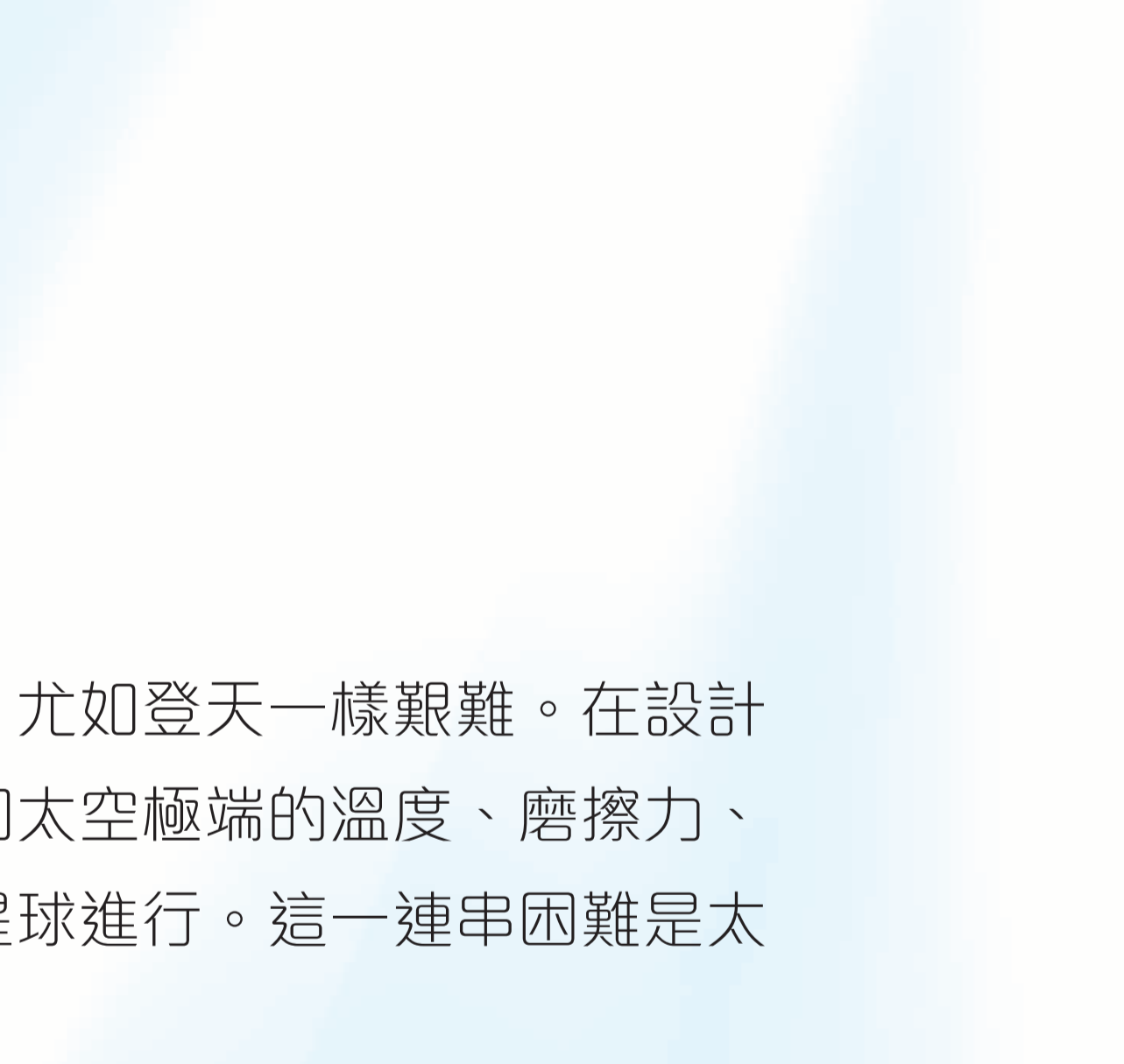


Sampling Tools for Space Exploration 太空探索的樣本採集工具

Current challenges

Man is slowly extending his knowledge to the heavenly bodies millions of kilometers above him. But the challenges really are sky-high. There are huge difficulties in designing tools to be used in space, especially for functions such as rock-drilling and soil-grinding. These tools need to be very strong to withstand the extreme temperature, high friction, vacuum and zero-gravity environment in aerospace. And the energy supply is limited too. Besides, many missions to far-off planets do not include human beings, thus the tools have to operate themselves or be usable by robots.



