

# Science, Technology, Education and Health News from China

## Number 137 – November 2015

Please note that the previous newsletters can be downloaded from the website of the Embassy of Switzerland in China: [www.eda.admin.ch/beijing](http://www.eda.admin.ch/beijing).<sup>1</sup> To subscribe/unsubscribe or send us your comments, please write an email with the corresponding subject to [yuan.jing@eda.admin.ch](mailto:yuan.jing@eda.admin.ch).

### Introduction

The story of the month reports the China Vocational Education Research Institute's interim report on the development of vocational education in China. In research, China will launch its dark matter satellite in mid-December. Nature Publishing Group releases a landmark white paper on research in China. China is to build the world's biggest animal cloning factor in Tianjin. China seeks robot technology cooperation opportunity worldwide. In education, State Council calls for more top-level universities. In health, A new gene resistant to last-resort antibiotics found in animals and people in China.

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## Story of the Month

### Interim Evaluation of the Medium-Long Term Education Plan (2010-2020) on Vocational Education

2015 marks the mid-term of the National Medium and Long Term Education Development Plan (2010-2010). Mandated by the Ministry of Education, the Research Institute of Vocational Education and Training of the Ministry of Education conducted an interim evaluation on the progress of Vocational Education which was published earlier this month.

According to the evaluation, students enrolled vocational education now accounts for 45% of the upper secondary education. In 2014, tertiary level vocational education admitted 3.37 million students, which is 46.9% of the total number of students in higher education. 10.6 million students are studying full-time at a tertiary level vocational education institutions, on top of the 55.9 million who are pursuing non-degree, part-time or further education. However both secondary level and tertiary level failed to meet the enrollment goals set in the development plan (-4.9 million for secondary level VET schools, -13.9 million for tertiary level VET institutions), due to “demographic change”.

In the past 5 years the government has steadily increased the funding of VET. Total investment on VET reached RMB 342 billion, a 42.2% growth compared to 2010 with an annual double digit growth rate. Government expenditure on VET saw a 75.2% growth compared to 2010, showcasing strong government commitment on improving the quality of VET education. Ministry of Education has also been pushing provincial governments to establish a minimum expenditure per VET student standard to guarantee expenditure on VET on both secondary and tertiary level. Until the end of 2014, 19 provinces have established expenditure standards for secondary level VET students and 22 provinces have established standards for tertiary level VET students. However given the regional disparities on economic and education development, expenditure on VET is way lower in western China compared to its counterparts in the east.

Efforts have been made to implement reforms on vocational education. In the past 5 years, the Ministry has pushed for 62 industry associations have established advisory committee for vocational education. The Ministry also started 165 pilot projects on “modern apprenticeship program”. Teaching standards have been established for 410 tertiary level occupations and 230 secondary level occupations. A training scheme for VET faculty has been published where it becomes mandatory for VET teachers to spend 6 months in industry every 5 years. Reform has also been introduced to give schools more autonomy on hiring and evaluating their own faculty in order to attract more teachers with strong industry background.

In the next 5 years, the interim report sees the main challenges of VET in China in 1) further scaling vocational education; 2) improving the governance and quality of VET; 3) improving the qualification, especially the industry experience of VET faculty and 4) further increase central and local government expenditure on VET.

Speaking at the press conference, WANG Jiping, Inspector at the Department of Vocational Education and Adult Education at the Ministry of Education confirmed that VET is still the weak link in China’s education system. In the next steps, the ministry will focus on deepening reform, improving quality of education, prioritizing VET in underdeveloped regions and intensifying international cooperation and development cooperation through VET.

## News

### 1. State Council puts top-grade university plan on fast track

*(China Daily, 06-11-2015)*

China plans to build a series of world-class universities and disciplines in as little as five years, according to a document released on 3<sup>rd</sup> Nov by the State Council, China's Cabinet. It vowed to increase financial support and strengthen performance management.

The new policy is expected to tackle problems such as redundant construction and lack of competition that were brought about by the current "985" and "211" higher education programs.

The "211" project, launched in 1993, aims to build 100 universities for the 21st century. Project "985" was named when then-president Jiang Zemin gave a speech in May 1998, and called for China to build a number of key universities in China.

