

CURRENT COMMENTS

Do French Scientists Who Publish Outside of France and/or in English Do Better Research?

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Last year I reported to you the *cause célèbre* which developed from my assertions about the poor quality of French journals and the need of French scientists to publish in English.¹⁻²

A major question which could not be answered at that time concerned the impact of French-authored articles published outside of France—especially those in English. It had already been demonstrated that the impact of the average article published in French journals was significantly lower than that of articles published in journals of any other major country except the Soviet Union.³⁻⁴

The major problem we faced was how to identify articles by French authors in other than French journals, and to determine the language of those articles. Once we had this information, we could use our citation files to measure the impact of the articles.

Fortunately, the ISI[®] tape files contain addresses for *all* the authors of articles indexed in the *Science Citation Index*[®]. Even though it was only last year that we added addresses to the printed *Source Index* section of *SCI*[®], we have processed and retained this information in

our computer files since 1961. In addition, the record for each article in the file contains a language indicator.

In order to limit the size of the study, we searched only our 1973 *Source Index* files. We learned that there were 17,376 articles which had *at least one* author with a French address. Of these, 10,112 were articles published in French journals. The remaining 7,264 articles (42% of the total) appeared in international multilingual or other primarily English journals. We confirmed that 61% of these 7,264 articles were, in fact, published in English.

In order to measure the impact of all the articles by French authors, we matched the 1973 *Source Index* file against the 1973 to 1976 *Citation Index* section of our *SCI* tape file to see how many times the 1973 articles were cited. Of the 17,376 articles by French authors, 9,723 were cited 43,181 times. This is an average of 4.44 citations per cited article. This figure is significantly lower than the 5.68 citations received by the average 1973 article which was cited during 1973-76.

Of the 9,723 French-authored articles that were cited, 5,151 were

published in journals from France, while 4,572 were published in journals from other countries. Thus, 49% of the 10,112 articles published in France were not cited; only 37% of the 7,264 articles published in other countries remained uncited. This is the preliminary indicator of the impact of scientific publication in France. Now comes the clincher! The 4,572 cited articles published outside France received 28,951 citations—an average of 6.33. The 5,151 cited articles published in France's own journals received 14,230—an average of 2.76. The difference in impact is 2.3 to 1!

The dramatic difference in impact of the two groups was confirmed by constructing a special list of most-cited 1973 articles by French authors. This was arranged so that we could identify the most-cited articles published in France and outside France. Here again, the group which published outside France was outstanding. Of these articles, 248 were cited over 20 times, while only 22 articles published in France achieved this citation frequency. Of the 270 articles which were cited 20 times or more, 240 (89%) were published in English. In Figure 1 we have listed the five most-cited articles published "inside" France. Ironically, the most highly cited article was published in English. In Figure 2, we have listed the 15 most-cited articles from the "outside" group. Only one of these was published in French.

Next we examined the effect of language of publication on the im-

act of French-authored articles. We found that of 12,593 articles published in French, only 6,075 were cited. This leaves 52% of the French language group uncited. By contrast, of the 4,724 articles published in English, 3,547 were cited. Only 25% of the articles published in English were uncited during the years studied. The impact of the average English article was 7.45, while that for the French group was only 2.95! These are even more dramatic differences than the figures for the "inside-outside" comparison.

It is important to note, however, that similar differences will be observed for other bilingual comparisons, such as Spanish-English, German-English, or Russian-English. In the case of Spain, the average article published in English is cited 2.4 times as often as one published in Spanish. More than half the articles published in Spanish were not cited, while over 60% of those in English were. Incidentally, only 773 articles were published by Spanish authors in our 1973 file.

