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While rankings are only one of many measures of our Faculty's excellence, they illustrate our pre-eminence across diverse engineering fields, and they are widely cited as a key factor students and faculty consider when selecting U of T Engineering.

It has been 10 years since the three main ranking organizations, Shanghai Jiao Tong Academic Ranking of World Universities (ARWU), Times Higher Education (THE) and QS World University Rankings (QS), began publishing global rankings specific to engineering, with National Taiwan University Performance Ranking of Engineering Papers (NTU; formerly HEEACT) joining them in 2008. The dramatic displacement of U.S. schools by Asian institutions at the top level of the most recent ARWU is another reminder that engineering schools of global stature operate in an environment that is increasingly international and competitive.

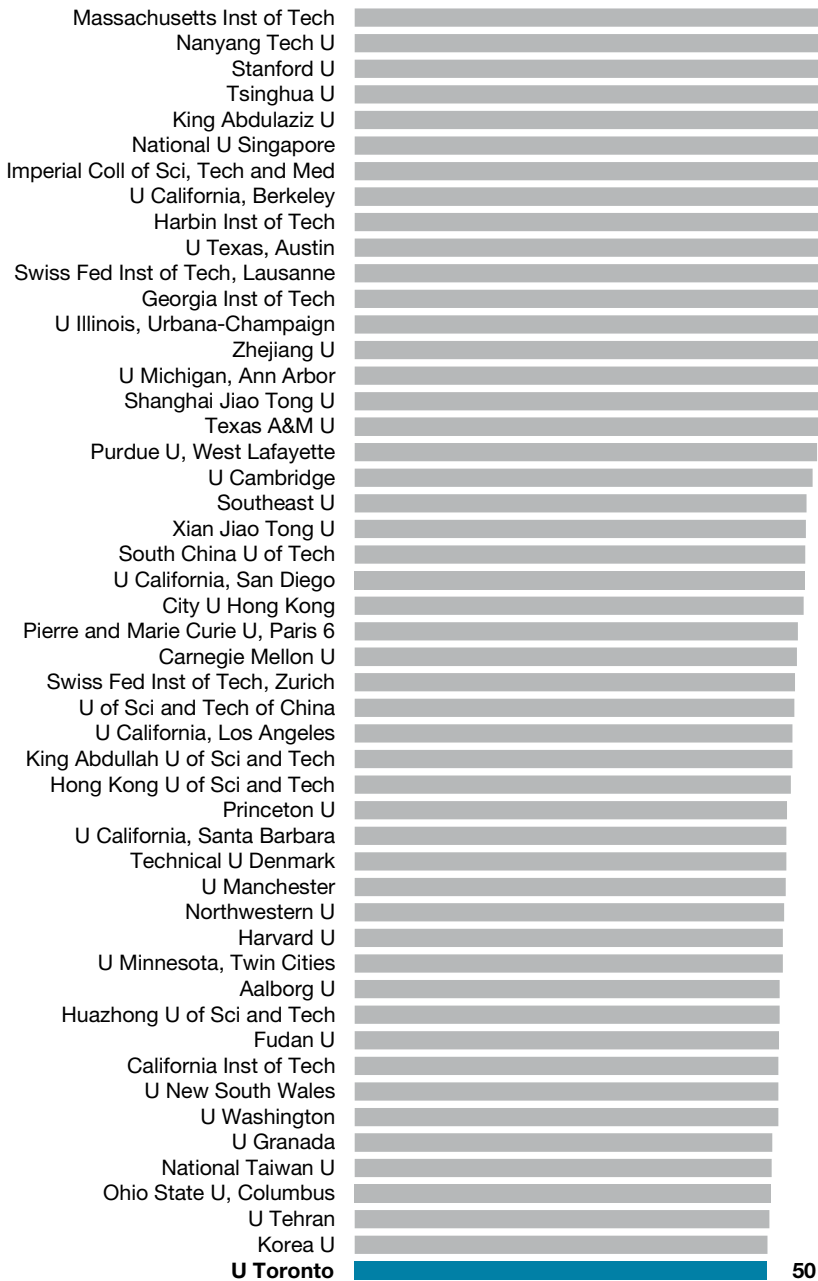
Within that context, it is particularly significant that this year, for the first time, U of T is the only Canadian university to appear within the top 50 across all four of the major global rankings for Engineering. Our outstanding rankings facilitate international visibility that enhances our ability to attract students, faculty and industry collaborators, and strengthens our position as a leader in engineering education and research.

This year, the ARWU has added subject-level ranking in engineering fields, joining those that have been provided by both QS and NTU for the past seven years. While each organization's assessments are unique, and often distinct from the others, overall U of T continues to rank number one in Canada across all international engineering rankings and among the top 10 North American public institutions across most subjects.

Comprehensive University Rankings

Shanghai Jiao Tong Academic Ranking of World Universities (ARWU) for Engineering/Technology and Computer Sciences

Figure 6.1a ARWU Top 50 World Universities, 2016



U of T continues to rank among the premier universities worldwide in the 2016 Shanghai Jiao Tong Academic Ranking of World Universities (ARWU) for Engineering/Technology and Computer Science. After dramatic changes at the top of the rankings, U of T is now the only Canadian school remaining in the top 50.

Among North American public universities, our closest peer institutions, U of T ranked 14th. We lead all Canadian schools in highly cited research and articles in top journals, two of the three indicators that constitute the ARWU's evaluation methodology.

The ARWU is the longest running of the global rankings. It has provided overall rankings since 2003 and engineering field rankings since 2007. For much of the past decade, U.S. schools dominated the top 10 engineering school rankings. In 2016, five of those schools were displaced by four Asian and one Middle Eastern university that had each climbed, on average, 16 places to get there.

The number of North American schools in the ARWU top 50 fell from 27 to 21. Two of them held their positions, including MIT in the top spot. In contrast, the number of Asian schools in the top 50 increased from 12 to 16, and all but one of them rose by an average of 18 places. Middle Eastern schools in the top 50 increased from one to three, collectively climbing by an average of 63 places. Though U of T was clearly impacted by this overall trend, our rank variation was close to the average for other Canadian schools in the top 200 of the ARWU.

Data in this chapter include rankings published between August 2016 and July 2017.

