ANALYSIS

On 1 October 2010, the 61st National Day of the People’s Republic of China, the unmanned lunar probe Chang'e II was launched successfully. This is China’s first spacecraft to be boosted directly into an Earth-Moon transfer orbit and marks another big step towards the realisation of China’s space development strategy. It is also regarded as an exciting present to the country and its people on their special day.

Another important move by the Chinese Government to prepare the nation for the next decade of rapid strategic development is the release of the State Council statement on promoting seven prioritised emerging industries with strategic importance. The statement makes it clear that China is open to international exchanges and collaboration in relevant fields and is keen to explore foreign markets as well.

More details on both developments are inside this edition.
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China outlines roadmap in developing emerging industries of strategic importance


08/09/2010

The Chinese cabinet, the State Council, issued a statement on 8 September, stressing the importance of stepping up efforts to develop emerging industries of strategic importance, and prioritising seven areas: energy saving and environmental protection, new generation information technology, biology, high-end equipment manufacturing, new energy, new materials and new energy vehicles.

The Chinese Government will pilot the development of these industries by “building industrial standards and creating a sound market environment”, according to the State Council’s statement. China will also support products from the identified industries to enter the international market. A development plan and catalogue of guidance on developing the industries will be formulated in a bid to optimise regional distribution and facilitate coordinated development.

Comments:
The original Chinese version of the state council report elaborates on the seven prioritised areas. The following translation is for reference only. The original Chinese version is at: [http://www.gov.cn/zwgk/2010-10/18/content_1724848.htm](http://www.gov.cn/zwgk/2010-10/18/content_1724848.htm):

- **Energy-saving environmental protection industry**
  Focus on development and promotion of energy efficient technology, equipment and products; speed up R&D and industrialisation of key common technologies in resource recycling; improve resource utilisation and re-manufacturing industry; promote market-oriented energy-saving environmental protection services system; accelerate the development of advanced technology to support the recycling of waste products and actively promote the use of clean coal; and develop the comprehensive utilisation of seawater.

- **New generation of information technology industries**
  Accelerate the construction of broadband, integrated, secure information network infrastructure; promote R&D and industrialisation of the next generation of mobile communication, internet core equipment and intelligent terminals; speed up the integration of telecommunications networks, cable TV networks and the internet; promote R&D and demonstration applications of internet and cloud computing; further develop integrated circuits, new displays, advanced software, high-end servers and other core infrastructure industries; improve information service capacity including software services and network value-added services; accelerate intelligent transformation of critical infrastructure; and develop digital virtual technology and promote cultural creative industries.

- **Biotechnology industry**
  Develop innovative drugs, including biotech drugs for prevention and treatment of major diseases, new vaccines and diagnostic reagents, chemicals drugs and modern Chinese medicine; speed up R&D and industrialisation (especially large-scale production) of biomedical engineering products, such as advanced medical equipment and medical materials; cultivate bio-breeding industry, actively promote green agricultural bio-products, and promote accelerated development of bio-agriculture; promote R&D, demonstration and application of key bio-manufacturing technologies; speed up R&D and industrialisation of marine bio-technologies and products.
- **High-end equipment manufacturing industry**  
  Focus on developing route and regional aircraft as well as general aviation aircraft; actively promote space infrastructure construction and development of satellites and their application; develop rail transportation equipment by relying on passenger line and urban rail; develop marine engineering equipment for exploring marine resources.

- **New energy industries**  
  Actively develop the next generation of advanced nuclear technology and reactors; speed up the popularisation and application of solar thermal technology and explore the diversified solar photovoltaic/thermal power generation market; improve wind power technology and equipment and speed up construction of a new smart grid that adapts to the development needs of new energy; develop and utilise biomass energy.

- **New materials industries**  
  Further develop new functional materials, especially rare-earth functional materials, high performance membrane materials, special glass, functional ceramics and semiconductor lighting materials; develop advanced structural materials, especially high-quality special steel, new alloy materials and engineering plastics; enhance the development of high-performance fibres and composites, especially carbon fibre, aramid fibre and UHMWPE fibre; carry out research on common basic materials.

