

Canadian Universities' Performance in Research 2000 Edition

Observatoire des sciences et des technologies (OST)

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Context

OST is dedicated to monitoring trends in scientific research and analyzing outputs arising from investments in university research. Scientific publications are the main output of research, and we used the bibliometric database constructed by OST over the years to compare the research performance of the universities that produced, for statistical significance, over 100 publications in 1998.

This report is the second exercise of OST in ranking Canadian universities. Its aim is to rank universities according to research in the natural, engineering and biomedical sciences. Three indicators are presented here to assess universities' strength:

1. The volume of publications per professor,
2. The relative weighted impact factor,
3. The rate of international collaboration.

Results

Publications

The volume of publications per professor is a relative measure of performance between institutions. Three universities are on top of the list for the ratio of publications by professor : McGill, Toronto and Alberta. On average, the professors at each of these universities publish more than 2 papers/year. They are followed by a second group of universities where researchers publish between 1,0 and 2,0 papers. A third group published under one paper/year.

As compared to 1995, the following four universities have improved their position: Guelph, McMaster, Carleton and Montreal.

Relative Weighed Impact Factor

The impact factor is an indicator that measures the number of citations a journal receives over a given period of time. It is used here as an indicator of the quality of the published papers. The “relative weighed impact factor” developed by OST is a synthetic index that weigh the impact factor of eight fields into a unique score. Our calculations show that eleven universities have a relative weighted impact factor over 1, that is, over the national average, but only two universities have a significant score: Toronto and McGill. Four universities have improved their position since 1995: Laval, UBC, INRS and Alberta.

Relative Weighed Impact Factor by Field

OST has calculated the relative weighted impact factor of each university in the eight scientific fields. Universities with the highest relative impact factor are in each field:

- clinical medicine: McGill, Laval, Toronto
- biomedical research: Toronto, Alberta, McGill, McMaster
- biology: Montreal, INRS, Queens
- physics: INRS, Carleton, McGill
- chemistry: Carleton, Alberta, Queens, Laval
- earth and space: York, Toronto, New Brunswick
- engineering: INRS, McMaster, Toronto
- mathematics: Toronto, McGill, McMaster

International Collaboration

Several studies have argued that international collaboration is correlated with the quality of research. On this dimension, the most internationally networked universities are not necessarily the ones that rank first in term of the volume of papers. On top of the list we find: Carleton, Victoria and York with approximately 50% of their papers written with foreign researchers. In 1995, no university had more than half of its publications written in international collaboration.

Table 1
Publications per professor (Natural, biomedical and engineering)

| Institution | Publications | Number of professors | Publications / Professors |
|-----------------------|---------------------|-----------------------------|----------------------------------|
| MCGILL-UNIV | 2 295 | 844 | 2,72 |
| UNIV-TORONTO | 3 305 | 1 479 | 2,23 |
| UNIV-ALBERTA | 1 519 | 725 | 2,10 |
| UNIV-GUELPH | 768 | 385 | 1,99 |
| UNIV-VICTORIA | 342 | 173 | 1,98 |
| SIMON-FRASER-UNIV | 346 | 177 | 1,95 |
| QUEENS-UNIV | 639 | 328 | 1,95 |
| MCMASTER-UNIV | 1 073 | 558 | 1,92 |
| UNIV-BRITISH-COLUMBIA | 1 932 | 1 039 | 1,86 |
| UNIV-OTTAWA | 700 | 413 | 1,69 |
| CARLETON-UNIV | 312 | 194 | 1,61 |
| UNIV-WATERLOO | 698 | 439 | 1,59 |
| YORK-UNIV | 285 | 183 | 1,56 |
| UNIV-MONTREAL | 1 381 | 910 | 1,52 |
| INRS | 164 | 116 | 1,41 |
| UNIV-CALGARY | 872 | 626 | 1,39 |
| UNIV-WESTERN-ONTARIO | 939 | 712 | 1,32 |
| UNIV-MANITOBA | 728 | 637 | 1,14 |
| CONCORDIA-UNIV | 200 | 178 | 1,12 |
| UNIV-LAVAL | 857 | 793 | 1,08 |
| DALHOUSIE-UNIV | 634 | 591 | 1,07 |
| UNIV-SASKATCHEWAN | 639 | 596 | 1,07 |
| UNIV-WINDSOR | 145 | 142 | 1,02 |
| UQAM | 177 | 182 | 0,97 |
| UNIV-SHERBROOKE | 329 | 430 | 0,77 |
| MEM-UNIV-NEWFOUNDLAND | 288 | 440 | 0,65 |
| UNIV-NEW-BRUNSWICK | 166 | 284 | 0,58 |
| TOTAL | 21 733 | 13 574 | 1,60 |