Figure 6.1b ARWU Top North American Public Universities, 2016

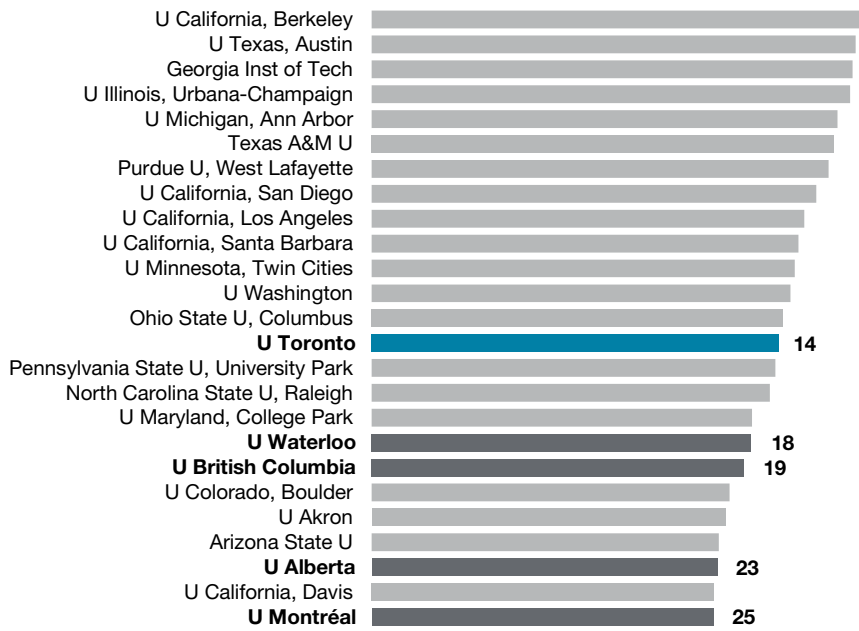


Figure 6.1c Canadian U15 Universities in ARWU Top 200, 2016



Figure 6.1d Scoring Analysis of Canadian U15 Universities in ARWU Top 200, 2016

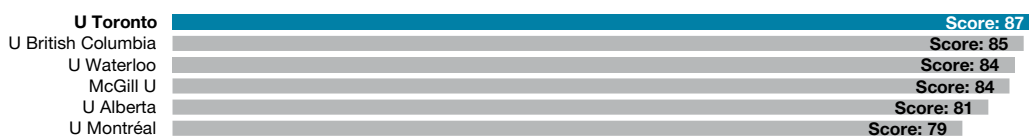
Scoring on Highly Cited Research: (HiCi) Indicator



Scoring on Published Articles: (PUB) Indicator



Scoring on Articles in Top Journals: (TOP) Indicator



Note 6.1d: In addition to HiCi, Pub and TOP, the ARWU uses a fourth indicator called Research Expenditures (FUND), which is used only for U.S. schools. Research funding mechanisms differ so significantly from country to country that all other international universities, including Canadian universities, are ranked using only the first three indicators.

Canadian Universities in ARWU by Subject, 2016

The Shanghai Ranking Consultancy, which produces the ARWU, published Global Subject Rankings for engineering disciplines for the first time in 2016. These replaced the more limited range of mainly science-focused subjects that have been featured since 2009.

The new subject rankings continue the ARWU's emphasis on publications and citations, much like the NTU ranking, and in contrast to the British rankings (THE and QS), which rely heavily on reputational indicators. Scoring is based on various measures, including 50% on citations, 30% on newly introduced measures of the extent of co-authorship with international and corporate or industrial partners, and 20% on the number of papers authored and international awards won by each institution.

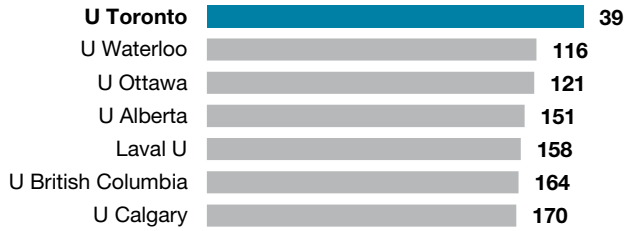
U of T dominated the new engineering subject rankings across all Canadian institutions, taking the top spot in three of the subjects. The new subject rankings are based on a wider range of measures. Figure 6.1d shows a scoring analysis of the three indicators that have historically determined our standing in the ARWU Engineering ranking: Highly Cited Research (HiCi), Published Articles (PUB) and Articles in Top Journals (TOP). The Research Funding (Fund) indicator is only used for U.S. schools.

The new rankings, by contrast, use up to seven indicators to evaluate an institution in each subject:

- **PUB** – the number of papers indexed in Scopus
- **TOP25** – the number of world top 25% most cited papers
- **TOP1** – the number of world top 1% most cited papers
- **FWCI** (Field Weighted Citation Index) – the number of citations received by an institution's publications compared with the average number of citations received by all other similar publications
- **IC** – the extent of international co-authorship
- **CC** – the percentage of publications with academic and corporate or industrial co-authors
- **MCR** – Most Cited Researchers
- **AWARD** – several subjects also assess the number of staff winning a significant award

