

Changchun

Changchun has traditionally been a manufacturing centre, producing goods ranging from cars to processed food. In line with China's growth and reform, the city is diversifying its economy by leveraging its research base.

ARTICLE COUNT (AC): **394**
 FRACTIONAL COUNT (FC): **226**
 WEIGHTED FRACTIONAL COUNT (WFC): **224**

Changchun, the capital and largest city of the northeastern province of Jilin, is home to many production industries. Its government estimates that output reached US\$150 billion in 2013, of which well over 90% came from the manufacture of cars, food, bio pharmaceuticals and construction materials.

However, Changchun wants to become an innovation-based economy. On 21 January 2014, the provincial governor announced the city would invest heavily in four new areas — photonics, chemical engineering, biochemistry and fine chemicals — and build on research from its four major research institutions: Jilin University (JLU); Northeast Normal University (NENU); and the two institutes of the Chinese Academy of Sciences (CAS) — the Changchun Institute of Applied Chemistry (CIAC) and the Changchun Institute of Optics, Fine Mechanics and Physics (CIOMP). Collectively, these institutions account for more than 98% of the city's weighted fractional count (WFC).

JLU is responsible for most of these papers. Jihong Yu and Guangshan Zhu from the State Key Laboratory of Inorganic Synthesis and Preparative Chemistry are the two largest contributors. In 2013, Yu published eight articles (WFC = 6.6), and Zhu seven (WFC = 6.2). Both researchers study the design and synthesis of porous materials, which have diverse applications

including carbon sequestration, water purification, catalysis and chromatography.

Myongsoo Lee, from the State Key Laboratory of Supramolecular Structure and Materials, is JLU's third highest contributor by WFC to chemistry. Lee joined JLU in 2013 but has already published three papers (WFC=2.1), on the self-assembly of nanomaterials.

CIAC is Changchun's powerhouse for high-quality chemistry research. Husband-and-wife team Xiaogang Qu and Jinsong Ren from the State Key Laboratory of Rare Earth Resource Utilization — who have been inseparable since graduating from the California Institute of Technology — have made the largest contribution by WFC. They published 20 articles (WFC = 16.3) on topics including artificial enzymes, catalysis, gene delivery and cell imaging. "We have developed novel biomimetics that could simulate cellular processes," says Ren. "We have made artificial enzymes that could serve a range of industrial applications that are cheaper and more rugged than their natural counterparts."

Another CIAC couple, Erkang Wang and Shaojun Dong from the State Key Laboratory of Electroanalytical Chemistry, are the third and fourth largest contributors with 24 articles (WFC = 16.0) on nanomaterials and G-quadruplexes (specific formations of nucleic acids). "We are working on enzymatic fuel cells that can produce

energy from bioavailable substrates," says Dong. In implants, such devices could power memory and electrical circuits in pacemakers.

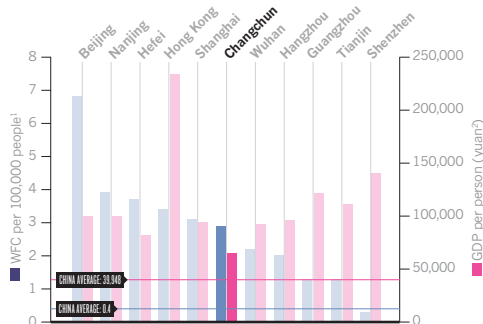
NENU is Changchun's top institution in the life sciences, which represent more than a fifth of its WFC. Notable contributors include palaeontologist Dongyu Hu, from the Ministry of Education Key Laboratory of Vegetation Ecology, who co-authored two articles — including one in *Nature* — on feathered dinosaurs. Hu sheds light on the evolution of birds and the origins of flight. It is chemistry where NENU excels. Zhongmin Su and Qian Zhang from the faculty of chemistry are its most prolific contributors. Su co-authored six articles (WFC = 5.1) on the synthesis of polyoxometalates (large metal clusters) and metal-organic frameworks, which have applications from catalysis to data storage. Zhang produced five articles (WFC = 4.9) on metal catalysts, notably on methods for introducing functional groups under mild conditions.

CAS institute CIOMP is the most dedicated to the physical sciences. Dezhen Shen and Jialong Zhao, from the State Key Laboratory of Luminescence and Applications, are the top two contributors with two articles each. Shen's are on the photocatalytic properties of titanium dioxide and manganese-doped zinc oxide, while Zhao's articles focus on the synthesis and application of zinc sulphide quantum dots. ■

CHANGCHUN ANALYSIS

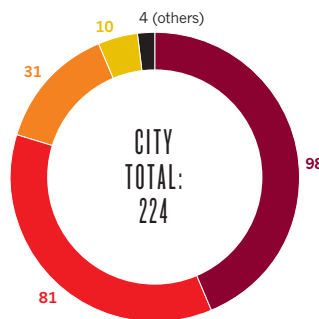
Changchun data

Per person, Changchun has the lowest gross domestic product (GDP) of the cities profiled, but an average WFC.



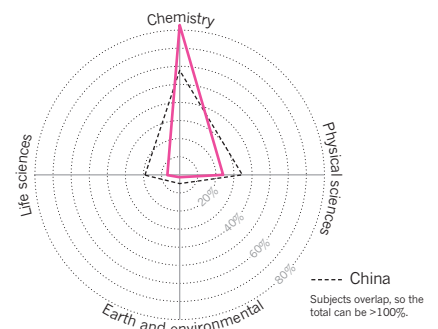
City WFC breakdown

Changchun has four major institutions, led by Jilin University.



City subject spread

Changchun is exceptionally focused on chemistry.



■ Jilin University ■ Changchun Institute of Applied Chemistry* ■ Northeast Normal University
 ■ Changchun Institute of Optics, Fine Mechanics and Physics*

*CAS institute: 1.360doc.com; 2. cnpop.org; yuan = US\$0.16