According to the document, a number of universities and disciplines will work toward the world's top level by 2020. The number will further increase by 2030, with a significant increase in the overall education quality. By midcentury, the quantity and quality of China's top-class universities and disciplines should be among the front-runners in the world.

The State Council, urged improving the quality of university teaching staff and their research capabilities through optimized internal management and enhanced international cooperation. It also encouraged the cultivation of more innovators and the transformation of scientific achievements into industrial output.

The education authority will have five-year plans starting in 2016, which will receive special funds from central financial departments. A third party will monitor and assess the spending of funds and the performance of universities.

The State Council called on various government departments and enterprises to participate in the initiative.

([http://www.chinadaily.com.cn/china/2015-11/06/content\\_22385306.htm](http://www.chinadaily.com.cn/china/2015-11/06/content_22385306.htm))

### 2. China to launch dark matter satellite in mid-December

*(Global Times, 16-11-2015)*

China's first satellite to investigate dark matter has been shipped and readied for a mid-December launch at the Jiuquan Satellite Launch Center in Northwest China's Gansu Province.

The Dark Matter Particle Explorer (DAMPE) Satellite, developed by the Chinese Academy of Sciences (CAS), left Shanghai for Jiuquan on 14<sup>th</sup> Nov together with its carrier, a Long March 2-D rocket.

The satellite and carrier rocket are fully prepared for blastoff after passing inspection and approval by the CAS. The launch will be the 26th mission for the Long March 2-D rocket.

DAMPE will have the widest observation spectrum and highest energy resolution of any dark matter probe in the world. According to experts, DAMPE is designed for an increased payload, carrying a payload of scientific instruments weighing 1,410 kilograms.

The satellite as a whole weighs 1,850 kilograms, and its lower size and weight has saved launching costs.

The satellite cost \$100 million to make and has a lifespan of more than three years.

DAMPE is one of the first four scientific satellites to be utilized by the CAS space program. It will observe the direction, energy and electric charge of high-energy particles in space in search of dark matter.

Though dark matter accounts for over a quarter of the universe's mass-energy balance, it can only be observed indirectly through its interaction with visible matter.

Many scientists, including Nobel laureate in physics Yang Zhenning, believe that the development of dark matter theory might help us understand phenomena that can't be explained with current knowledge, triggering "revolutionary progress" in physics.

(<http://www.globaltimes.cn/content/952892.shtml>)

### 3. Nature Publishing Group Releases Landmark White Paper

(*Nature*, 25-11-2015)

Nature Publishing Group (NPG), part of Springer Nature, releases Turning Point on 25<sup>th</sup> Nov: Chinese Science in Transition, a White Paper which takes the pulse of China's scientific research at a critical time in its development. It is the first report of its kind to be undertaken in China by a global publisher, drawing on quantitative and qualitative data NPG has recently gathered through interviewing and surveying more than 1,700 leading Chinese researchers.

As its pace of economic growth slows, China's stated aim is to move towards a more sustainable knowledge-based economy which will be driven by scientific and technological innovation. But the White Paper notes that average academic impact of Chinese research is not yet matching its growth in output, and lags behind the world average in a number of subject areas in normalized citation impact, one of the indicators of impact from research. The Chinese research environment therefore, like its economy, is at a turning point, and faces some unique challenges that need to be overcome in order to improve the quality and impact of the scientific output that will support sustainable growth.

The White Paper starts by focusing on a positive trend in Chinese science. It shows that China's long-lamented 'brain drain' has become a 'brain boomerang', with the vast majority of young Chinese scientists planning to return quickly to China after a period overseas: 85% plan to return within 5 years. This trend of faster-returning 'haigui' (homing turtles, as they are colloquially referred to in China), reflects the country's increased standing in global research, and a greater confidence Chinese scientists have in the country's future. China's increased efforts to attract, develop and retain talented researchers are also securing greater numbers from abroad.