Figure 6.1e Canadian Universities in ARWU Subject Ranking

Chemical Engineering



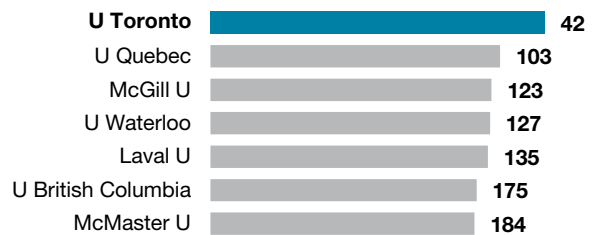
Civil Engineering



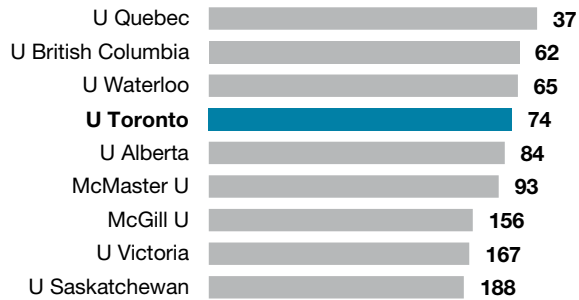
Electrical Engineering



Materials Engineering

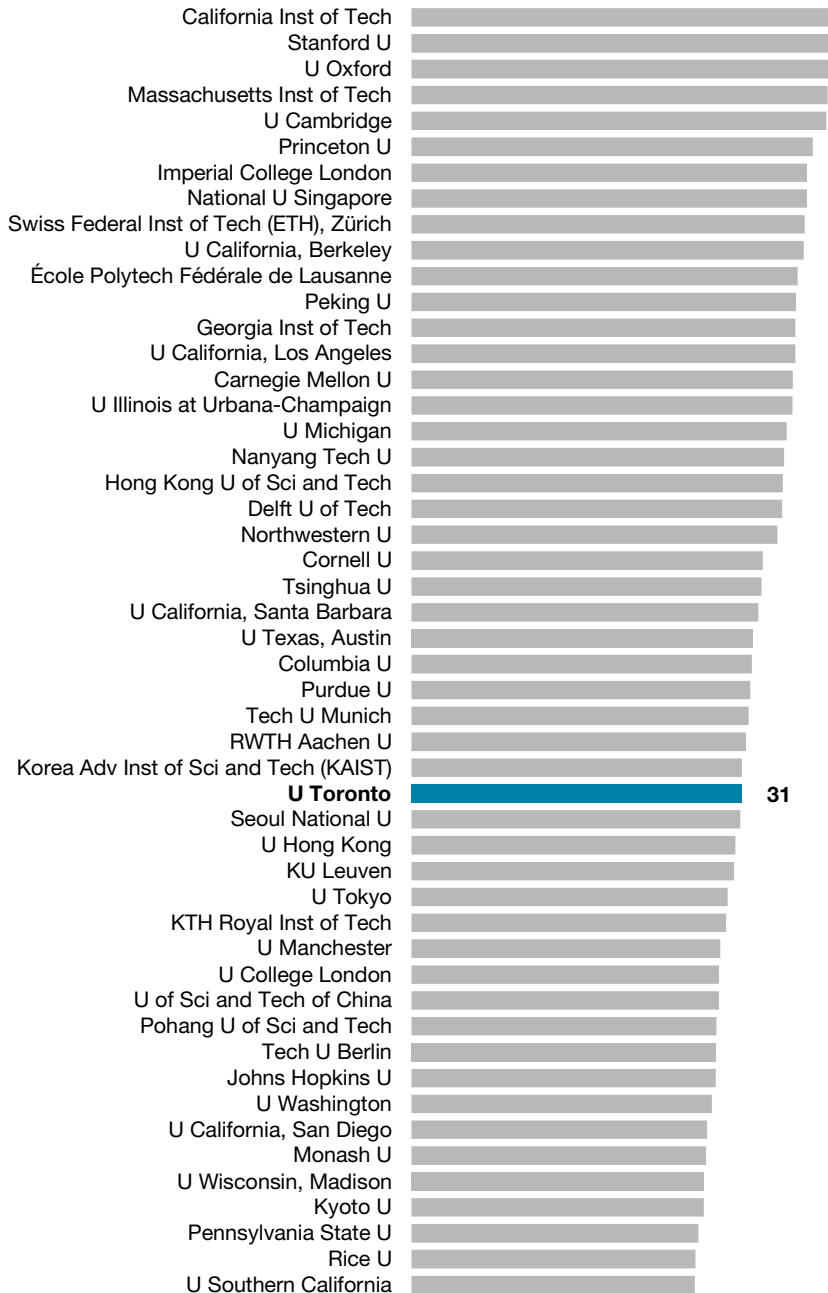


Mechanical Engineering



Times Higher Education (THE)–Elsevier World University Ranking for Engineering and Information Technology

Figure 6.2a THE Top 50 World Universities, 2016



In 2016, the Times Higher Education (THE) marked its 10th year of publishing an Engineering and Information Technology field ranking with a succession of partners: first QS, then Thomson-Reuters, and most recently Elsevier. Throughout that time, U of T has remained both the top Canadian university for engineering and among the top 10 North American public universities, this year placing ninth.

THE is the second-longest-running survey of its kind after the ARWU. What sets it apart as an influential assessment of global, research-intensive universities is the breadth of its evaluation, which aims to measure institutions across all their core missions: teaching, research, knowledge transfer and international outlook. The THE ranking uses 13 performance indicators in five weighted categories:

- Teaching: the learning environment (30%)
- Research: volume, income and reputation (30%)
- Citations: research influence (30%)
- International outlook: staff, students and research (7.5%)
- Industry income and innovation (2.5%)

