

Science, Technology, Education and Health News from China

Number 132 –June 2015

Please note that the previous newsletters can be downloaded from the website of the Embassy of Switzerland in China: www.eda.admin.ch/beijing¹. To subscribe/unsubscribe or send us your comments, please send an email with the corresponding subject to chenchen.liu@eda.admin.ch.

Introduction

The story of the month covers Chinese government pays high attention to the cultivation of innovation and career –creating talents. In science and technology, China and Europe announce joint satellite mission. China's big biotech bet starting to pay off. Breeders in China have discovered the secret for creating rice varieties. In education, The Chinese Ministry of Education is calling for more foreign universities to accept the Chinese gaokao exam. University Teachers encouraged launching start-ups. China's vocational institutions train 130 million graduates. In health, Chinese scientists claim to have found a way to change the genetic make-up of a popular type of rice, which could require less fertilizer and thus help the environment.

Contents

Story of the Month	2
News.....	3
1. China, Europe announce joint satellite mission.....	3
2. China's big biotech bet starting to pay off.....	3
3. Modified rice may help combat China's smog problem, scientists claim	4
4. China MoE urges int'l acceptance of gaokao exam.....	5
5. University Teachers Encouraged to Launch Start-ups.....	6
6. China Focus: China's vocational institutions train 130 mln.....	7
7. Geneticists reveal what makes great rice.....	8
(Collaborating Opportunities).....	9

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¹ Please click on the blue texts to activate the hyperlinks to either email addresses or related websites.

Story of the Month

In order to carry out *The Implementation Suggestions on Deepening Innovation and Entrepreneurship Education Reformation of Institution of Higher Education*, Yuan Guiren, the minister of Ministry of Education (MOE), recently has pointed out that the State Council pays high attention to the cultivation of innovation and career –creating talents.

The deepening of innovation and entrepreneurship education reformation of colleges and universities has important significance. It is an urgent demand to accelerate the implementation of driving development strategy by innovation, a breakthrough of boosting higher education comprehensive reform, and an important measure for promoting higher quality pioneering work and employment of college graduates.

Yuan Guiren emphasizes that, the deepening of innovation and entrepreneurship education reformation of colleges and universities is an important content to boost higher education comprehensive reform at present and in the future. It will start from the following six key tasks.

The first is to **revise talent strategy**. The MOE should insist the basic guidance of morality education, carry out grand discussion on talent cultivation concept, and make clear purpose and requirements of innovation and entrepreneurship education, and perfect curriculum system of innovation and entrepreneurship education. The second is to **boost cooperative education**. The MOE should promote the collaboration between talent cultivation and social need as well as the cooperation of college and college, college and government, and college and society, propel disciplines' cooperation, and establish new mechanisms of structural adjustment, diverse cooperation and cross cultivation. The third is to **strengthen entrepreneurial practice**. The MOE should reinforce the formation and sharing of experimental teaching resource, broadly set up internship and training platform, and hold all kinds and all levels of innovation and entrepreneurship competitions. The current priority is to host the first session "Internet +" undergraduates innovation and entrepreneurship competition. The fourth is to **reform administration system**. The MOE will focus on establish individual cultivating and teaching management system, carry out innovation and entrepreneurship, build innovation and entrepreneurship credit accumulation and transforming system, and reform examination and evaluation system for students' course of study. The fifth is to **improve faculty's competence on innovation and entrepreneurship**. The MOE should insist the participation of the entire personnel, combine full-time and part-time teachers, as well as complete and strengthen teacher team of innovation and entrepreneurship education. The MOE needs to reform teaching content and methods organize and carry out specialized training. The sixth is to **foster innovation and entrepreneurship culture**. The MOE should regard innovation and entrepreneurship culture as a key content of college culture construction, hold lectures and forums with emphasis and different levels, and carry out theme activities in all direction and from multiple aspects. MOE needs to increase the value publicity of innovation and entrepreneurship, as well as find and set up models of innovation and entrepreneurship

News

1. China, Europe announce joint satellite mission

(Xinhua, 04-06-2015)

The Chinese Academy of Sciences (CAS) and the European Space Agency (ESA) have decided their joint space satellite program will focus on an X-ray imaging satellite to study the Earth's magnetosphere, the CAS announced June 4th.