- **New energy automotive industry**  
  Focus on core technology breakthrough in batteries, drive motors and electronic control; promote application and industrialisation of plug-in hybrid electric vehicles and pure electric vehicles; carry out cutting-edge technology R&D relating to fuel cell vehicles, and vigorously promote low-emission fuel-efficient vehicles.

The statement also emphasised the importance of enhancing international collaboration and exchanges in these seven prioritised areas. Translation of the original statement is:

**Vigorously promote international technological cooperation and exchanges**

- Promote multi-level, multi-channel international technological cooperation and exchanges via various cooperation mechanisms;
- Encourage foreign enterprises and research institutions to establish R&D institutions in China; support qualified foreign-invested enterprises and domestic enterprises, research institutions to apply for national research projects;
- Support China's enterprises and research institutions to actively do global R&D service outsourcing, carry out joint R&D overseas, establish joint R&D institutions overseas and to apply for patents abroad; and
- Encourage China's enterprises and research institutions to participate in the development of international standards; encourage foreign-invested enterprises to participate in China's technology demonstration projects, jointly developing international standards.

More detailed industry planning for the seven key areas is to be further promulgated by the Chinese Government.
China pushes for energy cooperation and innovation

China will adopt a more open attitude toward international science and technology cooperation and exchanges in energy conservation and emissions reduction, Vice Minister of Science and Technology Zhang Laiwu told the media on 16 September. "We plan to work with other countries to establish a global technological cooperative platform for energy, resources and environment", said Vice Minister Zhang.

Official figures released on Thursday show that the Chinese Government has allocated more than 10 billion RMB (A$1.52 billion) to research and development on energy conservation and emissions reduction technologies during the 11th Five-Year Plan (2006-2010).

Comments:
"China will invest 5 trillion RMB (A$760 billion) in renewable energy projects over the next decade under an industry development plan, China Securities Journal reported in early August, citing the State Information Centre. The Chinese government’s support for more active international S&T collaboration in energy, resources and environment, creates collaboration opportunities for key foreign partners, including Australia, which has strong research and innovative capacities in the identified areas."

China welcomes international collaboration in energy technology research and transfer

At the China (Taiyuan) International Energy Industry Expo, held on 16-18 September in Shanxi, Vice Minister of Science and Technology Li Xueyong said new energy industries will be a focal point for development in the next five years.

To seek an energy-efficient and environmentally friendly path for economic growth was a "pressing" task for the country, Gao Hucheng, Vice Minister of Commerce said. "There is no land boundary in terms of low-carbon and green technology," Gao said, expressing hope for more international cooperation in this field.

Comments:
The newspaper, Science and Technology Daily, ran a report in Chinese about Vice Minister Li’s speech. He stressed six major tasks that China faces in the next five-year period in developing energy-related science and technology. (The translation below is for reference only). The original Chinese version is at: [http://www.stdaily.com/kjrb/content/2010-09/18/content_231252.htm](http://www.stdaily.com/kjrb/content/2010-09/18/content_231252.htm)

- To develop energy conservation and energy efficiency technologies;
- To strengthen the production of clean coal technology;
- To develop wind, solar, biomass and other renewable energy, and to promote the restructuring of the energy industry;
- To accelerate the construction of the smart grid and to guarantee reliable and efficient operation;
- To accelerate the development of nuclear technology and to provide safe and reliable low-carbon energy for future; and
- To continue strengthening the construction of new-energy vehicles, as well as the clean production, ecological construction and industrialisation of low-carbon energy.

Vice Minister Li stressed the importance of further enhancing China’s international S&T collaboration in this field. In the next five years, China will continue to carry out extensive S&T cooperation with key foreign partners in fields including energy-saving, new energy and renewable energy.
China strives for more space technologies
20/09/2010

At a meeting held to celebrate the 30th anniversary of the establishment of the Special Committee for Spacecraft Measuring and Control, part of the Chinese Society of Aeronautics, it was reported that China will strive to master six key technologies concerning space based measuring and control, high speed data transmission, and high precision measurement in the next 20 years:

1) China will build up its space based measuring and control capability, in an effort to reduce the cost of land based navigation, shifting its focus from land based navigation to high altitude and deep space missions. Chinese scientists will work on space based internet technology on an experimental basis, getting prepared for establishing an integrated information network linking the earth and space, and for manned deep space probe activities, allowing astronauts to work in orbit for an extended time;

2) China will enhance its efforts to develop high speed data transmission technologies, in an attempt to improve its earth-space communication capability. Chinese scientists will also work on applicable relay technologies for moon and space probe activities, seeking an economic and efficient solution for high speed transmission between the earth and space.