Figure 6.2b THE Top North American Public Universities, 2016

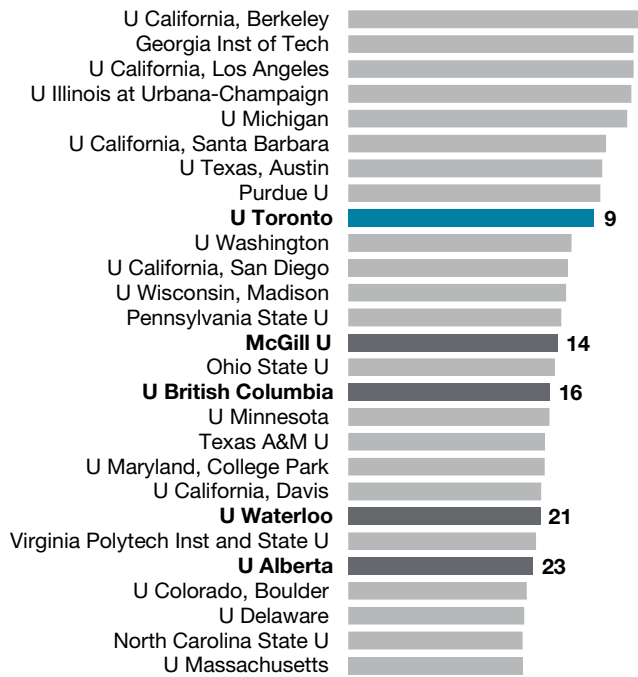


Figure 6.2c Canadian U15 Universities in THE Top 100, 2016



QS World University Rankings for Engineering and Technology

Figure 6.3a QS Top 50 World Universities, 2017

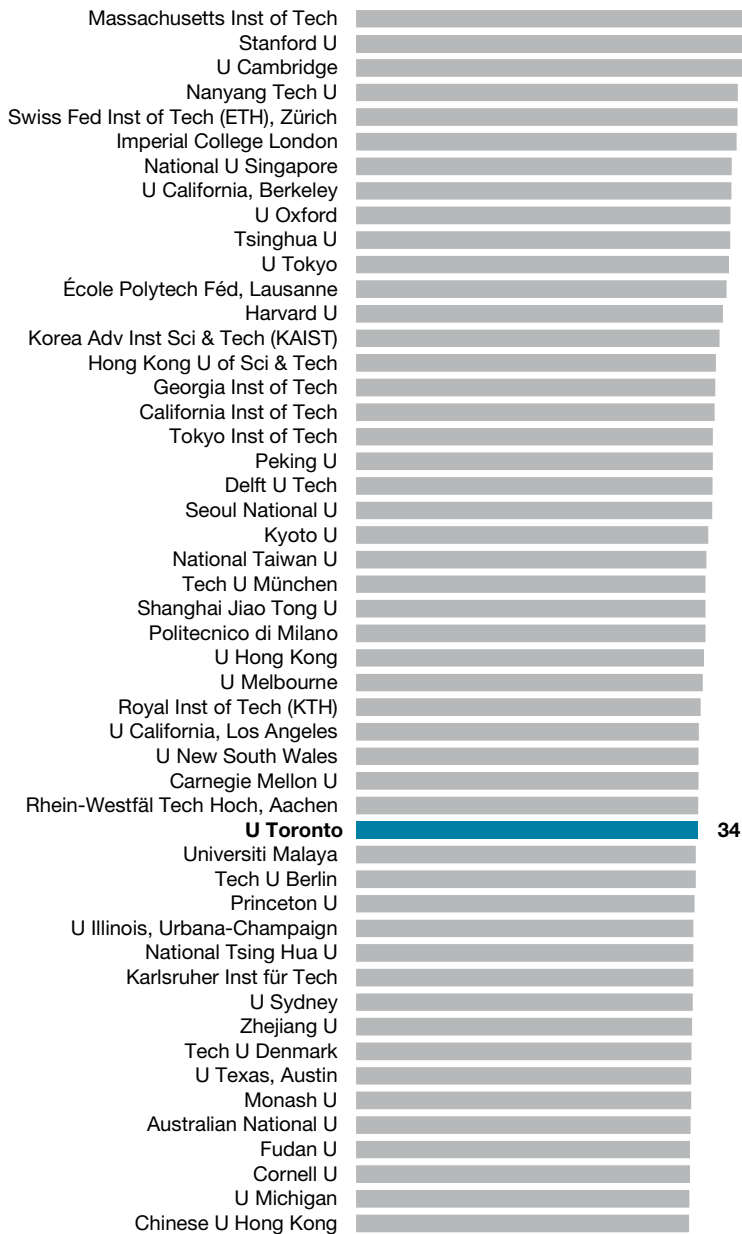
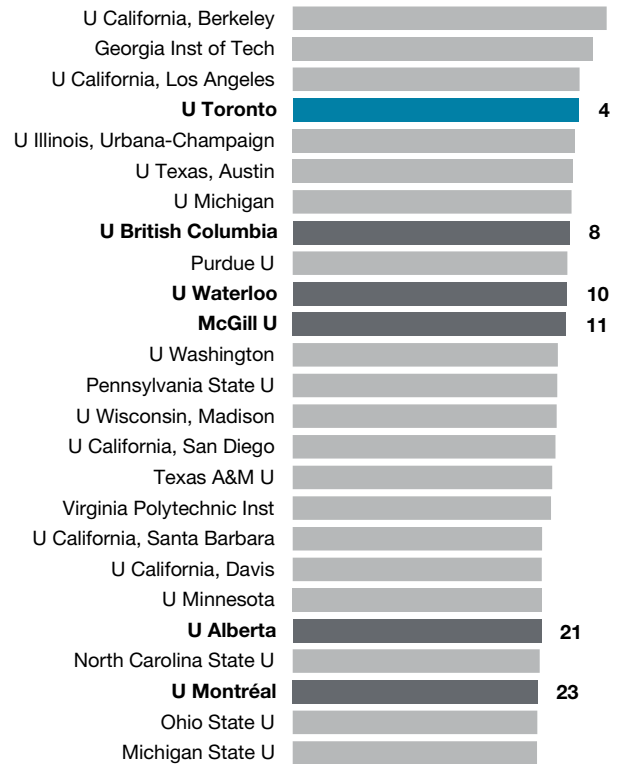


Figure 6.3b QS Top North American Public Universities, 2017



U of T Engineering rose 15 places in the most recent QS World University Rankings for Engineering and Information Technology, bringing us back into the range of our typical ranking since 2010.

Our standing among North American public universities also rose to fourth place, the highest we have been among these peer institutions.

Nationally, it was encouraging to see all our U15 peers improve their rankings significantly over the previous rankings period. Even so, U of T was the only Canadian university to make the QS top 50 for the third year in a row.

Figure 6.3c Canadian U15 Universities in QS Top 200, 2017

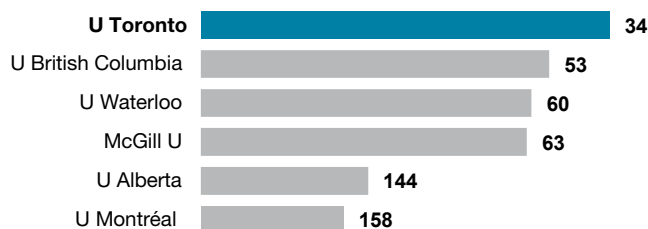
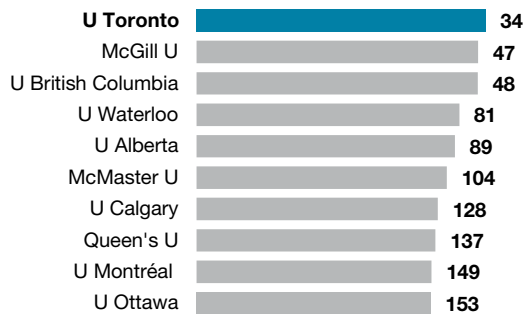
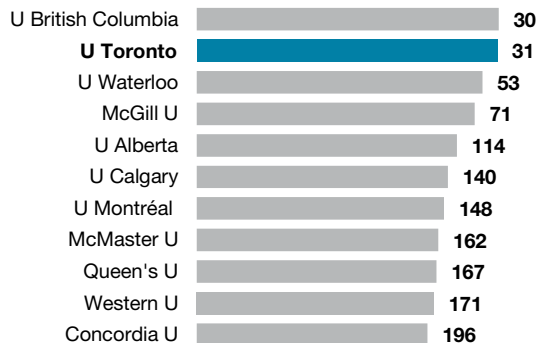


