THE HONG KONG 香港理工大學

exploration history

Professor Yung Kai-leung, from the Department of Industrial and Systems Engineering, together with researchers from the Industrial Centre, collaborated with dentist, Dr Ng Tze Chuen and adopted the concept of dental forceps to develop the "Space Holinser Forceps System", were ordered four sets by the Russian Space Agency for use by astronauts in precision soldering at the former MIR Space Station.





2005

Developed by PolyU in 1997, the "Mars Rock Corer" was used for the Mars Express Mission's the Beagle 2 Lander in 2003.

Mars Surveillance Camera

In collaboration with China Academy of Space Technology (CAST), The Hong Kong Polytechnic University (PolyU) has successfully developed and manufactured the "Mars Landing Surveillance Camera" ("Mars Camera") in Hong Kong, one of the key instruments onboard the Mars spacecraft of the Nation's first Mars mission Tianwen-1.

The spacecraft for the Mars probe comprises an orbiter, a lander and a rover, aiming to complete orbiting, landing and roving in one single mission, an unprecedented attempt globally, as well as to obtain scientific exploration data on the Red Planet. Located on the outside top surface of the Mars lander platform, the Mars Camera monitored the landing status and deployment of the rover 'Zhurong' with respect to the unfolding of solar panels and status of the antennae. The information is critical for the successful movement of the Mars Rover onto the Mars surface.

The Mars Camera is lightweight (around 390g) yet strong and durable enough to withstand the extreme temperature differences of about 150 degrees Celsius experienced during the nine-month journey between Earth and Mars, followed by operation under the extremely low temperatures on the Mars surface. As this Mars Camera is designed for the lander, it also has to withstand huge impact shock of 6,200G (i.e. 6,200 times the force of Earth's gravity). Despite

having a wide-angle field of view (a maximum of 120 degrees horizontally and a maximum of 120 degrees vertically), the Mars Camera has low image distortion.

Principal Investigator IR PROF. KAI LEUNG YUNG

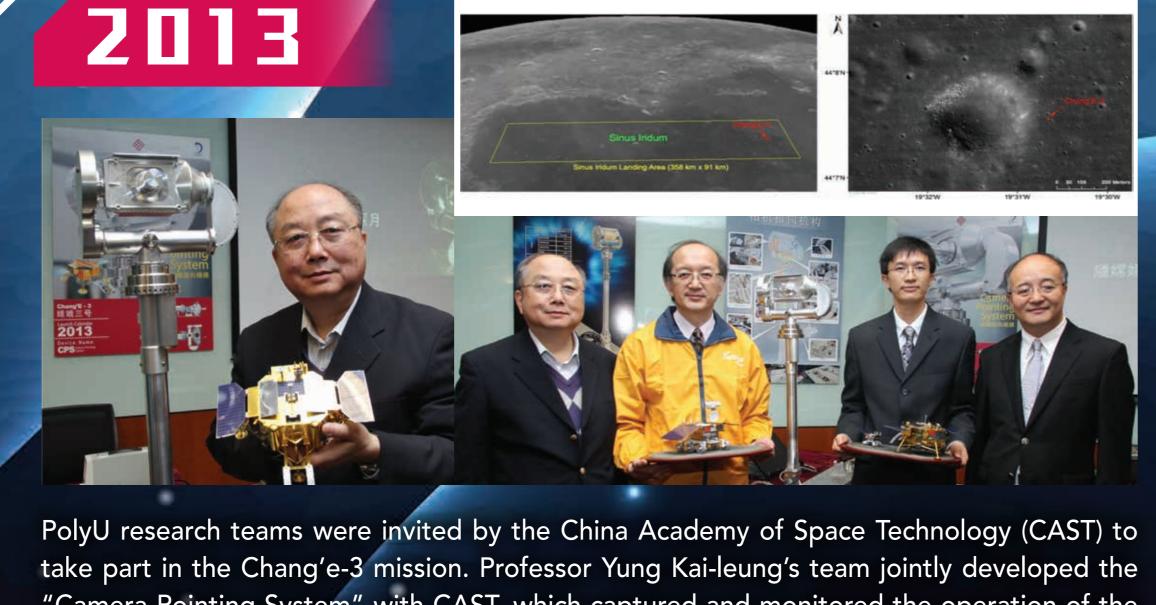
Sir Sze-yuen Chung Professor in Precision Engineering, Director of Research Centre for Deep Space Explorations, Chair Professor of Precision Engineering and Associate Head of Department of Industrial & Systems Engineering

POLYTECHNIC UNIVERSITY



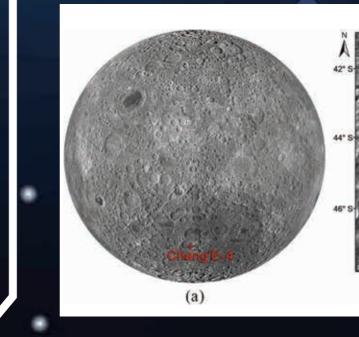
Phobos-Grunt Mission, to collect so samples from the Martian moon Phobos.