The project, known as SMILE, was selected from 13 proposals and is due to launch in 2021. It plans to study the effects of the Sun on the Earth's environment by creating images of the interactions between solar winds and the Earth's magnetosphere with innovative X-ray and ultraviolet technologies, the CAS said in a statement.

Previously, the ESA contributed to China's Double Star, a similar satellite mission launched in 2003 to focus on the impact of the Sun on the Earth's environment.

SMILE will be the first comprehensive collaboration between China and the ESA with joint efforts in definition, implementation and data utilization, the CAS said, adding that the next step will be a project feasibility study.

(http://news.xinhuanet.com/english/2015-06/04/c_134298066.htm)

2. China's big biotech bet starting to pay off

(Reuters, 09-06-2015)

Years of pouring money into its laboratories, wooing scientists home from overseas and urging researchers to publish and patent is starting to give China a competitive edge in biotechnology, a strategic field it sees as ripe for "indigenous innovation."

The vast resources China can throw at research and development - overall funding more than quadrupled to \$191 billion in 2005-13 and the Thousand Talents Program has repatriated scientists - allow China to jump quickly on promising new technologies, often first developed elsewhere.

These efforts were illustrated vividly in April - not without controversy - when scientists at Sun Yat-sen University in Guangzhou published results of a ground-breaking experiment to alter the DNA of human embryos using new CRISPR-Cas9 gene editing technology.

CRISPR, which allows scientists to edit virtually any gene they target, is akin to a biological word-processing program that finds and replaces genetic defects.

The Guangzhou team is not alone. Data compiled by Thomson Innovation, a Thomson Reuters unit, shows China is a growing force in gene editing, with a burgeoning patent portfolio.

More than 50 Chinese institutions are patenting in the field, led by the Chinese Academy of Sciences, universities, the Anhui Academy of Agricultural Sciences and Beijing Jifulin Biotech. Nearly a fifth of the 518 families of gene editing patents analysed since 2004 were associated with Chinese entities.

For top-tier institutions, "the level of available resources is incredible in terms of the freedom, the flexibility that gives key leading Chinese scientists to move very, very fast on a given research track if a new opportunity arises," said James Wilsdon, professor of science and democracy at the University of Sussex.

China has also invested in gene sequencing.

Shenzhen-based BGI, formerly the Beijing Genomics Institute, for example, claims to be the world's largest genomics organization, though the original gene sequencing technology was developed in the United States and Britain.

China was also first to approve a gene therapy to treat head and neck cancer in 2003, though it remains controversial abroad, and Chinese scientists have pushed the boundaries in animal research.

A team from Northwest A&F University and the National Beef Cattle Improvement Centre reported last month that they had developed genetically modified cows rich in the beneficial Omega-3 fatty acids more usually found in fish. Also, Chinese researchers last year engineered the first monkeys with targeted mutations using the CRISPR gene editing system.

"The Chinese could, over time, play a very significant role in this game as they have a very entrepreneurial attitude - much more so than in parts of Europe," said Rodger Novak, CEO of CRISPR Therapeutics, a private Swiss-American biotech business.

One of the attractions of CRISPR, which has the potential to eliminate certain diseases but also create designer babies, is its ease of use.

"CRISPR technology is very simple. That's the beauty of it. It has taken off rapidly in the academic environment because it works, it's reliable, it's cheap and you don't need a lot of knowledge to make use of it," said Novak.

The technique has taken biology by storm, igniting a fierce patent battle. Some in the field believe CRISPR could prove as revolutionary, and as profitable, as recombinant DNA technology, which was developed in the 1970s and 80s, and launched the biotechnology industry.

But CRISPR has also been controversial.

The paper by the Chinese team, led by Huang Junjiu, provoked an outcry from some U.S. and European scientists because it was the first to use human embryos.

Robin Lovell-Badge, Head of Developmental Genetics at Britain's National Institute for Medical Research, does not believe the Chinese have a permanent edge in gene editing.

"It's been so obvious that these techniques will be used in human embryos at some point. I don't think there's any intellectual advantage. They've just done it first, and not very well," he said.

