

Tianjin

Tianjin, a major transport hub 120 kilometres southeast of Beijing, is one of four municipalities under the direct administration of central government. By leveraging the innovation of its top universities, the city hopes to lead the nation in two emerging research areas.

ARTICLE COUNT (AC): **341**
 FRACTIONAL COUNT (FC): **169**
 WEIGHTED FRACTIONAL COUNT (WFC): **168**

Over the last four years, Tianjin has positioned itself as an incubator for innovation. It spent US\$7 billion — or 2.98% of its GDP — on research and development in 2013 — a percentage surpassed only by Beijing and Shanghai. Through the provision of start-up subsidies, the city has increased its number of innovation-based companies to 50,000, which now account for 20% of its small- and medium-sized enterprises.

In January 2014, the Tianjin Co-Innovation Center for Chemical Science and Engineering — established by the city’s two leading universities of Nankai (NKU) and Tianjin (TJU) — held a meeting of 70 distinguished scientists to explore better ways to leverage its discoveries. As a result, the centre will focus on two research areas, advanced functional materials and renewable energy. The goal will be to streamline the product development cycle, from research to patenting to technology transfer. Both universities have published work in these fields in 2013, including two articles (WFC = 2) on solar cells for NKU; and four articles on technologies including hydrogen production, solar cells and microbial fuel cells (total WFC = 2.24) for TJU.

Tianjin is strong in chemistry and though both leading universities focus on this field, NKU is historically strong in basic research, while TJU is better known for applied research.

Founded in 1919, NKU is Tianjin’s premier higher education institution and the city’s largest contributor to the index. In 2013, the university published 190 articles (WFC = 113.8), accounting for 68% of the city’s WFC. Three researchers from its college of chemistry are responsible for most of these publications. Xiuping Yan is the most prolific, having published 12 articles (WFC = 10.5) on metal-organic frameworks, a class of porous composite materials with applications in catalysis, sensing and separation. Yan explains that these materials are significant because of their long-lasting fluorescence.

Qilin Zhou and Jun Chen are the second and third largest contributors by WFC. Zhou led eight articles — all co-authored by NKU researchers (WFC = 8) and all pertaining to asymmetric synthesis. The highlight, he says, was a chiral catalyst with a ‘turnover number’ (the number of molecules a catalyst converts before it is exhausted) exceeding 4.5 million — way above the typical value of the order of one thousand. Chen, meanwhile, co-authored eight articles (WFC = 6.9) on nanomaterials.

Founded in 1895, TJU is Tianjin’s second largest research institution in the index with 66 articles (WFC = 33.7), representing 20% of the city’s WFC. Jinlong Gong from the school of chemical engineering and technology is the largest contributor in chemistry, with seven

articles (WFC = 4.8) — including one in *Nature Communications* — on nanomaterials.

Also notable is Jun’an Ma from the department of chemistry, who published three articles (WFC = 2.8) on the synthesis of organo-fluorine compounds. “We found a way of constructing trifluoromethyl pyrazoles,” says Ma. This can be used to treat HIV or arthritis, he says.

There are eight other Tianjin universities in the Nature Index. These include Tianjin Medical University (TMU), Tianjin University of Technology (TUT) and Tianjin University of Science and Technology (TUST). Among these, TMU stands out as the most collaborative. Its AC/FC ratio is the highest among the city’s six major contributing universities.

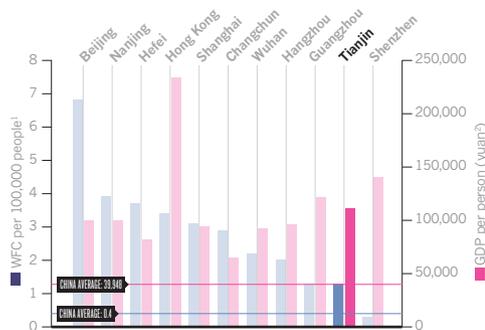
Of TUT researchers, Xianshun Zeng, in the school of materials science and engineering, is the most prolific. He co-authored three articles (WFC = 1.9) on fluorescent chemosensors which have big implications for detecting and monitoring environmental contaminants, such as palladium and bisulphate species.

TUST is the only Tianjin institution with earth and environmental science research, which represents more than 41% of its WFC. The top contributor is Hao Wei, dean of the college of marine science and engineering. Wei published two articles (WFC = 1.1) on mechanisms driving interannual ocean variability. ■

TIANJIN ANALYSIS

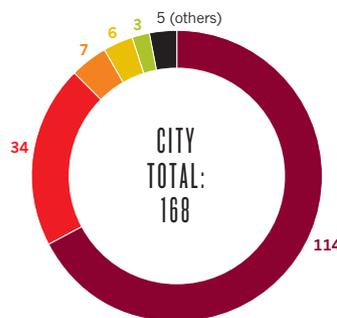
Tianjin data

Tianjin has a high rate of GDP per person, but one of the lowest rates of WFC of the cities profiled.



City WFC breakdown

Of Tianjin’s 19 institutions in the index, Nankai is dominant by WFC.



City subject spread

Nearly three-quarters of Tianjin’s WFC is derived from chemistry, way above the national average.