Figure 6.3d Canadian Universities in QS by Subject, 2017

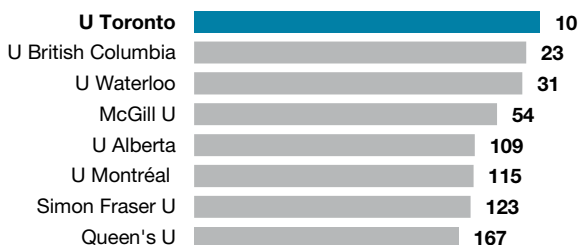
Chemical Engineering



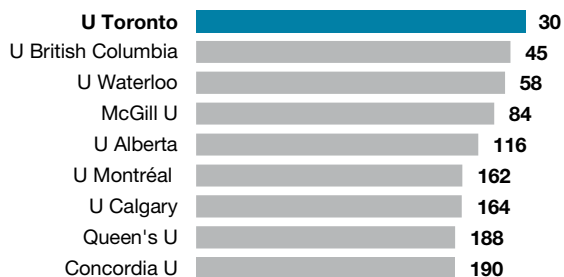
Civil & Structural Engineering



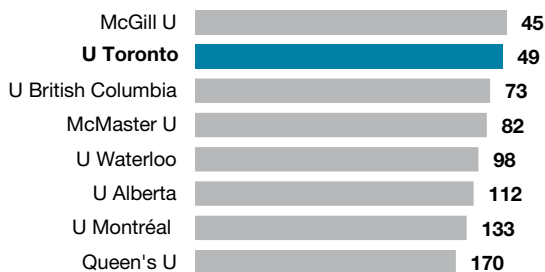
Computer Science & Information Systems



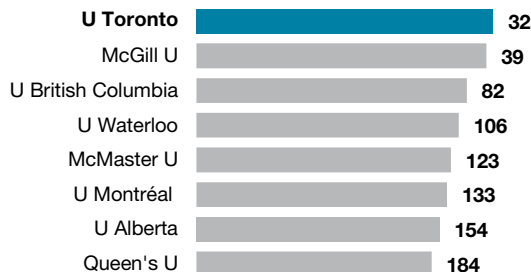
Electrical & Electronic Engineering



Materials Sciences



Mechanical, Aeronautical & Manufacturing Engineering



Mineral & Mining Engineering



With the inclusion of the Mineral & Mining Engineering field for the first time, we are now recognized as the top Canadian engineering school in four out of seven engineering and information technology subjects (Chemical Engineering, Computer Science & Information Systems, Electrical & Electronic Engineering, Mechanical, Aeronautical & Manufacturing Engineering) and second in two other subjects (Civil & Structural Engineering, Materials Science), demonstrating our strength across a range of disciplines.

National Taiwan University (NTU) Performance Ranking of Engineering Papers

U of T Engineering ranked 43rd globally and first in Canada in the National Taiwan University Performance Ranking of Engineering Papers. We also placed ninth among the top tier of North American public universities. NTU uses the publication of engineering papers to identify and compare the top 200 universities in the world by subject.

NTU's ranking is based on eight weighted criteria grouped into three broad categories:

Research Productivity

- Total number of articles published in the past 11 years (2005–2015) [10%]
- Total number of articles published in the most recent year reported (2015) [15%]

Research Impact

- Total number of citations in the past 11 years (2005–2015) [15%]
- Total number of citations in the past two years (2014–2015) [10%]
- Average annual number of citations over the past 11 years (2005–2015) [10%]

Research Excellence

- H-index (measures productivity and impact of published work) of the past two years (2014–2015) [10%]
- Number of highly cited papers in the past 11 years (2005–2015) [15%]
- Number of papers published in high-impact journals in the current year (2015) [15%]