3) China will strive for breakthroughs in high precision measurement techniques, realising precision orbiting and positioning, and meeting the high precision needs for lower and middle orbit satellite positioning at a millimeter level, geosynchronous satellite positioning at a 10-meter level, and precision landing/docking/celestial body surface navigation in deep space probe activities.

4) China will improve its space debris monitoring technologies, and associated prewarning capability. In the next 5 to 10 years, the space objects and debris that can be cataloged will exceed 20,000 in number, a noticeable threat to China’s space assets. In this context, Chinese scientists will enhance their efforts to identify, and catalog the properties of, space debris.

5) China will develop efficient management techniques, enhancing the efficiency of its control system. China will build a capable management system for large scale resources planning and management, multiple target control, quick space response, and failure handling, in an effort to deal with the booming number of in-orbit spacecraft and requirements for multiple-satellite measurement and control.

6) China will develop and apply integrated information technologies, raising the overall capability of its control system. Chinese scientists will establish a new and flexible measuring and control information systems, featuring an open structure, information sharing, and resources realignment, meeting the increasing measuring and control needs in the future.

Comments
As China steadily progresses in its key space programs, space-based measuring and control technologies have become more and more critical in supporting the implementation of China’s aerospace development strategy. China has been exploring international markets in this area, seeking to export relevant equipment and expertise.
Joint scientific research lauded

Cao Jianlin, Vice-Minister of Science and Technology, said on 8 September at the 21st Century Forum that the Chinese Government is open to other countries in efforts to build an innovative country, and looks forward to more international cooperation in R&D. "Open innovation is an important step for basic research to better guide and serve sustainable development," he said, adding that globalisation has provided an opportunity for countries to jointly conduct research.

"The future of innovation actually relies heavily on international cooperation," said Wang Longde, a member of the Standing Committee of the National People's Congress. He said China needs to build long-term mechanisms to boost joint R&D among different countries.

Comments:
This is another strong message from the Chinese Government to boost international collaboration in research and innovation to ensure the sustainable development of the country.

China to double science communicators by 2020

China will double its number of science communicators to 4 million by 2020, according to the Chinese Association for Science and Technology (CAST). CAST will train and support professional communicators to work in rural areas and museums. It also hopes to boost the number of advanced professionals in science writing, research and development and science industry management, as outlined in the 2010–2020 China's Popular Science Talent Plan', issued in late July by CAST.

According to CAST's press release, there is a shortage of science communicators, or 'science popularisation professionals', in China, especially in rural areas. According to CAST, the Chinese Government will invest RMB 300 million (AS$46 million) this year to reward excellent science communication groups and individuals in rural areas, and special attention will be given to those facilitating low-carbon agriculture and modern agricultural knowledge.

Comments:
Like Australia, China is now turning more attention to science popularisation, as the country strives to build itself into an innovation power. According to CAST’s plan on science communicator development (2010-2020), China faces the following challenges that constrains the development of science:
- Insufficient number of full-time science popularisation professionals, with poor general quality;
- Instability of part-time science popularisation workforce;
- Shortage of grassroots science communicators;
- Shortage of high-quality science talent in the areas of popular science writing and design, science research and development, science media, science industry, science planning and organization; and
- Problems in selection, training and appointment of science popularisation personnel

Therefore, CAST decided to implement a science communicator development plan, as elaborated in the 2010-2020 Plan, which covers rural areas, urban communities and enterprises. It also plans to promote the development of youth S&T counsellors, volunteers and high-quality professionals.
**FEATURE STORY**

**Chang’e II, China’s new Lunar probe**


10/10/2010


10/10/2010


10/10/2010

China launched Chang’e II, its second Lunar satellite, at 18:59:57 on 1 October 2010 aboard a Long March (CZ) III-C rocket from the Xichang Satellite Launch Center in Sichuan Province. The satellite made a successful separation from the rocket, and entered the Earth-Moon transfer orbit as planned. A solar energetic particle detector aboard the satellite was put into operation at 20:37 on 2 October 2, the first of the seven scientific instruments aboard the satellite to begin operation. Two more onboard scientific instruments, the γ-ray spectrometer and solar wind ion detector, started on 4 October. At 07:00 on 5 October, Chang’e II sent back the first 1.6 GBytes of scientific data. Scientists said the data so far received are in line with the anticipated results.

