a French journal, and

Figure 3. Articles from Journals Published in France that were Cited More than 150 Times during the Period 1961-1974.

1. 396 **Thiery J P.** Mise en evidence des polysaccharides sur coupes fines en microscopie electronique (Electron-microscopic demonstration of polysaccharides in fine sections). *J. Microscopie* 6:987-1018, 1967.
2. 377 **Mulliken R S.** Quelques aspects de la theorie des orbitales moleculaires (On some aspects of the molecular orbital theory). *J. Chim. Phys.* 46:497-542, 1949.
3. 290 **Novikoff A B & Woo-Yung Shin.** The endoplasmic reticulum in the Golgi zone and its relations to microbodies, Golgi apparatus and autophagic vacuoles in rat liver cells. *J. Microscopie* 3:187-206, 1964.
4. 256 **Rosset R, Monier R & Julien J.** Les ribosomes d'*Escherichia coli*. I. Mise en evidence d'un RNA ribosomique de faible poids moleculaire (Ribosomes of *E. coli*. I. Demonstration of a ribosomal of low molecular weight). *B. Soc. Chim. Biol.* 46:87-109, 1964.
5. 213 **Sussman R & Jacob F.** Sur un systeme de repression thermosensible chez le bacteriophage λ d'*Escherichia coli* (On a system of heat-sensitive repression in the lambda bacteriophage of *E. coli*). *C. Rend. Acad. Sci.* 254:1517-1519, 1962.
6. 193 **Gabe M.** Sur quelques applications de la coloration par la fuchsine-paraldehyde-improved Gomori's aldehyde-fuchsin (On some applications of the fuchsin-paraldehyde stain-improved Gomori's aldehyde-fuchsin). *B. Micr. Appl.* 3:152-162, 1953.
7. 185 **Lejeune J, Gautier M & Turpin R.** Etude des chromosomes somatiques de neuf enfants mongoliens (Study of somatic chromosomes in nine cases of mongolism). *C. Rend. Acad. Sci.* 248:1721-1722, 1959.
8. 184 **Cohen G N & Rickenberg H V.** Concentration specifique reversible des aminoacides chez *Escherichia coli* (Specific reversible concentration of amino acids in *E. coli*). *Ann. Inst. Pasteur* 91:693-720, 1956.
9. 181 **Gabriel P.** Des categories Abeliennes (Abelian categories). *Bull. Soc. Math. France* 90:323-448, 1962.
10. 167 **Rickenberg H V, Cohen G N, Buttin G & Monod J.** La galactoside-permease d'*Escherichia coli* (Galactoside permease in *E. coli*). *Ann. Inst. Pasteur* 91:829-857, 1956.
11. 161 **Dutrillaux B & Lejeune J.** Sur une nouvelle technique d'analyse du caryotype humain (A new method for analysis of human karyotypes). *C. Rend. Acad. Sci.* 272:2638-2640, 1971.
12. 159 **Lejeune J, Gauthier M & Turpin R.** Les chromosomes humains en culture de tissus (Human chromosomes in tissue cultures). *C. Rend. Acad. Sci.* 248:602-603, 1959.
13. 153 **Drach P.** Mue et cycle d'intermue chez les crustaces decapodes (Molting and the inter-molting cycle in decapod crustaceans). *Ann. Inst. Oceanogr. Monaco* 19:103-391, 1939.

equally clearly *Lancet* is there because it is a good journal. In both cases, 22.3 percent of the 1974 citations were of material in the two journals older than 1961. It is in citation of their newer articles that the records differ. We know from many years' *SCI* statistics that about 2% of citations are of articles published the same year. About 11% are citations of articles published the previous year, and 12% are citations of articles two years old. The year-by-year citation record shows a delay in the citation by French journals of *Lancet* articles compared with *NVP* articles. The cumulative percentages are for *Lancet* and

NVP respectively: 1974, 1.2 & 6.7; 1973, 13.3 & 27.0; 1972, 26.6 & 47.9; 1971, 39.9 & 55.8. This same delay shows up in the case of many other non-French journals cited by the French group. The language factor operates apparently to affect the immediacy with which a journal is cited. Considering this fact carefully, one must conclude that *Lancet* is even more important to French medicine than its rank here proves, and that *NVP* may not be as important as its rank suggests.

In Figure 2 we find that the journals that cite French journals most heavily are predominately French, and that the self-

citing rate is much higher than normal. Individual citation records show the same delay mentioned above, in the case of non-French journals.

Like the list of *cited* journals, the list of *citing* journals in this French study differs from cited and citing lists for the total literature in the matter of physics. Only four or five journals on either list can be considered physics journals. Among the top fifty citing and cited journals of science as a whole there are double the number of physics journals on these lists.

In considering Figures 1 and 2, it seems that we have a literature that is mainly of low impact. The French journals cite foreign literature much more heavily than their own, while their own literature is mainly cited by themselves. An interesting example of this phenomenon is shown by the mathematics section (A) of the *Comptes Rendus* of the French Academy. Only 30.6% of its references cited journals in the French group, and most of those (80.6%) were self-citations (see item 7 in Figure 2). The foreign literature does not, so to speak, return the compliment. In Figure 1, item 25 shows that of the 844 citations this same journal received, 71.3% were 'French citations', and again most of them self-citation.

Thus, the French look to the foreign literature much more than to reports of their own research. Is this a local situation like that in large universities where one

lab doesn't know what the other lab is doing. Such a situation is epitomized in a recent *New Yorker* cartoon, which shows one aging scientist looking over his shoulder to comment to another, "I see by the current issue of 'Lab News' that you've been working for the last twenty years on the same problem *I've* been working on for the last twenty years."⁷ We doubt it.

Is it due to the unwillingness of foreigners to read French? I doubt this also, as shown by *the high citation rates of the older French literature*.

As in the past, we present along with the listing of frequently cited journals a list of highly cited articles. On page 9 you will find the articles from the group of French journals that were cited more than 150 times during the period 1961-1974. Most have to do with molecular biology. But most important of all, only two of them--items 1 and 11--were published within the last decade. All the rest appeared in 1964 or earlier. Most readers will not be surprised to find that the authors include several Nobel Prize winners, but it may be disappointing to others that several of the articles--including one written in English--are not the work of French scientists. You have your choice between a dozen and a baker's dozen in the case of these articles, since the last, the thirteenth, may and may not be geographically French, as you prefer.

1. Garfield E. Journal citation studies. 22. Russian journal references and citations in the *Science Citation Index* data bank. Paper presented at the US/USSR Symposium on Forecasting Information requirements and Services, Yale University, New Haven, Conn., 20-23, October 1975.
2. -----, Journal citation studies. 9. Highly cited pediatric journals and articles. *Current Contents*®(CC®) No. 29, 17 July 1974, p. 5-9.
3. *Science Citation Index 1974 Guide and Journal Lists*. (Philadelphia: Institute for Scientific Information, 1975), p. 95.
4. Garfield E. Citation analysis as a tool in journal evaluation. *Science* 178:471-79, 1972. Reprinted in CC No. 6, 7 February 1973, p. 7-24. - This article discusses the concept of impact, and various methods of determining it.
5. -----, The mystery of the transposed journal lists; wherein Bradford's law of scattering is generalized according to Garfield's law of concentration. CC No. 31, 4 August 1971, p. 5-6.
6. -----, Journal citation studies. 17. Journal self-citation rates--there's a difference. CC No. 52, 25 December 1974.
7. *New Yorker*, 5 January 1976, p. 33.