Guoji Guo, a beneficiary of the returnee scheme and a professor at Zhejiang University using CRISPR on stem cells, said Huang's work was significant, but still relied on a tool developed in the United States.

"We want findings that can change the world," Guo said.

(<http://www.reuters.com/article/2015/06/09/china-biotech-idUSL3N0YJ29B20150609>)

3. **Modified rice may help combat China's smog problem, scientists claim**

(South China Morning Post, 12-06-2015)

Chinese scientists claim to have found a way to change the genetic make-up of a popular type of rice, which could require less fertilizer and thus help the environment.

Chinese rice, especially the japonica subspecies grown in northern provinces like Heilongjiang province, requires the heavy use of fertilizers because of the poor rate at which it absorbs nitride from soil and water. Plants need nitride to grow healthily.

But the fertilizer harms the soil, water and air – several studies have tied the nation’s smog levels to nitrogen fertilizers.

When nitric oxides are released into the atmosphere, they undergo a series of photochemical reactions that transform them into harmful fine particulates, which in turn become smog.

Although it has just 7 per cent of the world’s farmland, the mainland consumes 35 per cent of its nitrogen fertilizers. But it has been difficult to persuade farmers to scale back their use.

Scientists claim to have made headway against the problem.

A team led by Professor Chu Chengcai at the Chinese Academy of Sciences’ Institute of Genetics and Developmental Biology in Beijing, claims to have boosted by more than a third, the rate at which the japonica variety can absorb nitride. The higher absorption was made possible by cloning a gene called NRT1 from Indica rice.

Their research was published in the latest issue of the journal Nature Genetics.

The transplantation of the nitric booster gene “had significantly improved grain yield and nitrogen use efficiency”, the team said, adding the discovery would have “enormous application value” in the fight against nitrogen pollution.

The breakthrough was hailed as “a great discovery” by an anonymous peer reviewer.

During a series of field experiments in Beijing, Shanghai and Changsha in Hunan province, the team found that the modified rice species needed only half as much fertiliser to achieve similarly high grain yields as regular japonica.

Indica belongs to the same family as japonica but is grown mostly in southern China as well as in tropical regions like Thailand and the Philippines, and in India.

Indica absorbs nitrogen more easily than its northern cousin. Yet its area of cultivation is limited because it cannot survive in northern China’s cold climate, despite this region serving as the country’s largest rice production centre. Moreover, Chinese consumers prefer the rich and sticky taste of japonica.

In their paper, the scientists said the discovery also represented an important milestone for the “green super rice project”, an international effort to develop new species of rice to meet the growing global demand for food resources.

(<http://www.scmp.com/tech/science-research/article/1820233/modified-rice-may-help-combat-chinas-smog-problem-chinese>)

4. China MoE urges int’l acceptance of gaokao exam

(The Pie News, 15-06-2015)

The Chinese Ministry of Education is calling for more foreign universities to accept the Chinese gaokao exam, after more than nine million students took the test this month.

The gaokao, which is sat by Chinese students wanting to pursue higher education, is taken over the course of two days, and plays a part in determining the students’ acceptance into a university.

According to Chinese news site Global Times, Yu Jihai, deputy director of the division of international education at China’s Ministry of Education said at a conference last month that they “are currently working on having foreign countries recognize the grades of China’s gaokao”.

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Some institutions around the world are accepting the gaokao test results in admissions, including almost 60% of Australian universities, as well as all universities in France.

Last month the University of San Francisco announced a pilot programme that will admit Chinese students based on their gaokao results and a face-to-face interview.

However, the results are not recognised universally.

Kim Morrison, CEO of Grok Education Services, said she has been working with foreign institutions for a year to help them understand what the results mean.

"It's not straightforward," she told The PIE News. "Because the gaokao results can vary based upon province for example, and even the scale of the results can be different."

She added: "And then how does an institution determine what results they should be using?"

Another advantage of universal gaokao usage, as cited by the University of San Francisco, is to cut down on study time for other admission exams.

"USF wants to give excellent Chinese students the opportunity to start their education in the USA, immediately – without spending an extra year preparing for IELTS, TOEFL or SAT test," it said in a statement.