**Comments:**

*This is China’s first spacecraft to be boosted directly into an Earth-Moon transfer orbit, rather than requiring a parking orbit phase. This reduced total travel time to the Moon to 5 days, a significant reduction from the 12 days required by Chang’e I in 2007. In addition to its scientific studies, the Chang’e II mission will provide data in support of the Chang’e III mission planned for 2013, which will include a Lunar lander and rover.*

After a 112 hour flight, the satellite was instructed to make a near Moon brake on 6 October, allowing it to be positioned at a perilune of 100km, in a 12 hour elliptical Lunar orbit. Two more perilune brakes put the satellite into a 100km lunar polar orbit. After a range of in-orbit tests and corrections, Chang’e II entered a 100 km × 15 km elliptical orbit, taking pictures of candidate landing areas in the Sinus Iridium selected for the Chang’e III mission, and testing a range of techniques, including quick orbit measuring techniques. The satellite will return to the 100-km orbit after a day or two, to continue its Lunar study mission.

Scientists who have been operating Chang’e II told reporters on 3 October that they have achieved several technological breakthroughs in monitoring and tracking the new satellite:

1) X-band was employed for the first time. China has mastered high-precision large antenna control, large antenna performance testing and calibration, and antenna reflector adjustment, and rolled out X-band ground monitoring equipment that can be used for this and follow-up missions.

2) Scientists performed a test to understand the impact of Lunar noise on satellite monitoring and tracking, and to verify the accuracy and validity of the satellite-ground link.

3) New coding techniques, low-density parity-check codes (LDPC), were employed in the lunar mission. The Chinese made LDPC codec has passed ground tests, with its functions and performance meeting the desired technical indicators.

4) DOR-based very long baseline interferometry was tested during the lunar missions. The Chang’e III satellite and follow-up missions will be measured and tracked using the new international standards.
**FEATURED REGION**

Qingdao: high-tech sector finds profit in innovation

http://www.chinadaily.com.cn/cndy/2010-09/15/content_11303291.htm
15/09/2010

As a national pilot city for technological innovation, Qingdao should be at the forefront, leading the nation in innovation that serves as a powerful engine in economic development, said Liu Mingjun, Director of the city's Development and Reform Commission. "Innovation will be the greatest power for Qingdao to blossom again." said Liu. "We will … build Qingdao into an innovation-oriented city in the next five years."

The coastal city's high-tech sector generated more than RMB 440 billion (A$67 billion) in industrial output last year, accounting for 46.5 percent of Qingdao's total. The value of industrial products with proprietary intellectual property surpassed RMB 150 billion (A$22.8 billion). The annual average number of new products in the city is about 4,000, more than half of which have proprietary intellectual property. The high-tech sector produced RMB 249 billion (A$37.9 billion) in industrial output in the first half of this year, up nearly 28 percent year on year. More than 2,900 patents have been granted during the same period, an increase of 50.8 percent year-on-year.

Local authorities plan to give full support to high-tech projects in 10 fields, with 12 technological industrialisation centres planned. The 10 fields to be supported include:

- e-communication,
- modern services,
- advanced equipment manufacturing,
- new materials,
- renewable energy,
- biotech,
- modern agriculture,
- environmental protection,
- transport, and
- comprehensive utilisation of resources.