One interesting by-product of this study has been the observation that articles covered by the *SCI* were cited with significantly higher frequency than the average cited item in our files. Experience shows that the average cited item tends to be cited 2.5 times over a *five-year* period. We have shown above that when the file is limited to items covered by the *SCI*, the average cited item achieved a citation rate of 5.7 over only a *four-year* period. The citation rate per cited item

Citations 1973-1976	Author/Affiliation	Article	Language
65	Faye G, Fukuhara H, Grandchamp C, Lazowska J, Michel F, Casey J, Getz O S, Locker J, Rabinowitz M, Bolotin-Fukuhara M, Coen D, Deutsch J, Dujon B, Netter P, Slonimski, P P. <i>Centre de Génét. Moléc. (CNRS), Gif-sur-Yvette</i>	Mitochondrial nucleic acids in the petite colonie mutants: deletions and repetitions of genes. <i>Biochimie</i> 55:779-92, 1973.	EN
60	Leonardelli J, Barry J, Dubois M P. <i>Lab. de Zoologie (CNRS), Besançon</i>	Neuro-endocrinologie - Mise en évidence par immunofluorescence d'un constituant immunologiquement apparente au LH-RF dans l'hypothalamus et l'éminence médiane chez les mammifères. (Immunofluorescent presentation of component immunologically related to LH-RF in hypothalamus and eminentia medialis in mammals.) <i>C.R. Acad. Sci. Ser. D.</i> 276:2043-9, 1973.	FR
58	Dutrillaux B, Laurent C, Couturier J, Lejeune J. <i>Inst. de Progenèse, Paris</i>	Cytogénétique-coloration des chromosomes humains par l'acridine orange après traitement par le 5-bromodéoxyuridine. (Coloration of human chromosomes by acridine-orange after treatment with 5-bromodeoxyuridine.) <i>C.R. Acad. Sci. Ser. D.</i> 276:3179-81, 1973.	FR
51	Barry J, Dubois M P, Poulain P, Leonardelli J. <i>Lab. d'Histologie (CNRS), Faculté de Médecine, Lille</i>	Neuroendocrinologie - Caractérisation et topographie des neurones hypothalamiques immunoréactifs avec des anticorps anti-LRF de synthèse. (Characterization and topography of immunoreactive hypothalamic neurons with synthetic anti-LRF antibodies.) <i>C.R. Acad. Sci. Ser. D.</i> 276:3191-3, 1973.	FR
46	Cagnac B, Grynberg C, Biraben F. <i>Lab. de Spectroscopie Hertzienne de l'ENS (CNRS), Paris</i>	Spectroscopie d'absorption multiphotonique sans effect Doppler. (Multiphotonic absorption spectroscopy without Doppler broadening.) <i>J. Phys.-Paris</i> 34:845-58, 1973.	FR

Figure 1. Most-cited articles by French authors published in France during 1973
(Note: in all cases, the affiliation is that of the first author)

Figure 2. Most-cited articles by French authors published *outside* France during 1973
(Note: in all cases, the affiliation is that of the first author)

Citations 1973-1976	Author/Affiliation	Article	Language
158	Gerschenfeld H. <i>Lab. de Neurobiologie, Ecole Normale Supérieure, Paris</i>	Chemical transmission in invertebrate central nervous systems and neuromuscular junctions. <i>Physiol. Rev.</i> 53:1-119, 1973	EN
103	Comes R, Lambert M, Launois H, Zeller H R. <i>Lab. de Physique des Solides, Université Paris-Sud, Orsay</i>	Evidence for a Peierls distortion or a Kohn anomaly in one-dimensional conductor of the type $K_2Pt(CN)_4Br_{0.30} \times H_2O$. <i>Phys. Rev. B-Solid State</i> 8:571-5, 1973.	EN
99	Brouet J C, Flandrin G, Seligmann M. <i>Inst. de Recherche sur les Maladies de Sang, Hôpital St.-Louis, Paris</i>	Indications of the thymus derived nature of the proliferating cells in six patients with Sezary's Syndrome. <i>N. Engl. J. Med.</i> 289:341-7, 1973.	EN
88	DeVries R M. <i>Département de Physique Nucléaire a Moyenne Energie, Centre d'Etudes Nucléaires de Saclay, Gif-sur-Yvette</i>	Recoil effects in single-nucleon-transfer heavy-ion reactions. <i>Phys. Rev. C-Nucl. Phys.</i> 8:951-60, 1973.	EN
73	Tardieu A, Luzzati V, Reman F C. <i>Centre de Génét. Moléc. (CNRS), Gif-sur-Yvette</i>	Structure and polymorphism of the hydrocarbon chains of lipids. A study of lecithin-water phases. <i>J. Mol. Biol.</i> 75:711-33, 1973.	EN
72	Thierry A M, Stinus L, Blanc G, Glowinski J. <i>INSERM, Lab. de Biologie Moléc., Collège de France, Paris</i>	Some evidence for the existence of dopaminergic neurons in the rat cortex. <i>Brain Res.</i> 50:230-9, 1973.	EN
64	Dutrillaux B. <i>Chaire de Génétique Fondamentale, Inst. de Progenèse, Paris</i>	Nouveau système de marquage chromosomique: Les bandes T. (New system of chromosome banding—T-bands.) <i>Chromosoma</i> 41:395-402, 1973.	FR