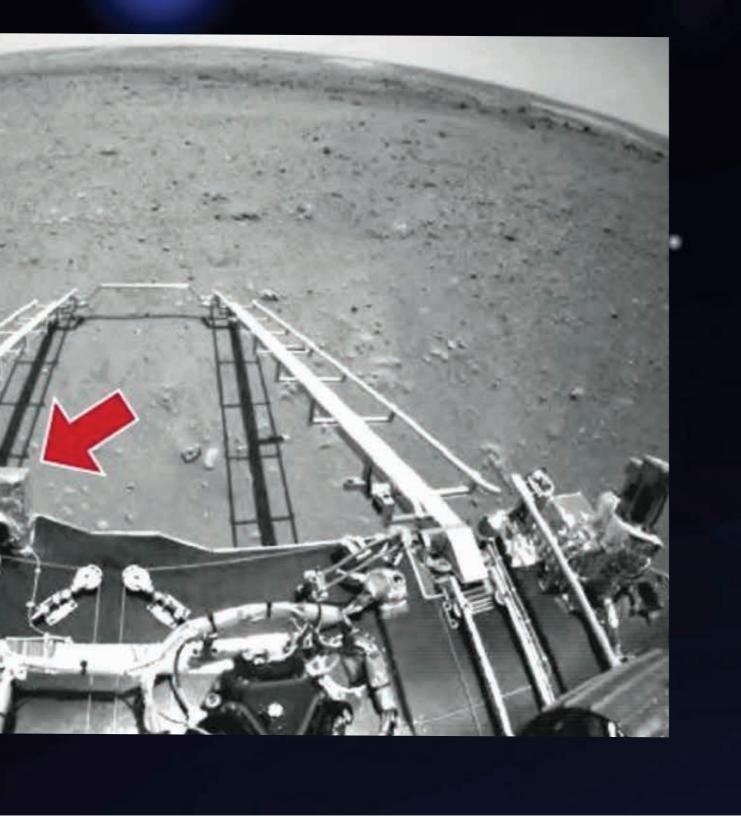
PolyU developed the "microsatellite platform and deployment system" with Aerospace Dongfanghong Development Ltd Shenzhen, for Long March-6's "20 satellites in one rocket" mission he instrument was installed in the "Kaituo-1B" microsatellite.

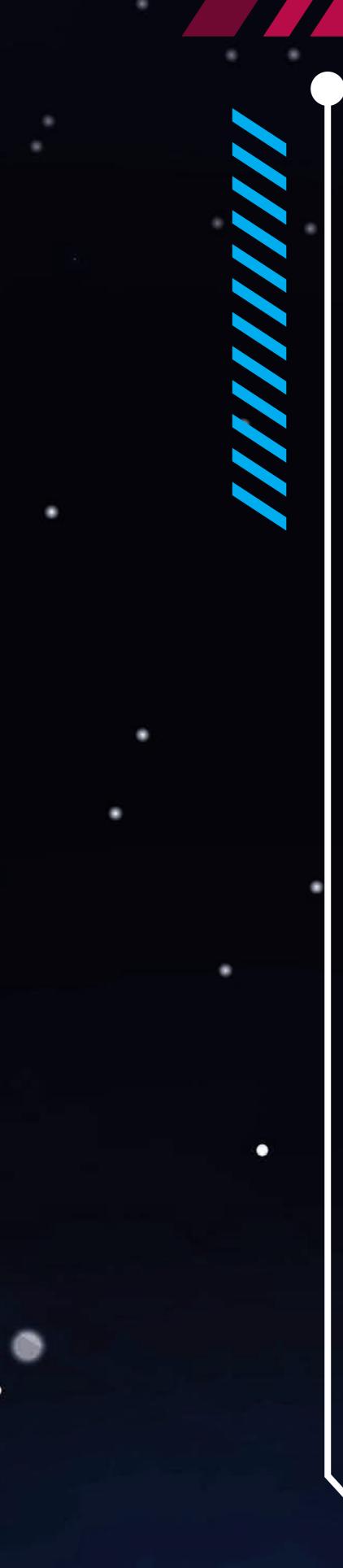


"Camera Pointing System" with CAST, which captured and monitored the operation of the lunar rover "Yutu" and taking images of the moon. Meanwhile, Professor Wu Bo's team worked on the topographic 3D mapping model and analysis of the landing site.