In order to develop and retain these scientists, the White Paper argues that it is vital to implement policies and funding schemes that better address their needs and concerns. In a bid to better understand these, the White Paper looks into three key stages of research process: funding, conducting and sharing research. It concludes that the picture of the fundamental components of the research ecosystem in China is overwhelmingly positive, but there are still anomalies and barriers that frustrate researchers and thwart progress towards a culture that recognizes and rewards excellence and innovation. A full summary of key findings and recommendations regarding funding, conducting and sharing research is included below. Commenting on the White Paper, Charlotte Liu, President of Springer Nature in Greater China, said: "Just like China's economy, Chinese science is at a turning point. The range of proposed suggestions and solutions found in this White Paper are based on our first-hand, wide-ranging study and explicitly address some of the issues our research identifies. They are intended to help China become more successful in this transition period. We believe that if they are refined, detailed and implemented by the key stakeholders associated with the research process, they provide the opportunity for China not just to be seen as a research giant but to establish an entrenched culture of innovation that can establish it as a global science and technology leader."

Annette Thomas, Chief Scientific Officer of Springer Nature, added: "China is pursuing an economic and social transformation driven by research and innovation. This White Paper and its recommendations are part of our contribution to that process. They reflect our commitment to facilitate China's growing contribution to global science and to help its researchers to publish, discover and succeed."

([http://www.nature.com/press\\_releases/turning\\_point.html](http://www.nature.com/press_releases/turning_point.html))

#### 4. **Alarming new 'superbug' gene resistant to last-resort antibiotics found in animals and people in China**

(SCMP, 19-11-2015)

A new gene that makes bacteria highly resistant to a last-resort class of antibiotics has been found in people and pigs in China - including in samples of bacteria with epidemic potential, researchers said on 18<sup>th</sup> Nov. The discovery was described as "alarming" by scientists, who called for urgent restrictions on the use of polymyxins - a class of antibiotics that includes the drug colistin and is widely used in livestock farming. "All use of polymyxins must be minimised as soon as possible and all unnecessary use stopped," said Laura Piddock, a professor of microbiology at Britain's Birmingham University who was asked to comment on the finding.

Researchers led by Hua Liu from the South China Agricultural University who published their work in the Lancet Infectious Diseases journal found the gene, called mcr-1, on plasmids - mobile DNA that can be easily copied and transferred between different bacteria. This suggests "an alarming potential" for it to spread and diversify between bacterial populations, they said. The team already has evidence of the gene being transferred between common bacteria such as E.coli, which causes urinary tract and many other types of infection, and Klesbsiella pneumoniae, which causes pneumonia and other infections. This suggests "the progression from extensive drug resistance to pandrug resistance is inevitable," they said. "(And) although currently confined to China, mcr-1 is likely to emulate other resistance genes ... and spread worldwide."

The discovery of the spreading mcr-1 resistance gene echoes news from 2010 of another so-called "superbug" gene, NDM-1, which emerged in India and rapidly spread around the world. Piddock and others said global surveillance for mcr-1 resistance is now essential to try to prevent the spread of polymyxin-resistant bacteria. China is one of the world's largest users and producers of colistin for agriculture and veterinary use.

Worldwide demand for the antibiotic in agriculture is expected to reach almost 12,000 tonnes per year by the end of 2015, rising to 16,500 tons by 2021, according to a 2015 report by the QYResearch Medical Research Centre. In Europe, 80 percent of polymixin sales - mainly colistin - are in Spain, Germany and Italy, according to the European Medicines Agency's Surveillance of Veterinary Antimicrobial Consumption (ESVAC) report.

For the China study, researchers collected bacteria samples from pigs at slaughter across four provinces, and from pork and chicken sold in 30 open markets and 27 supermarkets in Guangzhou between 2011 and 2014. They also analyzed bacteria from patients with infections at two hospitals in Guangdong and Zhejiang. They found a high prevalence of the mcr-1 gene in E coli samples from animals and raw meat. Worryingly, the proportion of positive samples increased from year to year, they said, and mcr-1 was also found in 16 E.coli and K.pneumoniae samples from 1,322 hospitalized patients.