Figure 2. Most-cited articles by French authors published *outside* France during 1973
(continued)

Citations 1973-1976	Author/Affiliation	Article	Language
63	Mathe G, Kamel M, Dezfulian M, Panneko O H, Bourut C. <i>Hôpital Paul Brousse, Inst. Cancer, Villejuif</i>	An experimental screening for systemic adjuvants of immunity applicable in cancer immunotherapy. <i>Cancer Res.</i> 33 :1987-97, 1973.	EN
62	LeClerc J C, Gomard E, Plata F, Levy J P. <i>Lab. d'Immunologie des Tumeurs, Hôpital Saint-Louis, Paris</i>	Cell-mediated immune reaction against tumors induced by oncornaviruses. 2. Nature of the effector cells in tumor-cell cytotoxicity. <i>Int. J. Cancer</i> 11 :426-32, 1973.	EN
61	Artzt K, Dubois P, Bennett D, Condamine H, Babinet C, Jacob F. <i>Lab. de Génét. Cellulaire, Inst. Pasteur et Collège de France, Paris.</i>	Surface antigens common to mouse cleavage embryos and primitive teratocarcinoma cells in culture. <i>Proc. Nat. Acad. Sci. US</i> 70 :2988-92, 1973.	EN
60	Vargaftig B B, Zirinis P. <i>Merrell Int'l. Research Center, Strasbourg</i>	Failure to produce cell-free lymphotoxin. <i>Nature New Biol.</i> 244 :114-6, 1973.	EN
59	Barojas J, Lévesque D, Quentrec B. <i>Lab. de Physique Théorique et Haute Energie, Faculté des Sciences, Orsay</i>	Simulation of diatomic homonuclear liquids. <i>Phys. Rev. A-Gen. Phys.</i> 7 :1092-105, 1973.	EN
57	Bach J F, Dardenne M, Salomon J C. <i>Hôpital Necker, Paris</i>	Studies on thymus products. 4. Absence of serum "thymic activity" in adult NZB and (NZB x NZW) F1 mice. <i>Clin. Exp. Immunol.</i> 14 :247-56, 1973.	EN
57	Reeves H, Audouze J, Fowler W A. <i>SEP, CEN Saclay, and Inst. d'Astrophysique, Paris</i>	On the origin of light elements. <i>Astrophys. J.</i> 179 :909-30, 1973.	EN
57	Thierry A M, Blanc G, Sobel A, Stinus L, Glowinski J. <i>Groupe de Neuropharmacologie Biochimique, Collège de France, Paris</i>	Dopaminergic terminals in the rat cortex. <i>Science</i> 182 :499-501, 1973.	EN

would be considerably higher if we eliminated from the calculations those items which are not substantive articles (e.g., letters, editorials, corrections). These items tend, when cited at all, to be cited only once.

It is of course necessary to consider whether the French-authored articles discussed above will become more heavily cited if one waits a few more years. The so-called half-life of articles in certain fields may be higher. It is possible that French science is more heavily committed to slower moving fields—such as mathematics. But clearly in the life sciences there can be little doubt about the difference in impact.

There is also the possibility that the papers published during 1973 are not typical of those published

during other years. After all, if there can be vintage years for French wines, why not for French research, too?

Nevertheless, it does seem obvious that, with certain exceptions, the best of French research is published outside of France and in English. Unfortunately, we do not have a definitive answer to the question of how much publication in French affects the citation rate of a truly high quality paper. But for the reasons I've stated many times, scientists risk oblivion when they avoid the reality of English as the international language of science. As future reports will demonstrate, this applies not only to our French colleagues but equally, if not more so, to scientists who speak and publish in German, Spanish, Italian, Japanese, or Russian.

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