

Current Comments

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We continue our study of Canadian research by examining the citation data not only for Canadian journals, but also for Canadian-authored articles published outside Canada. H. Inhaber has done a lot of work in these areas.¹⁻⁴ Our study is derived from the same data base we used to study French journals.⁵ The data base includes all articles with Canadian first authors listed in the 1973 *Science Citation Index*[®] (*SCI*[®]) and the citation records for these articles during the period 1973-1976.

In the French study, we investigated the relationship between language-of-publication and citedness. We found that French authors who publish in English are cited more often than their colleagues who publish in French. While English and French are both official languages in Canada, Table 1 shows that Canadian authors overwhelmingly publish in English. This is true whether or not they are located in French-speaking Canada. However, the 4% of Canadian articles published in French fared as badly as French-authored articles published in French. Of the Canadian articles published in French, 39% were cited. By comparison, the figure is 64% for Canadian articles published in English. More importantly, the average Canadian article published in English

received 5.5 citations. (The overall average for the *SCI* file was 5.7.) Canadian articles published in French averaged only 2.6 citations, slightly worse than the 2.95 citations that French-authored, French-language articles received. To comment any more on the language issue, I think, is like beating a dead horse.

Table 2 shows the distribution and citation record of Canadian-authored articles by country of publication. Canadian scientists published 14,238 articles in journals covered by the *SCI* in 1973. Over 70% of those articles were published abroad. US journals published nearly half of all articles with Canadian first authors. UK journals accounted for 10%. The rather high figure for the Netherlands (4.8%) testifies to the size of the publishing industry in that country, where such giants as Elsevier and affiliated companies are based.

The data in Table 2 show that any analysis of Canadian research cannot be based on a study of Canadian journals alone. In Part 1 of this study, we showed that only a few Canadian journals rank very high in terms of impact.⁶ As is the case with France and other countries, the best research in Canada flows to international journals. This international orientation, however, has not attracted

Table 1: The citation performance of Canadian authored articles by language used (articles published 1973; citation record 1973-76). A = Total items. B = Percent of total items. C = Cited items. D = Percent of cited items. E = Percent of language items that became cited. F = Total citations. G = Percent of total citations. H = Impact of items that became cited.

Language	A	B	C	D	E	F	G	H
English	14,831	96.1	9,504	97.6	64.1	52,688	98.9	5.5
French	574	3.7	226	2.3	39.4	579	1.1	2.6
Other	29	.2	7	.1	24.1	15	0.0	2.1
TOTAL	15,434	100.0	9,737	100.0	63.0	53,282	100.0	5.5

Canadian scientists to French journals. Less than 1% of Canadian articles were published in France.

Sixty-six percent of Canadian-authored articles published in Canada were cited. Surprisingly, this is slightly higher than the figure for Canadian articles published abroad—64%. Stated another way, about 35% of Canadian articles published at home or abroad were not cited.

Of possibly greater interest is the fact that cited articles with Canadian authors published abroad received 6.1 citations,

while those articles published at home received 4.1. The citation rate of Canadian articles published in the Netherlands is higher than I expected (7.2), while the citation rate for articles published in France is the lowest (2.9). This is consistent with our findings for French-language journals.

We were interested in learning how many articles in Canadian journals were published by Canadian authors. We found that only 71.8% were published by Canadians. Of the items in Canadian journals that were cited, 74.9% were by

Table 2. Distribution of Canadian-authored articles* by country of publication showing various aspects of citation performance (articles published in 1973; citation record 1973-1976). A = Articles appearing in 1973. B = Percent of 1973 Canadian-authored articles. C = Number of articles cited in 1973-76. D = Percent of articles that became cited. E = Number of citations received in 1973-76. F = Percent of citations received by Canadian-authored articles. G = Average number of citations to articles that became cited. H = Percent of Canadian-authored articles that became cited

Place of Publication	A	B	C	D	E	F	G	H
United States	7,070	49.7	4,477	48.5	28,909	56.6	6.5	63.3
Canada	4,091	28.7	2,699	29.2	10,936	21.4	4.1	66.0
United Kingdom	1,439	10.1	993	10.8	5,140	10.1	5.2	69.0
Netherlands	679	4.8	507	5.5	3,657	7.2	7.2	74.7
Switzerland	235	1.6	167	1.8	788	1.5	4.7	71.1
West Germany	199	1.4	156	1.7	810	1.6	5.2	78.4
France	107	.8	58	.6	167	.3	2.9	54.2
Denmark	106	.7	40	.4	244	.5	6.1	37.7
Others	312	2.2	140	1.5	401	.8	2.9	44.9
TOTAL	14,238	100.0	9,237	100.0	51,052	100.0	5.5	64.9

*Including notes, editorials and reviews

Canadian authors. These articles received 77.5% of the citations to the Canadian literature.