David Paterson and Patrick Harris from Australia's University of Queensland, writing a commentary in the same journal, said the links between agricultural use of colistin, colistin resistance in slaughtered animals, colistin resistance in food, and colistin resistance in humans were now complete. "One of the few solutions to uncoupling these connections is limitation or cessation of colistin use in agriculture," they said. "Failure to do so will create a public health problem of major dimensions."

(<http://www.scmp.com/news/china/society/article/1880457/alarming-new-superbug-gene-resistant-last-resort-antibiotics>)

#### 5. **China to build world's biggest animal cloning factory in Tianjin**

(SCMP, 24-11-2015)

Tianjin is building the world's largest animal cloning factory, aiming to produce one million cattle embryos annually, state media reported 23<sup>rd</sup> Nov. According to a Xinhua, mainland scientists have signed a deal to

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establish a 200 million yuan (HK\$ 242 million) commercial animal cloning center in the Tianjin Economic-Technological Development Area, a government-sponsored business development park.

Its main building was already under construction and due to be completed by June next year, the report said. Among the animals it will clone are sniffer and pet dogs, high-grade beef cattle, racehorses and "non-human primates". These animals will be used for commercial services and improving breeds. The project could rapidly improve the quality of livestock and bring the controversial science one step closer to mainstream acceptance, Xinhua reported.

Sinica, a subsidiary of Wuxi -based Boyalife Group which focuses on stem cell and regenerative medicine research, signed the agreement with TEDA on 20<sup>th</sup> Nov. The center will be jointly built by Sinica, Peking University's Institute of Molecular Medicine, the Tianjin International Joint Academy of Biomedicine and South Korea's Sooam Biotech Research Foundation.

Boyalife chairman Xu Xiaochun said the center would produce 100,000 cattle embryos a year before expanding annual output to one million. Xu said mainland farmers had struggled to breed enough beef cattle to meet market demand and the center would be the largest of its kind in the world.

The factory also plans to set up a cloning lab, a gene bank and a science education center. Since 2000, mainland scientists have cloned sheep, cattle and pigs. China's first commercial cloning company was established in September 2014 in Shandong province with the birth of three pure-blooded Tibetan mastiff puppies. The firm is a joint venture between Boyalife and Sooam Biotech.

Prior to this, cloning in China had been limited to scientific research. More and more companies have shown interest in investing in the technology for commercial use, especially animal husbandry. Sinica has cloned more than 550 sniffer dogs working for airports, customs and police. In April, scientists from Sun Yat-sen University in Guangzhou successfully edited human DNA in an embryo for the first time by "cleaving" a gene responsible for beta thalassemia, a common and sometimes deadly blood disorder among children in southern China. Scientists in Shanghai have also been rewriting the rules of reproduction with a groundbreaking experiment that combined genetic material from two female mice to create healthy offspring.

(<http://www.scmp.com/news/china/policies-politics/article/1882471/china-build-worlds-biggest-animal-cloning-factory>)

## 6. **China seeks robot technology assistance worldwide**

*(Xinhua, 24-11-2015)*

Vice-President Li Yuanchao encouraged overseas robotics companies on 23<sup>rd</sup> Nov to share technologies with China-based vendors, saying that international cooperation will help foreign companies tap into China's huge market. Li said he hopes that "industry leaders" in Europe, the United States and Japan will be open to technology cooperation with China, the world's second-largest economy, which buys one-fourth of all robots each year. "Although China is the world's biggest market for robots, it is lagging behind in advanced robotic development. ... The country will be more open to overseas experts and enterprises so they can conduct joint-development (with local scientists)," the vice-president told an industry expo in Beijing.

China became the world's largest robotics market last year by the number of products in use. At least 800,000 robots will be put into use in Chinese factories by 2020, according to the Ministry of Industry and Information Technology. Surging demand will create more than 100 billion yuan (\$15.7 billion) in turnover by then. President Xi Jinping wrote in a congratulatory letter sent to the expo that China is willing to work with the rest of the world in developing state-of-the-art robots.