Figure 6.4a NTU Top 50 World Universities, 2016

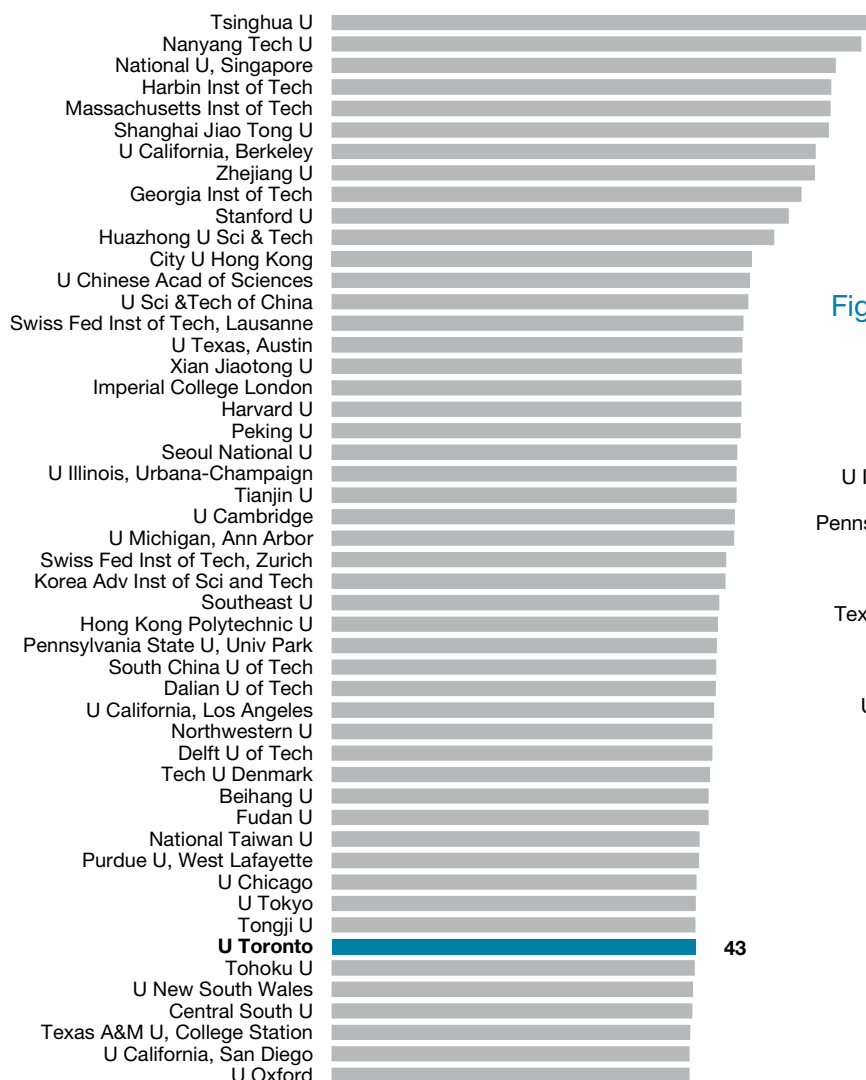
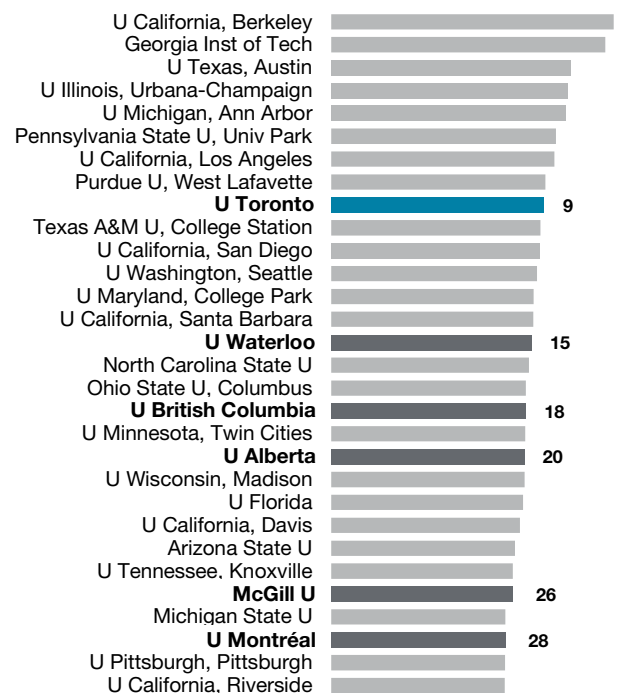


Figure 6.4b NTU Top North American Public Universities, 2016



In NTU's rankings of engineering and information technology subject areas (Figure 6.4d), U of T Engineering placed first among Canadian institutions in four out of six subject rankings. We are among the top 50 globally in Computer Science and in Civil, Electrical and Mechanical Engineering.

Figure 6.4c Canadian U15 Universities in NTU Top 200, 2016

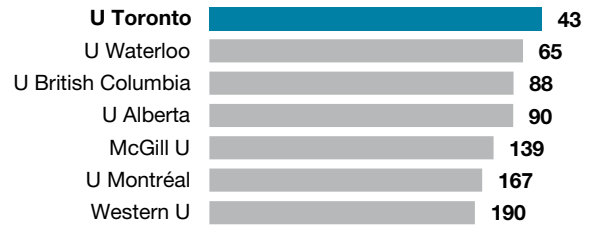
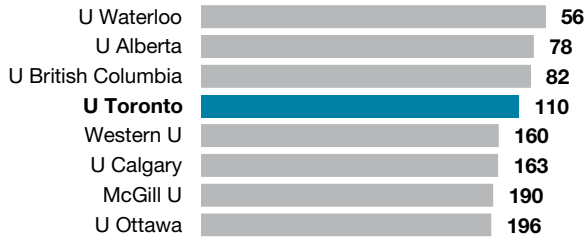


Figure 6.4d Canadian Universities in NTU by Subject, 2016

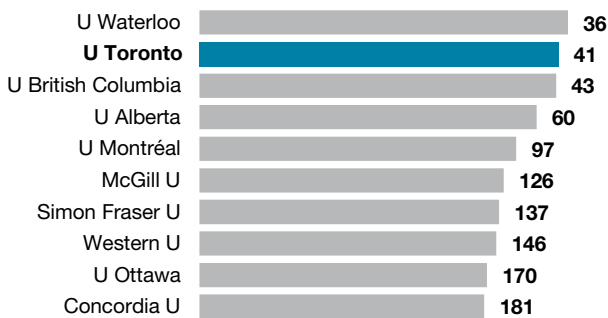
Chemical Engineering



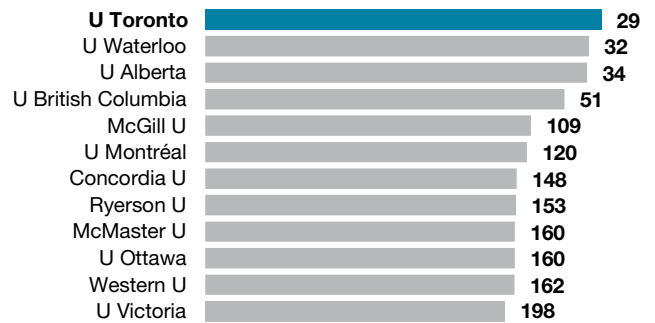
Civil Engineering



Computer Science



Electrical Engineering



Materials Science



Mechanical Engineering



Rankings Based on Publications and Citations

Figure 6.5a Number of Engineering Publications Indexed by Thomson Reuters for Association of American Universities (AAU) Public and Canadian Peer Institutions, 2011 to 2015