In the next five years Qingdao's administrators will spend more than RMB 10 billion (A$1.5 billion) to enable greater research and development. In addition to government aid, other financing means will be explored, including special funds for small and mid-size businesses, new investment funds and venture capital, and cooperating with banks on tech projects.
FEATURED EVENT

Australia-China Young Scientists Exchange Program (YSEP)
29/10/2010

The Australia China Young Scientist Exchange Program (YSEP) targets mid-career researchers who have shown both technical expertise and leadership potential in science and technology. It gives participants exposure to higher-order issues outside their scientific and technical specialty, such as science and technology policy and best practice research management.

The Australian Department of Innovation, Industry, Science and Research (DIISR) and the Chinese Ministry of Science and Technology (MOST) have provided matching funds to support this program which builds upon and progresses future science and research collaboration between Australia and China. The Australian Academy of Technological Sciences and Engineering (ATSE) manages the Australian end of the program for DIISR.

Since 2006, there have been 6 exchanges, 3 hosted by Australia and 3 hosted by China. These two-way exchanges have seen a total of 45 Australian and Chinese researchers experience high level access to the top scientists and institutions in each country, providing an excellent foundation for future collaboration between Australia and China.

To date, the program has fostered the establishment of two joint Australia-China Centres, as well as generating a significant number of published papers and regular student and postdoctoral exchange.

In the most recent round of the exchange program, in September 2010, eight Australian Researchers spent two weeks in China, visiting Research Institutes and Universities. A report on the round is at:
UPDATES ON KEY AREAS

Biotech (including health, medicine and TCM)

Genetic mutation found in non-smoking patients
30/09/2010

Researchers at the Chinese Academy of Sciences and Fudan University Tumor Hospital found genetic mutations in tumor samples from non-smoking lung cancer patients, taking advantage of a high-quality lung cancer sample database. The finding is the first report in the world of cancer-causing genetic mutation in non-smoking lung cancer patients, which creates a theoretical basis and guidance for individualised lung cancer treatments.

Newly developed anti-cancer drug
20/09/2010

Researchers at the Chinese Academy of Medical Sciences Tumor Hospital announced recently that they have finished phase III clinical trials of Icotinib Hydrochloride, a novel proprietary anti-cancer drug targeting small molecules. Clinical trials show that the new drug is effective on non-small-cell lung cancers in an advanced stage.

Largest PBmice Database in World
10/09/2010

Institute of Developmental Biology and Medicine of Fudan University established an integrated database system for piggyBac (PB) insertional mutations and associated characterisations in mice, containing more than 5,000 PB insertions, or 20% of the mouse genome. The scale the database has so far reached is equivalent to the total PB insertions collected by the world biomedical community in the past 20 years, making it the largest of its kind in the world.

Unique research laboratory established between Brisbane and Beijing
23/09/2010

The Queensland Brain Institute has opened the first joint neuroscience research laboratory between Australia and China. The lab, which will be dedicated to researching brain disorders, is a joint project with the Institute of Biophysics (IBP) under the Chinese Academy of Sciences (CAS), based in Beijing.
Energy

Sustainable aviation biofuel lab
10/09/2010

A sustainable aviation biofuel laboratory, jointly established by CAS Qingdao Institute of
Bioenergy and Bioprocess Technology and Boeing (China), was officially inaugurated on
2 September 2010. The new lab is designed to speed up commercial applications of sustainable
aviation biofuels, supporting Boeing’s sustainable aviation biofuels strategy and the needs of the
aviation industry. It focuses on developing algae plantation, reaping, and processing related
technologies and techniques, and associated commercial applications.

Environment (including Water)

Real-time observing system for South China Sea
20/09/2010

Chinese scientists recently put an optical marine observing system into operation in the northern
part of the South China Sea, a follow-up system to the buoy based observing network built by
them last year near Yongxin Island.

Mining

Chinese scientist honoured for work in mineral processing
10/09/2010

Professor Wang Dianzuo, 76, a member of both the Chinese Academy of Engineering (CAE)
and the Chinese Academy of Sciences (CAS), was given the Lifetime Achievement Award by
the International Mineral Processing Congress (IMPC) on 8 September, the first time a Chinese
scientist has been given the honour. He shared the honor with an Austrian scientist Alban Lynch.