Among all articles authored by Canadians, 383 were cited 20 or more times. Of these, only 38 (10%) appeared in Canadian journals. These 38 articles were cited a total of 960 times. One third of these citations were by Canadian authors. For the remaining 345 Canadian-authored articles published abroad, 18% of their 13,436 citations came from Canadian authors.

The articles published in Canada were cited about 25 times each. Those published outside Canada averaged 39. Clearly, the superstar papers of Canada migrate abroad.

Table 3 lists the 1973 Canadian-authored articles cited 30 or more times from 1973-76 that were published in Canada. Altogether, these eight articles received 264 citations. It is interesting to note that the Lossing article received 43% of its citations from the US and 27% from Canada. The Wood article, on the other hand, received 73% of its citations from US authors and only 10% from Canadians. Yet both of these articles appeared in the same journal, the *Canadian Journal of Chemistry*.

Similarly, the Durden article received 21% of its citations from US authors, 64% from Canadians, and 3% from British authors. But the Jones article received only 9% of its citations from

the US, 36% from Canada, and 52% from others. (Japanese authors made up 33% of the "others" category.) Yet the Durden and the Jones articles both appeared in the *Canadian Journal of Biochemistry*.

Table 4 is a list of Canadian-authored articles published abroad which received 60 or more citations. These 18 articles were cited a total of 1,752 times. Forty-six percent of these citations came from US authors, 17% from Canadian authors, 12% from British authors, and 25% from others. High impact journals like *Science*, *New England Journal of Medicine*, *Bacteriological Reviews*, and *Pharmacological Reviews* are well represented on the list. Thus, the most cited Canadian articles are published abroad and generally published in the high impact journals. As I've indicated before, these lists of most-cited articles tend to ignore smaller fields. For example, the most-cited articles published in fisheries research or earth science are not represented.

I have never observed an American bias against Canadian research. Clearly, Canadians can publish in American as well as international journals with little difficulty. In fact, what may bother our Canadian colleagues is a special form of imperialism. We not only treat them as equals but as though they were Americans. No such accusation is made by our friends in most other countries.

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Table 3: Articles with 30+ citations by Canadian authors published *inside* Canada during 1973 (Note: In all cases, affiliation is that of the first author).

Citations 1973-1976	Author/Affiliation	Article	Language
37	Lossing F P. <i>National Research Council Ottawa, Ontario, Canada</i>	Free-radicals by mass spectrometry. 45. Ionization potentials and heats of formation of C ₃ H ₃ , C ₃ H ₅ , and C ₄ H ₇ radicals and ions. <i>Can. J. Chem.</i> 50(24):3973-81, 1972.	EN
36	Isenor N R, Merchant V, Hallsworth R S & Richards M C. <i>Univ. of Waterloo, Dept. of Physics, Waterloo, Ontario, Canada</i>	CO ₂ laser-induced dissociation of SiF ₄ molecules into electronically excited fragments. <i>Can. J. Phys.</i> 51(12):1281-8, 1973.	EN
33	Britt B A, Kalow W, Gordon A, Humphrey J G & Rewcastle N B. <i>Univ. of Toronto, Dept. of Anesthesia, Toronto, Ontario, Canada</i>	Malignant hyperthermia-investigation of 5 patients. <i>Can. Anaes. SJ</i> 20(4):431-67, 1973.	EN
33	Deslongchamps P, Lebreux C & Taillefer R. <i>Univ. of Sherbrooke, Dept. Chim., Lab. Synth. Org. Sherbrooke, Que., Canada</i>	Importance of confirmation of tetrahedral intermediate in hydrolysis of esteraselective clearance of tetrahedral intermediate controlled by orbital orientation. <i>Can. J. Chem.</i> 51(10):1665, 1973.	EN
33	Jones S R & Hoffman I. <i>Univ. of Toronto, Dept. of Biochemistry, Toronto 181, Ontario, Canada</i>	Penicillocarboxypeptidase-S, a nonspecific SH-dependent exopeptidase. <i>Can. J. Biochem.</i> 50(12):1297-310, 1972.	EN
32	Durden D A, Philips S R & Boulton A A. <i>Univ. Hosp. Saskatoon, Psychiatr. Res. Unit, Saskatoon S7N 0W8, Saskatchewan, Canada</i>	Identification and distribution of beta-phenylethylane in rat. <i>Can. J. Biochem.</i> 51(7):995-1002, 1973.	EN
30	Chang T M S, Coffey J F, Barre P, Gonda A, Dirks J H, Levy M & Lister C. <i>McGill Univ., Physiology Dept., Montreal, Que., Canada</i>	Microcapsule artificial kidney-treatment of patients with acute drug intoxication. <i>Can. Med. Assoc. J.</i> 108(4):429-33, 1973.	EN
30	Wood D J, Hruska F E, Mynott R J & Sarma R H. <i>Univ. of Manitoba, Dept. of Chem., Winnipeg R3T 2N2, Manitoba, Canada</i>	Comparative proton magnetic-resonance study of molecular conformation of uracil and 6-AZA uracil nucleosides and nucleotides. <i>Can. J. Chem.</i> 51(15):2571-7, 1973.	EN