2019

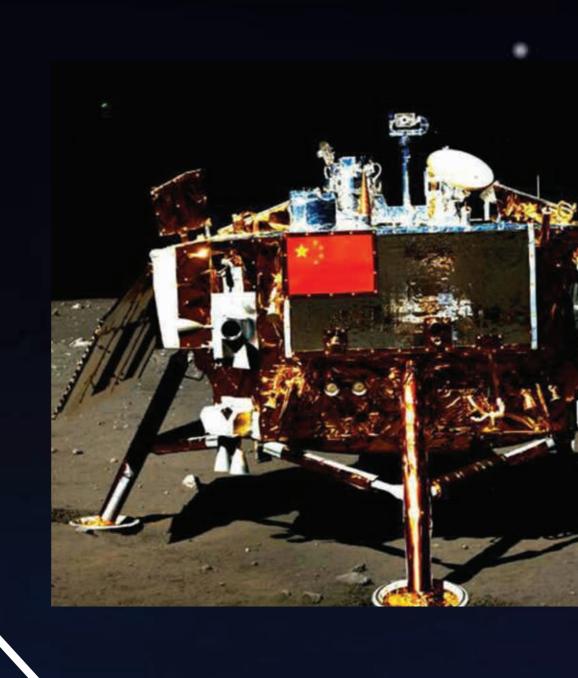






The "Camera Pointing System" which jointly developed by The Hong Kong Polytechnic University (PolyU) and China Academy of Space Technology (CAST) and manufactured in Hong Kong, was the Hong Kong's first developed and manufactured space instrument adopted by National Lunar Exploration Program and applied in Chang'e-3 and Chang'e-4 mission, and the Nation made history with the first soft landing on the far side of the Moon with the success of the Chang'e-4 mission.

The Camera Pointing System (CPS) measures 85 cm height by 27 cm width by 16 cm depth and weighs 2.8 kg. Mounted on the upper part of the lander of Chang'e-3 & Cheng'e-4 and capable of moving vertically by 120 degree and rotating sideway by 350 degrees, it is deployed for capturing panorama images of the moon landscape as well as movement of the lunar rover 'Yutu' and 'Yutu-2'. Upon the release of the lunar rover, the CPS started working together with other parts of the lander for in-situ lunar exploration.



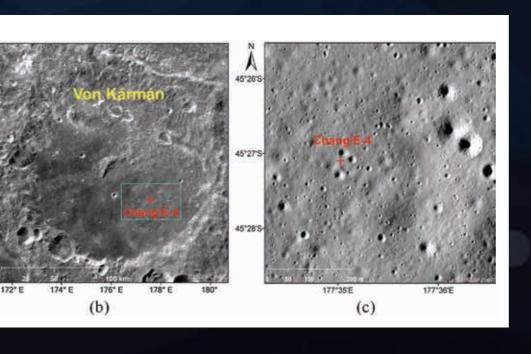
Research Centre for Deep Space Explorations 深空探测研究中心