Space

Sounding rocket assembly test completed
CAS: http://english.cas.cn/ST/HT/ht_progress/201009/t20100925_59235.shtml
25/09/2010

After 21 days of final preparation, sounding rocket assembly testing for the Meridian Project was
completed in Xi’an on 16 September 2010.
Water on Moon is bad news for China's lunar telescope
Moon Daily:
http://www.moondaily.com/reports/Water_on_Moon_is_bad_news_for_China’s_lunar_telescope_999.html
21/09/2010

The recent discovery of a watery dew covering parts of the Moon has important ramifications for China's third lunar probe, Chang'e III, which is to land on the Moon in 2013 with an ultraviolet telescope aboard. The equipment would be powered by solar panels.

In sunlight, water vaporises and is broken down into molecules of hydroxyl, a compound comprising one atom of hydrogen and one oxygen. "At certain ultraviolet wavelengths, hydroxyl molecules cause a particular kind of scattering, where photons are absorbed and rapidly re-emitted," said Zhao Hua of the Chinese Academy of Sciences. "Our calculations suggest that this scattering will contaminate observations by sunlit telescopes."

Marine

World’s first land cover map for South Pole
30/09/2010

Chinese scientists successfully produced a land cover map at a scale of 1:100,000 for the South Pole, the first of its kind in the world. The map shows important scientific data collected by Chinese scientists from Antarctica.

Modern polar expedition fleet
30/09/2010

China plans to build a new ice breaker for polar expedition activities in 2011, to join the current Xuelong ("Snow Dragon") polar scientific research vessel.

China plans to build 4th Antarctic research station
26/09/2010

According to the State Oceanic Administration, China will build its 4th South Pole research station in 5 to 15 years.
Other Fields of Science

Low-dose, simple, and fast X-Ray imaging
20/09/2010

In collaboration with an imaging team at the National Synchrotron Radiation Lab in Hefei, researchers at the University of Science and Technology of China achieved a major breakthrough in X-ray phase-contrast imaging, making it a faster, more sensitive, and safer X-ray phase-contrast imaging CT technology. The finding was published in the recent issue of *PNAS*.

ITER's superconductor program completed
Chinese Academy of Sciences: [http://english.cas.cn/Ne/CASE/201009/t20100928_59417.shtml](http://english.cas.cn/Ne/CASE/201009/t20100928_59417.shtml)
28/09/2010

A superconductor production line has been put into operation in the International Thermonuclear Experimental Reactor (ITER) research centre, which is being set up in Hefei (Anhui province) by seven countries including China and the US. The 1000-meter-long production line is capable of making superconductors which are used in tokamaks.

Facility to test new light source
Shanghai Daily: [http://www.shanghaidaily.com/article/?id=449206&type=Metro#ixzz0zSopunDV](http://www.shanghaidaily.com/article/?id=449206&type=Metro#ixzz0zSopunDV)
14/09/2010

The Chinese Academy of Sciences announced that Shanghai will begin construction of a testing facility for 4th generation light sources that can create super X-rays are able to expose the atomic structure of complicated chemical compounds and proteins.

Chinese scientists realise long-range quantum teleportation in free space
01/09/2010

The USTC (University of Science and Technology of China)-Tsinghua University joint team has successfully realised 16-kilometre long-range quantum teleportation, over 20 times the previous world record. This result demonstrated for the first time the feasibility of long-range quantum teleportation in free space, thereby accomplishing a major step toward the eventual realisation of a global quantum communication network.
**Discovery of the isostructural phase transition in a cubic perovskite**


01/09/2010

A CAS research group from the Institute of Geochemistry announced the discovery at the Beijing Synchrotron Radiation Facility that pressure can induce isostructural phase transition in a perovskite material, PbCrO3. This cubic-cubic phase transition involved a volume collapse of 9.8%, the first time such an effect has been detected in a cubic perovskite.

**Chinese International S&T Cooperation**

**China-EU joint remote sensing training**


20/09/2010

An advanced land-based remote sensing training course, co-sponsored by the China National Remote Sensing Centre and the European Space Agency under a China-EU “Dragon” S&T cooperation program, opened recently in Lanzhou, capital city of Gansu province. The training was designed to let young remote sensing personnel from research institutes and universities in China’s west to become familiar with the latest remote sensing techniques developed by Chinese and European researchers.

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