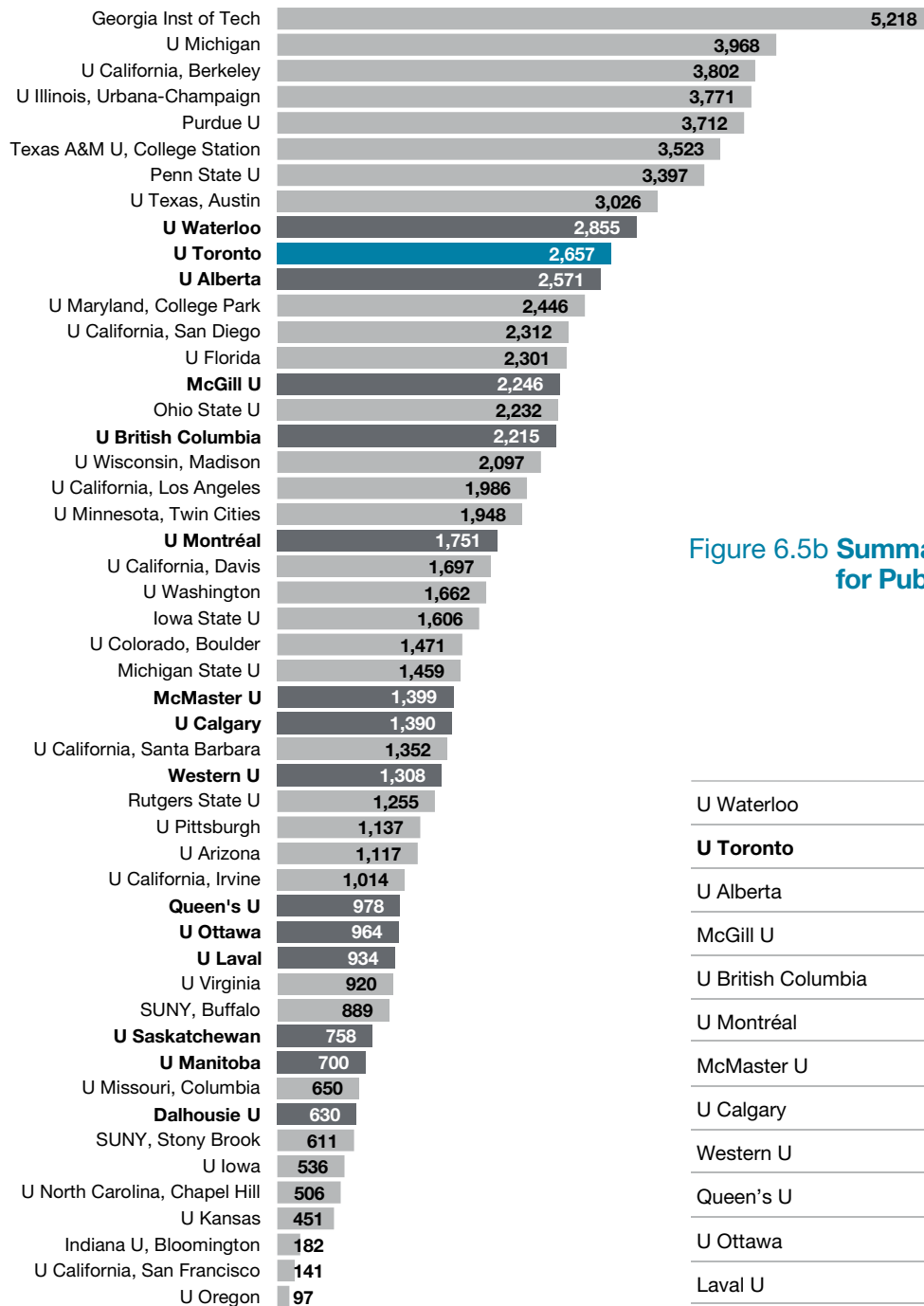


Figure 6.5b Summary of U15 Bibliometrics for Publications

	Publications	Faculty Count	Publications per Faculty	Rank on Pub per Faculty
U Waterloo	2,855	288	9.9	6
U Toronto	2,657	246	10.8	5
U Alberta	2,571	195	13.2	3
McGill U	2,246	143	15.7	1
U British Columbia	2,215	186	11.9	4
U Montréal	1,751	255	6.9	13
McMaster U	1,399	150	9.4	7
U Calgary	1,390	157	8.9	8
Western U	1,308	96	13.6	2
Queen's U	978	129	7.6	12
U Ottawa	964	124	7.8	11
Laval U	934	162	5.8	15
U Saskatchewan	758	88	8.7	9
U Manitoba	700	83	8.4	10
Dalhousie U	630	97	6.5	14

Note 6.5 and 6.6: Faculty counts are based on data from the Engineers Canada Resources Report (2015) Publication and citation data from Thomson Reuters InCites™, updated March 11, 2017.

The Association of American Universities (AAU) index measures research output, productivity and intensity based on publication counts. Once again, U of T Engineering ranked 10th in North America and second in Canada, based on a total publication count of 2,657 papers between 2011 and 2015.

The AAU index citation counts are based on the total number of papers cited over a five-year period, as well as the frequency of citations per faculty member and articles. U of T Engineering placed first in Canada and 10th among North American public institutions in the total number of citations. As in the past two years we ranked third in Canada for citations per faculty after McGill University and Western University and retained the lead among Canadian universities in the number of citations per publication, which is the metric representing the relevance of our publications as cited by other researchers.

Figure 6.6a Number of Engineering Citations Indexed by Thomson Reuters for Association of American Universities (AAU) Public and Canadian Peer Institutions, 2011 to 2015