Source: Observatoire des sciences et des technologies

Table 2
Relative Weighed Impact Factor
(Natural, biomedical and engineering)

| Institution | RWIF |
|-----------------------|-------------|
| UNIV-TORONTO | 1,12 |
| MCGILL-UNIV | 1,07 |
| CARLETON-UNIV | 1,05 |
| UNIV-CALGARY | 1,02 |
| UNIV-LAVAL | 1,01 |
| MCMASTER-UNIV | 1,01 |
| UNIV-BRITISH-COLUMBIA | 1,01 |
| INRS | 1,00 |
| UNIV-ALBERTA | 1,00 |
| SIMON-FRASER-UNIV | 1,00 |
| QUEENS-UNIV | 1,00 |
| UNIV-VICTORIA | 0,99 |
| YORK-UNIV | 0,99 |
| UNIV-MONTREAL | 0,98 |
| UNIV-WESTERN-ONTARIO | 0,97 |
| UNIV-OTTAWA | 0,96 |
| UNIV-GUELPH | 0,96 |
| UNIV-WATERLOO | 0,95 |
| MEM-UNIV-NEWFOUNDLAND | 0,95 |
| UNIV-WINDSOR | 0,95 |
| CONCORDIA-UNIV | 0,95 |
| DALHOUSIE-UNIV | 0,93 |
| UNIV-MANITOBA | 0,91 |
| UQAM | 0,90 |
| UNIV-SHERBROOKE | 0,87 |
| UNIV-NEW-BRUNSWICK | 0,87 |
| UNIV-SASKATCHEWAN | 0,86 |

Source: Observatoire des sciences et des technologies

Table 3
Relative Weighed Impact Factor, by field (Natural, biomedical and engineering)

| Institution | BIOLOGY | BIOMEDICAL RESEARCH | CHEMISTRY | CLINICAL MEDICINE | EARTH AND SPACE | ENGINEERING & TECHNOLOGY | MATHEMATICS | PHYSICS |
|-----------------------|----------------|----------------------------|------------------|--------------------------|------------------------|-------------------------------------|--------------------|----------------|
| UNIV-TORONTO | 1,12 | 1,26 | 1,03 | 1,06 | 1,18 | 1,12 | 1,30 | 1,11 |
| MCGILL-UNIV | 0,93 | 1,07 | 0,96 | 1,08 | 1,08 | 1,03 | 1,28 | 1,22 |
| CARLETON-UNIV | 1,15 | 0,56 | 1,13 | N.S. | 1,09 | 1,02 | 0,68 | 1,39 |
| UNIV-CALGARY | 0,97 | 1,05 | 1,00 | 1,03 | 0,93 | 1,09 | N.S. | 0,94 |
| UNIV-LAVAL | 1,10 | 0,88 | 1,10 | 1,07 | 0,71 | 1,03 | N.S. | 1,01 |
| MCMASTER-UNIV | 1,14 | 1,07 | 0,99 | 0,93 | 1,09 | 1,25 | 1,19 | 0,98 |
| UNIV-BRITISH-COLUMBIA | 1,03 | 0,97 | 1,07 | 1,04 | 0,90 | 0,87 | 1,06 | 1,04 |
| INRS | 1,24 | 0,63 | 0,82 | N.S. | 0,97 | 1,35 | N.S. | 1,40 |
| UNIV-ALBERTA | 0,88 | 1,10 | 1,12 | 0,95 | 0,99 | 1,05 | 0,95 | 0,93 |
| SIMON-FRASER-UNIV | 0,94 | 0,86 | 1,01 | N.S. | 1,03 | 1,07 | 1,04 | 1,07 |
| QUEENS-UNIV | 1,19 | 0,93 | 1,12 | 1,00 | 1,00 | 0,96 | 0,77 | 0,94 |
| UNIV-VICTORIA | 0,92 | 1,02 | 1,06 | N.S. | 1,07 | 1,05 | 0,87 | 0,97 |
| YORK-UNIV | 0,95 | 0,94 | 0,88 | 0,93 | 1,19 | 1,08 | 0,91 | 0,88 |
| UNIV-MONTREAL | 1,27 | 0,99 | 1,02 | 0,98 | 0,85 | 1,05 | 0,99 | 0,86 |
| UNIV-WESTERN-ONTARIO | 1,06 | 0,91 | 1,00 | 1,00 | 1,15 | 0,96 | 0,85 | 0,82 |
| UNIV-OTTAWA | 0,92 | 0,92 | 1,07 | 0,97 | 0,87 | 0,98 | N.S. | 0,96 |
| UNIV-GUELPH | 1,02 | 0,89 | 0,92 | 0,92 | 1,04 | N.S. | N.S. | 0,91 |
| UNIV-WATERLOO | 1,11 | 0,77 | 0,98 | 0,70 | 0,97 | 1,04 | 0,97 | 0,99 |
| MEM-UNIV-NEWFOUNDLAND | 0,99 | 0,76 | 1,02 | 0,90 | 1,08 | 0,77 | N.S. | 0,99 |
| UNIV-WINDSOR | 0,95 | N.S. | 1,06 | N.S. | N.S. | 0,84 | N.S. | 0,81 |
| CONCORDIA-UNIV | N.S. | 0,85 | 1,01 | N.S. | N.S. | 0,92 | N.S. | 0,78 |
| DALHOUSIE-UNIV | 1,05 | 0,91 | 1,06 | 0,86 | 1,04 | 0,99 | 0,89 | 1,01 |
| UNIV-MANITOBA | 0,91 | 0,71 | 0,95 | 1,02 | 0,83 | 0,95 | 0,97 | 0,77 |
| UQAM | 1,01 | 0,98 | 0,82 | 0,65 | 1,14 | N.S. | N.S. | N.S. |
| UNIV-SHERBROOKE | 0,87 | 0,94 | 0,82 | 0,78 | N.S. | 0,91 | N.S. | 1,02 |
| UNIV-NEW-BRUNSWICK | 0,83 | N.S. | 0,89 | N.S. | 1,17 | 0,79 | N.S. | 0,84 |
| UNIV-SASKATCHEWAN | 0,96 | 0,71 | 0,92 | 0,84 | 0,89 | 0,81 | N.S. | 0,88 |