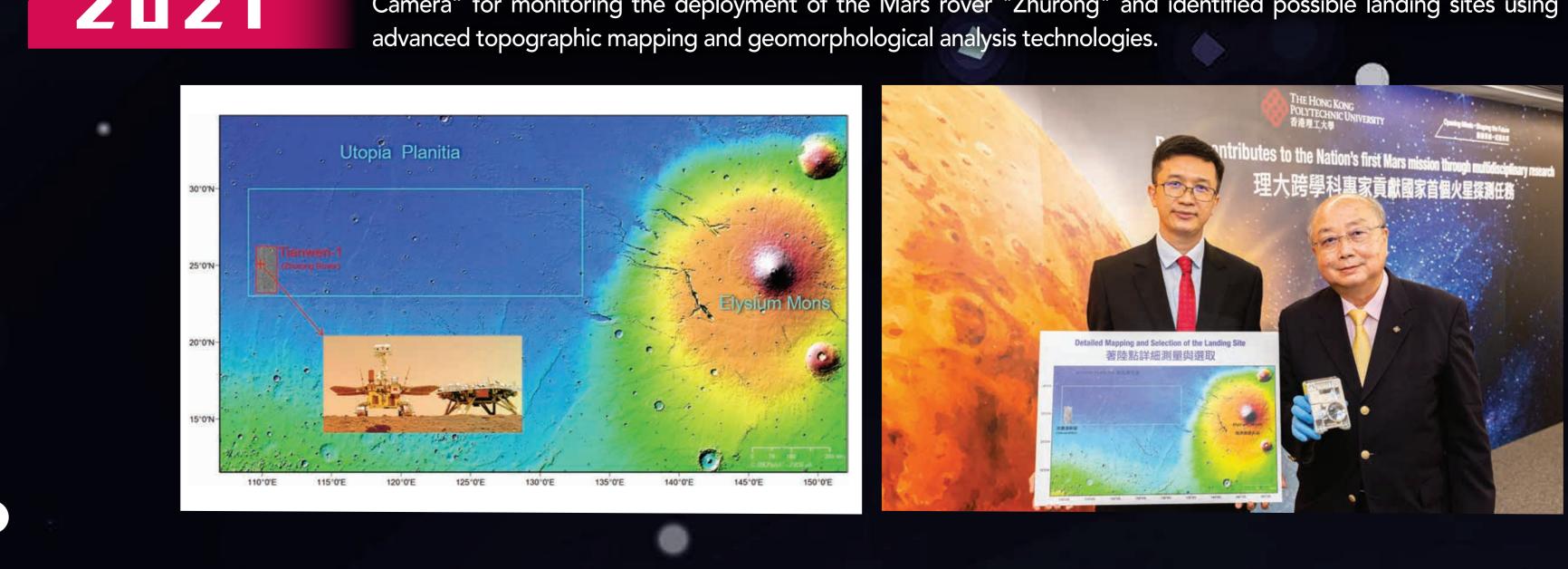
REDSE

In collaboration with CAST, PolyU Prof. Yung's team developed and manufactured the "Surface Sampling and Packing System" for the Nation's Chang'e-5 mission, the world's first fully automated multi-point lunar surface sampling and packaging. The system automatically collected and packed approximately 1.5 kilograms of surface lunar soil samples and returned back to Earth. PolyL Professor Wu Bo's team helped select the landing site through topographic and geomorphological characterisation and analysis.

The Nation made history with the first soft landing on the far side of the Moon with the success of the Chang'e-4 mission, and captured and monitored the operation of the lunar rover "Yutu-2" and taking images of the moon by "Camera Pointing System". PolyU Professor Wu Bo's team helped select the landing site through topographic and geomorphological characterisation and analysis.







Camera Pointing System





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The "Lunar Surface Sampling and Packing System" was developed and manufactured by The Hong Kong Polytechnic University (PolyU) in collaboration with the China Academy of Space Technology (CAST) for the Nation's first lunar sample-return mission – 'Chang'e-5' and first lunar sample-return mission from the far side of the Moon in human history – 'Chang'e-6'. Unlike previous methods adopted by other countries involving drilling or manual excavation, this system designed as fully automated multi-point lunar surface sampling and with a packaging mechanism.

The PolyU-designed and made in Hong Kong system includes two samplers for collecting loose and sticky lunar soil, along with two high-temperature near-field cameras to capture samples from multiple points on the lunar surface. The automatic vision guidance ensures accurate sampling, deposition, and placement into the ascender. Additionally, a primary sealing and packaging system, consisting of a sample container and sealing mechanism, is employed.

Once the sampling is complete, the sealing and packaging device securely seals the container. The sampler, guided by the near-field cameras, then inserts the sealed container into the ascender for transportation back to Earth.





After Chang'e 5 mission, on 3 May, the Chang'e-6 probe, carrying PolyU-developed "Surface Sampling and Packing System was launched successfully from China's Wenchang Space Launch Site. On June 3, the PolyU-developed system accomplished the tasks of automatic sample collection and packaging on the lunar surface, following the soft landing of the Chang'e-6 probe, marking a milestone in human space exploration. The probe with the cargo of the first-ever lunar soil samples from the far side returned to Earth on June 25.

In the Tianwen-1 mission, PolyU Prof. Yung's team together with CAST developed the "Mars Landing Surveillance Camera" for monitoring the deployment of the Mars rover "Zhurong" and identified possible landing sites using

Surface Sampling and Packing System