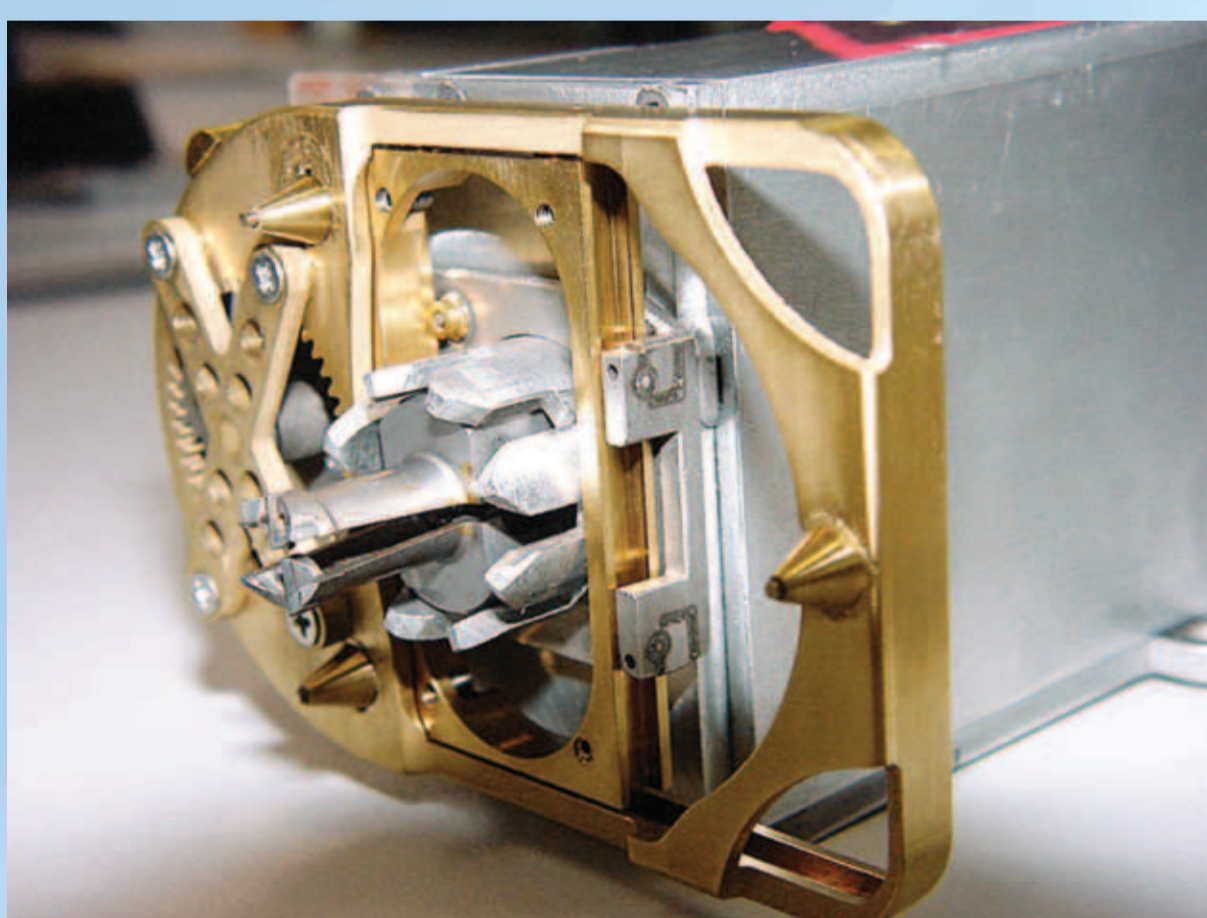
Our solutions

PolyU has been actively conducting research and development in space sampling tools which help to uncover the mystery of outer space. Over the years, several revolutionary space tools have been made for different missions.

Year	PolyU's Space Tools	Space Mission
2003	Mars Rock Corer	Mars Rock Corer can grind, drill, core and grip rock samples, with energy consumption as low as 2 Watts and weighs 370 grams only. The tool was carried onboard the Beagle 2 Lander in a spacecraft of the European Space Agency's Mars Express Mission.
2011	Soil Preparation System (SOPSYs)	Designed for the Sino-Russian Mars Mission "Phobos-Grunt", SOPSYs weighs merely 400 grams. It can grind and sift rocks of the Martian moon Phobos to the size of >1mm in diameter and then from it into a plug of measured size for in situ analysis.
Scheduled end of 2012	Camera Pointing System	The 2nd phase of China's lunar exploration programme
To be announced	Surface Sampling and Packing System	The 3rd phase of China's lunar exploration programme

Impact to the world

PolyU's wealth of experience in developing sophisticated space tools for different missions provides great solutions to the daunting list of challenges that space explorers have faced for many years. While PolyU's endeavours help in turning man's space exploration dreams into reality, our participation in space programmes with home-made devices actually onboard spaceships also inspire the public about how Hong Kong can contribute to advancement of frontier technologies.



目前之挑戰

隨著科技的進步，人類對距離數百億公里之遙的天體瞭解慢慢地增加。拓展過程中遭遇的挑戰，尤如登天一樣艱難。在設計探索太空的使用工具時，特別在研製鑿岩和土壤研磨的工具，同樣面臨著許多巨大的困難。例如太空極端的溫度、磨擦力、真空和無重環境、電力……而且太空探索工具往往需要自行運作，許多航太任務更要在遙遠的星球進行。這一連串困難是太空飛行工具設計師多年來面對的艱巨挑戰。

理大之解決方案

理大一直積極研究及發展太空樣本採集工具，以助揭開外太空生命之謎，經過多年來的努力，有多項突破性發展。

年份	理大研發的太空工具	太空任務
2003	岩芯取樣器	岩芯取樣器重370克，耗電僅2瓦特，可作磨、鑽、挖及抓取土質樣本之用，在歐洲太空總署的「火星快車」任務中由火箭帶動登陸船「獵犬二號」攜帶到火星。
2011	行星表土準備系統	「行星表土準備系統」僅重四百克，隨俄羅斯的太空任務「火衛一土壤」登陸火星最大的衛星「火衛一」，把「火衛一」的表層土壤磨碎及篩選適量直徑少於一毫米的樣本將它壓成柱狀以進行實地分析。
預計2012年年底	相機指向機構系統	中國探月工程的第二階段
待定	表取採樣執行裝置原理樣機	中國探月工程的第三階段

對世界之影響

近年世界各國進行愈來愈多的太空任務，探索浩瀚宇宙的未知。當中要面對許多人類未曾踏足的環境、無數艱巨的挑戰，要完成探索任務，往往有賴太空工具的幫助。多年來理大的科學家研發出多套太空工具，滿足不同任務的要求，憑藉經年累月的太空科研經驗，結合創新的科技發明，為人類在太空開拓知識的領域作出貢獻。而這些本地研發的太空工具能實際應用於各個太空任務，實在是香港人的驕傲。