Source: Observatoire des sciences et des technologies (SCI)
N.S. : Non-significant

Table 4
International collaboration (Natural, biomedical and engineering)

| Institution | Publications | International collaborations | Share (%) |
|-----------------------|---------------------|-------------------------------------|------------------|
| CARLETON-UNIV | 312 | 161 | 51,6% |
| UNIV-VICTORIA | 342 | 174 | 50,9% |
| YORK-UNIV | 285 | 142 | 49,8% |
| MCMASTER-UNIV | 1 073 | 445 | 41,5% |
| SIMON-FRASER-UNIV | 346 | 140 | 40,5% |
| UNIV-SHERBROOKE | 329 | 130 | 39,5% |
| MCGILL-UNIV | 2 295 | 884 | 38,5% |
| INRS | 164 | 62 | 37,8% |
| UNIV-WATERLOO | 698 | 263 | 37,7% |
| UNIV-ALBERTA | 1 519 | 558 | 36,7% |
| UNIV-BRITISH-COLUMBIA | 1 932 | 703 | 36,4% |
| UQAM | 177 | 63 | 35,6% |
| UNIV-MONTREAL | 1 381 | 482 | 34,9% |
| UNIV-TORONTO | 3 305 | 1 141 | 34,5% |
| CONCORDIA-UNIV | 200 | 69 | 34,5% |
| UNIV-WINDSOR | 145 | 49 | 33,8% |
| UNIV-WESTERN-ONTARIO | 939 | 312 | 33,2% |
| QUEENS-UNIV | 639 | 209 | 32,7% |
| DALHOUSIE-UNIV | 634 | 207 | 32,6% |
| UNIV-CALGARY | 872 | 283 | 32,5% |
| UNIV-LAVAL | 857 | 275 | 32,1% |
| UNIV-MANITOBA | 728 | 231 | 31,7% |
| UNIV-SASKATCHEWAN | 639 | 196 | 30,7% |
| UNIV-GUELPH | 768 | 234 | 30,5% |
| MEM-UNIV-NEWFOUNDLAND | 288 | 85 | 29,5% |
| UNIV-OTTAWA | 700 | 200 | 28,6% |
| UNIV-NEW-BRUNSWICK | 166 | 47 | 28,3% |
| TOTAL | 21 733 | 7 745 | 35,6% |

Source: Observatoire des sciences et des technologies