China is looking at robots to improve efficiency in manufacturing sectors ranging from automobiles to textiles. It currently relies on overseas giants such as ABB Switzerland Ltd and KUKA AG in Germany to

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provide high-end robots used in the automobile manufacturing, electronics and logistics sectors. Luo Jun, the executive president of the Beijing-based International Robotics and Intelligent Equipment Industry Alliance, said that robots made in China account for only 20 percent of the market share nowadays, and that their presence in high-end sectors is significantly lower. "It will not be easy for local companies to replace imported devices without overseas technology assistance," Luo said. Because of huge demand, overseas giants may be willing to provide some technologies in exchange for market shares in China, Luo added.

Wang Tianran, an academician at the China Academy of Engineering, said that the aging population and the increasing income of Chinese families are set to boost sales of service robots that can conduct such tasks as cooking, monitoring blood pressure and helping senior citizens. "This is a young market and will witness high double-digit growth," Wang said.

([http://news.xinhuanet.com/english/china/2015-11/24/c\\_134847865.htm](http://news.xinhuanet.com/english/china/2015-11/24/c_134847865.htm))

## 7. China Focus: Construction of China's mega radio telescope enters final stage

(Xinhua, 21-11-2015)

Chinese scientists on 21<sup>st</sup> Nov tested the installation of the "retina" of the world's largest ever radio telescope to be completed in September next year. Technicians lifted a 30-tonne feed cabin of the Five hundred meter Aperture Spherical Telescope - or FAST - above a half-finished dish-like reflector measuring 500 meters in diameter and 1.6 kilometers in perimeter. Once completed, the cabin, home to a feed source which collects signals from the universe, will be suspended 140 to 160 meters above the reflector made up of 4,450 panels.

Each panel is an equilateral triangle with a side length of 11 meters, and has cables fixed to the back of it so that it could adjust angles and positions in synchronization with the source cabin, which is driven by cables, servomechanisms in addition to a parallel robot as a secondary adjustable system. "If you compare the FAST to an eye, then the feed source is its retina," said Sun Caihong, a chief engineer with the FAST program, "All signals we collect eventually comes here."

Sun said control of high-precision and long-distance movements of the source cabin using steel cables had been a serious challenge for experts, but they managed to narrow down maximum error to less than 10 millimeters. "This is one of our greatest innovations," he said.

Construction of the FAST began in March 2011 with an investment of 1.2 billion yuan. The installation of the test feed cabin means the construction of FAST has entered its final stage. Technicians are still continuing the work that started months ago to assemble the reflector, which is hung over the ground supported by thousands of steel pillars and cables in a valley deep in southwest China's mountainous Guizhou Province.

The Karst formation in the local landscape is good for draining rainwater underground and protecting the reflector, Sun said. The surrounding area has "radio silence" as there are no towns and cities within a sphere of five km and only one county center within a sphere of 25 km, he said. Upon completion, the telescope will be the world's largest of its kind, overtaking Puerto Rico's Arecibo Observatory, which is 300 meters in diameter.

It will also be 10 times more sensitive than the steerable 100-meter telescope near Bonn, Germany, according to Zheng Xiaonian, deputy head of the National Astronomical Observatories under the Chinese Academy of Sciences. "FAST will be the top level facility in the world for at least 20 to 30 years," Zheng said.

Unlike optical telescopes used to observe the universe by visible light, a type of electromagnetic radiation, radio telescopes operate in the radio frequency portion of the electromagnetic spectrum where they can detect and collect data on radio sources. The key science goals of FAST are based on observables

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between 70MHz and 3 GHz, including the 21 cm HI hyperfine structure line, pulsar emissions and radio continuum.

Earlier reports said it will enable astronomers to jumpstart many science goals. For example, they could survey natural hydrogen in distant galaxies, detect faint pulsars, look for the first star shining, or even hear possible signals from other civilizations.

([http://news.xinhuanet.com/english/2015-11/21/c\\_134840638.htm](http://news.xinhuanet.com/english/2015-11/21/c_134840638.htm))

### **(Collaboration Opportunities)**

#### **Escalade 2015**

Date: December 8

Place: Shanghai

Contact: swissnex China

#### **St. Gallen Symposium – Beijing**

##### **Reception**

Date: December 9

Place: Beijing

Contact: swissnex China

#### **Big Data for Smart Ideas – swissnexDay'15**

Date: December 15

Place: Shanghai

Contact: swissnex China