"The preparation for the gaokao is so incredibly intensive, it's pretty hard for a student to prepare for more than one system," confirmed Morrison.

She went on to say that ideally, by taking just the gaokao, Chinese students would have an international credential that they can take to a foreign university. "That's the rationale."

(<http://thepienews.com/news/china-moe-urges-intl-acceptance-of-gaokao-exam/>)

5. University Teachers Encouraged to Launch Start-ups

(CAS, 09-06-2015)

In China, teachers in universities used to be forbidden to start businesses of their own unless they first quit their jobs. But now, in the latest measure to boost technology creation, Shanghai has been the first to lift the ban. University teachers can now establish start-ups while retaining their titles.

Gan Yong is a researcher in the Shanghai Institute of Materia Medica of the Chinese Academy of Sciences, China's top medicine research body. He registered a company in January to bring his research to the market. Now, he has ten percent shares of a pharmaceutical enterprise which develops medicines for cancer.

"Our job is to develop new medicines; it doesn't matter whether we do it in the institution or outside. As a matter of fact, the ultimate goal is to industrialize our technology and products, and benefit patients," Gan said.

While Gan works with the company, the institute will maintain the title and position of Gan's team, as long as they fulfill their research and teaching duties. Also being primarily a researcher, Gan has no plans to go into business. He will take the company through its start-up stage and hand it over to professional managers.

In the past, researchers like Gan Yong were restricted to working solely within their academic institutions, meaning they were unlikely to benefit personally from the fruits of their research. Perhaps more importantly, vital scientific findings and even breakthroughs would often stay in the lab for years, with no market incentive to release them to the outside world.

Establish a start-up, test it in the market and further enhance research. This is the mantra many research teams are now considering in Shanghai.

"We are showing our support by releasing the restrictions on creativity. We encourage teachers to retain their position, suspend salary and go found a business. Surveys have shown that in the past several years, the transfer rate of technology from research schools has been low, because teachers were not allowed to set up business," said Jiang Sixian, Party Secretary of Shanghai Jiao long University.

Universities in Shanghai are now working on detailed measures to ensure researchers have no trouble coming back to university by allowing them to return to their original positions, while keeping social security and contracts.

(http://english.cas.cn/newsroom/news/201506/t20150609_148334.shtml)

6. **China Focus: China's vocational institutions train 130 mln**

(Xinhua, 29-06-2015)

More than 130 million people have graduated from vocational schools and colleges in China since September 1996, according to a report from the top legislator on June 27th.

Zhang Dejiang, chairman of the National People's Congress (NPC) Standing Committee, told the bimonthly session of the legislature that vocational schools and colleges have become the main training ground for technical workers.

China has about 13,300 vocational schools and colleges, with 30 million students. In 2014, there were about 18 million students in secondary vocational schools, compared with 12.7 million in 1996. The number of students enrolled at vocational colleges stood at 10 million last year, compared to 1.23 million in 1996.

Along with the increasing number of students, investment in vocational education has expanded in the past 19 years. According to the report, annual spending rose from 114 billion yuan (then about 14.5 billion U.S. dollars) in 2006 to 345 billion yuan (about 57 billion U.S. dollars) in 2013, an increase of 17 percent per year.

A project initiated in 2009 to exempt some students at secondary vocational schools from tuition fees has benefited 34.6 million people. In the 19 years since the law on vocational schools and colleges was introduced, more than 200 million people have participated in evaluations of vocational skills, with about 160 million obtaining certificates.

Among those who earned certificates, about 1.47 million were as senior technicians, the most skilled workers, and some 6 million were as technicians.

Since 2006, vocational education in rural, poverty-stricken or ethnic minority areas has greatly improved. More than 40 million people from rural areas received vocational training in the past decade.

Training for the disabled was also included in the vocational education plan. In the northwestern province of Gansu alone, the government has set up 31 training centers for the group in the past five years, with 21,000 people having studied at the centers.

From March to May this year, Zhang led a team who held seminars with headmasters, teachers and human resources officials at about 70 institutions, training centers and enterprises on how to improve teaching, the first time the NPC Standing Committee had organized an event. Problems unearthed included unstable levels of investment and lack of experienced teachers.