Table 4: Articles with 60+ citations by Canadian authors published *outside* Canada during 1973 (Note: In all cases, affiliation is that of the first author).

Citations 1973-1976	Author/Affiliation	Article	Language
296	Seeman P. <i>Univ. of Toronto, Fac. Med., Dept. of Pharmacology, Toronto M5S 1A8, Ontario, Canada</i>	Membrane actions of anesthetics and tranquilizers. <i>Pharm. Rev.</i> 24:583-655, 1972.	EN
197	Craik F I M & Lockhart R S. <i>Univ. of Toronto, Dept. of Psychology, Toronto, Ontario, Canada</i>	Levels of processing—framework for memory research. <i>J. Verb. Learn.</i> 11:671-84, 1972.	EN

- 138 Appleton T G, Clark H C & Manzer L E. *Univ. of Western Ontario, Dept. of Chemistry, London N6A 3K7, Ontario, Canada*
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- 91 Perry T L, Hansen S & Kloster M. *Univ. of British Columbia, Fac. Med., Vancouver 8, BC, Canada*
- 78 Shiu R P C, Kelly P A & Friesen H G. *McGill Univ., Dept. Exptl. Med., Montreal, Que., Canada*
- 77 Whitfield J F, Rixon R H, MacManus J P & Balk S D. *Natl. Res. Council of Canada, Div. Biol., Ottawa 1, Ontario, Canada*
- 70 Martin J B. *McGill Univ., Montreal Gen. Hosp., Dept. Med., Montreal, Que., Canada*
- 69 Houmard J & Drapeau G R. *Univ. of Montreal, Dept. of Microbiology, Montreal 101, Que., Canada*
- 67 Teo T S & Wang J H. *Univ. of Manitoba, Dept. of Biochemistry, Winnipeg, Manitoba, Canada*
- 65 Grover S H, Guthrie J P, Stothers J B & Tan C T. *Univ. of Western Ontario, Dept. of Chemistry, London N6A 3K7, Ontario, Canada*
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- Small subcutaneous doses of heparin in prevention of venous thrombosis. *N. Eng. J. Med.* 288(11):545-51, 1973. EN
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- Radioreceptor assay for prolactin and other lactogenic hormones. *Science* 180(4089):968-71, 1973. EN
- Calcium, cyclic adenosine 3', 5'-monophosphate, and control of cell-proliferation—review. *In Vitro.* 8(4):257-8, 1973. EN
- Neural regulation of growth-hormone secretion. *N. Eng. J. Med.* 288(26):1384-93, 1973. EN
- Staphylococcal protease—a proteolytic-enzyme specific for glutamoyl bonds. *PNAS US* 69(12):3506-9, 1972. EN
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- Peripheral thymus-dependent (T) lymphocytes in Grave's Disease and Hashimoto's thyroiditis. *N. Eng. J. Med.* 288(25):1313-7, 1973. EN
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