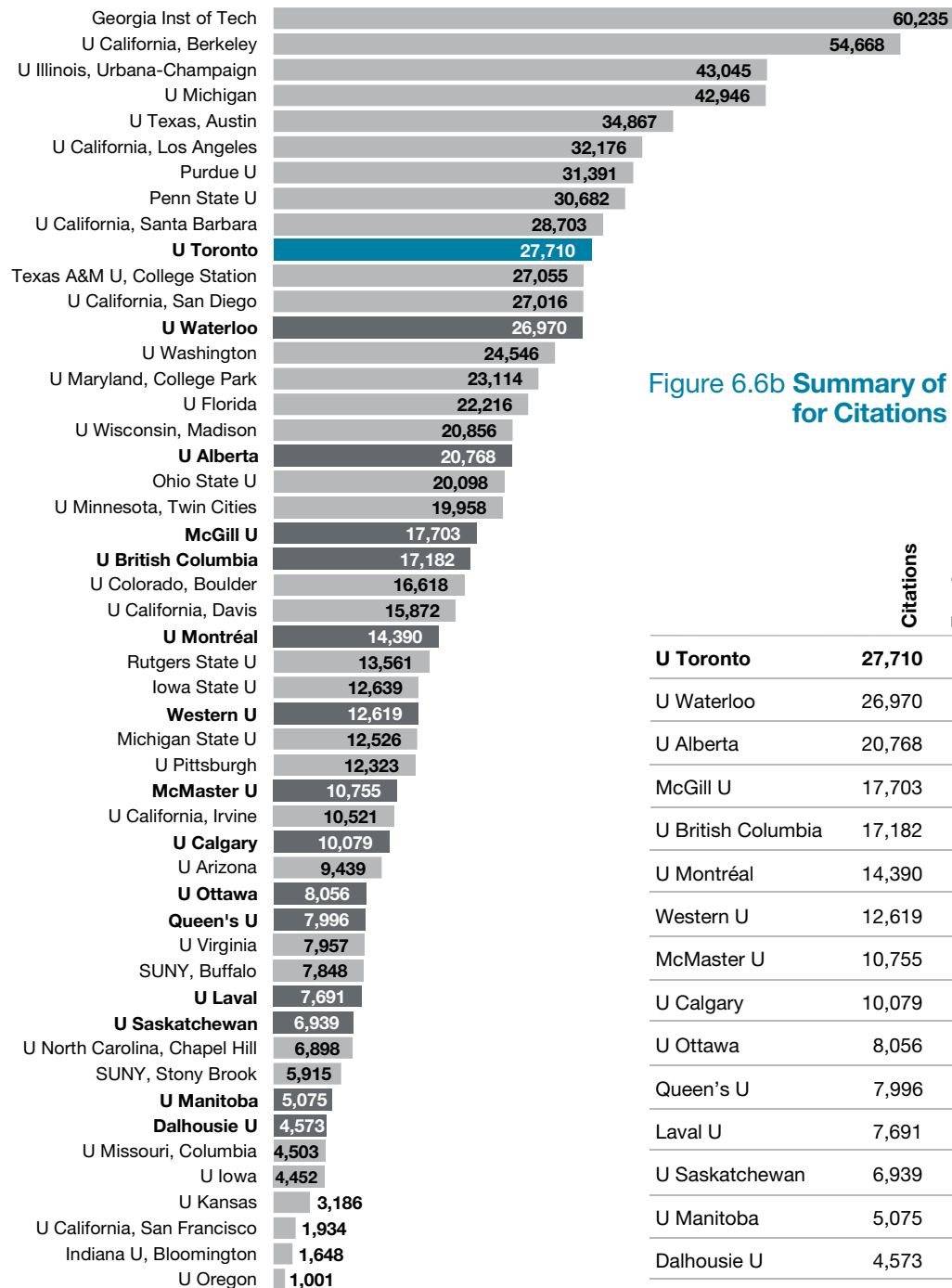


Figure 6.6b Summary of U15 Bibliometrics for Citations

	Citations	Faculty Count	Citations per Faculty	Rank on Citations per Faculty	Citations per Publication	Rank on Citations per Publication
U Toronto	27,710	246	112.7	3	10.4	1
U Waterloo	26,970	288	93.5	5	9.4	3
U Alberta	20,768	195	106.5	4	8.1	9
McGill U	17,703	143	123.8	2	7.9	10
U British Columbia	17,182	186	92.5	6	7.8	11
U Montréal	14,390	255	56.4	13	8.2	7
Western U	12,619	96	131.4	1	9.6	2
McMaster U	10,755	150	71.9	8	7.7	12
U Calgary	10,079	157	64.2	10	7.3	14
U Ottawa	8,056	124	65.0	9	8.4	5
Queen's U	7,996	129	62.1	11	8.2	8
Laval U	7,691	162	47.5	14	8.2	6
U Saskatchewan	6,939	88	79.2	7	9.2	4
U Manitoba	5,075	83	61.1	12	7.3	15
Dalhousie U	4,573	97	47.1	15	7.3	13

Summary of Ranking Results

In 2016, U of T Engineering remained the top Canadian university, and the only Canadian institution within the global top 50, across all the rankings. Among North American public universities, we ranked in the top 10 in three of the four ranking systems. Although no ranking can decisively illustrate a school's performance, our high rankings enhance our ability to attract top faculty, researchers and students from around the world.

Figure 6.7 Summary of University of Toronto Engineering Performance in World Rankings

Ranking Organization	Release Date	Canada	North American Public	World
Academic Ranking of World Universities for Engineering (ARWU) for Engineering / Technology and Computer Sciences	August 2016	1	14	50
ARWU Scoring Detail by Category	August 2016			
• Highly Cited (HiCi)		1	15	46
• Publications (PUB)		2	9	67
• Publications in Top Journals (TOP)		1	17	57
ARWU Subject Ranking <i>[New for 2016]</i>	June 2016			
• Chemical Engineering		1	10	39
• Civil Engineering		3	16	81
• Electrical & Electronic Engineering		1	10	27
• Energy Science & Engineering		9	33	162
• Environmental Science & Engineering		2	10	25
• Materials Science & Engineering		1	10	42
• Mechanical Engineering		4	22	74
Times Higher Education (THE) – Elsevier World University Ranking for Engineering & Technology	September 2016	1	9	31
QS World University Rankings for Engineering and Technology	March 2017	1	4	34
QS World University Rankings by Subject	March 2017			
• Chemical Engineering		1	8	34
• Civil & Structural Engineering		2	8	31
• Electrical & Electronic Engineering		1	7	30
• Materials Science		2	11	49
• Mechanical, Aeronautical & Manufacturing Engineering		1	8	32
• Mineral & Mining Engineering		4	7	17
• Computer Science & Information Systems		1	2	10
National Taiwan University (NTU) Performance Ranking of Scientific Papers for World Universities by Subject	October 2016	1	9	43
NTU Performance Ranking by Subject	October 2016			
• Chemical Engineering		4	19	110
• Civil Engineering		1	10	35
• Electrical Engineering		1	7	29
• Materials Science		1	10	62
• Mechanical Engineering		1	11	47
• Computer Science		2	10	41