Zhang said training skilled technicians did not only help young people secure better jobs, but also helped international competitiveness.

Vocational education is important to the "Made-in-China 2025" plan to reform the manufacturing sector and change the reputation of "Made-in-China" goods. Often dubbed the factory of the world, China earned the title at the expense of the environment, with many manufacturers describing their production processes as dull, dirty and dangerous. "Made-in-China 2025" lays out strategies for switching from low-end manufacturing to more value-added production, with domestic manufacturers expected to make technological breakthroughs in a number of emerging industries from numerical control tools and robotics to aerospace equipment and new energy vehicles.

(http://news.xinhuanet.com/english/2015-06/29/c_134366384.htm)

7. Geneticists reveal what makes great rice

(Nature, 06-07-2015)

Breeders in China have discovered the secret for creating rice varieties that could improve breakfast, lunch and dinner for millions of people in Asia. Two teams of molecular geneticists, working independently, have identified a gene that controls both shape and texture and can be selected for without sacrificing the yield of the crop.

“The implications are enormous,” says Susan McCouch, a rice geneticist at Cornell University in Ithaca, New York, who was not involved in either study. “The rice-breeding community has had this problem — they have been able to improve yield or quality, but almost never simultaneously.”

In Southeast Asia, where up to 76% of the caloric intake comes from rice, savvy shoppers know what to look for in the grain. Good rice is transparent; opaque spots indicate a disagreeable chalky taste. And for many, the best rice has long, slender grains. “This shape is associated with quality,” says Xiangdong Fu, a geneticist at the Chinese Academy of Sciences in Beijing and the senior author of one of the studies¹.

Consumers will pay so much more for quality that breeders in some countries have been prepared to sacrifice yield to create elite varieties. A grain-improving gene in an Indian favourite, Basmati, comes with a 14% decrease in yield. But Chinese farmers will often accept lower quality to keep yields high.

Two papers published on 6 July in Nature Genetics^{1, 2} identify a gene that is associated both with long, slender shape and with reduced chalkiness — and can be bred into rice lines with little or no cost in terms of yield.

The gene can induce radical changes in shape by promoting longitudinal cell division over transverse cell division. The more copies of a particular version — or allele — of the gene that a variety has, the longer the grain. The gene is dominant, which makes it useful for creating hybrid varieties. A neighboring gene, which codes for a protein involved in transcribing DNA into RNA, represses the effect but can be disabled.

The real heroes in the story are the breeders, says McCouch. The gene, known as both GL7 and GW7, is highly expressed in two US varieties, as well as in a new Chinese line called TaifengA. “The breeders have already accomplished this; they don’t need these people doing the molecular genetics.”

But now that the miracle gene has been identified, it can be manipulated with advanced tools. “There are already some varieties that exist in the Chinese market that contain these alleles,” says Guosheng Xiong at the Chinese Academy of Agricultural Sciences in Shenzhen and an author of one of the papers. “But with this knowledge, we can introduce it to some varieties that have good taste and cooking qualities but don’t look good.”

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Other staple foods are roughly the same throughout the world, but preferences for rice size, shape and flavour vary widely from country to country. The Japanese famously like their rice short, fat and sticky, which explains why their breeders have bred out a second copy of GL7 in a variety introduced from the Americas.

But irrespective of local preference, hardly anyone likes chalkiness. Chalky rice also breaks easily, reducing the value of a crop and the amount of money that a farmer can earn in a year.

In whatever line it is included, the gene will improve the look and taste of bulk Chinese rice. "It will be much more beautiful and better tasting," says Fu. And that is no small accomplishment for a country where many eat rice three meals a day, according to McCouch. "It will bring pleasure to some of the world's poorest people," she says.

(<http://www.nature.com/news/geneticists-reveal-what-makes-great-rice-1.17918>)

(Collaborating Opportunities)

The China Hardware Innovation Camp (CHIC)

Date: July

Place: Shenzhen

Contact: Swissnex China

Venture Leaders China

Date: October 20 – 30

Place: Beijing, Shanghai, Shenzhen

Contact: swissnex China

All Swiss University Alumni Gathering

Date: October

Place: Beijing, Shanghai

Contact: swissnex China