

## Google Lunar XPRIZE: Sharing the global adventure of going ‘Back to the Moon: For Good’

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### Abstract

The Google Lunar XPRIZE is igniting a new era of lunar exploration by offering the largest international incentive prize of all time. A total of \$30 million in prizes are available to the first privately funded teams to safely land a robot on the surface of the Moon. Currently 23 teams are competing for the Google Lunar XPRIZE, with team headquarters spread across the world, including Germany, Hungary, Spain, Croatia, Denmark, Romania, Russia, India, Israel, Malaysia, Japan, Chile and Brazil as well as the USA. Building awareness and involving the public with the competition presents an outreach challenge on a global scale. A strong presence on social media is one of the core requirements for teams participating in the competition. To engage and inspire young people, Google Lunar XPRIZE has for the past three years run a junior version of the competition, MoonBots, a LEGO® MINDSTORMS® Challenge. A kit based on the competition has now been developed for use in Science Centres. In Autumn 2013, a full-dome planetarium show will be launched entitled ‘Back to the Moon – For Good.’ This show will be available to planetaria around the world at a no-cost lease. This suite of outreach activities aim to build excitement over the next two years as the teams prepare for launch before the Google Lunar XPRIZE expiry date of December 2015.

### 1. Introduction

Scientists and explorers have shown that the Moon is an ideal platform from which to study the Earth and the wider solar system and universe. There is much we can learn about the formation of our planet and the solar system by studying the Moon. Further, the Moon has untapped resources that could allow us to improve the quality of life here on Earth as well as expand our permanent presence beyond Earth orbit. The \$30 million Google Lunar XPRIZE will be

awarded to the first privately funded teams to build robots that successfully land on the lunar surface, explore the Moon by moving at least 500 meters, and return high definition video and imagery. The competition's grand prize is worth \$20 million. Additionally, a second place prize of \$5 million will be available for the second team to complete the competition objectives. \$4 million in bonus prizes are available for achieving other specific mission objectives, including operation at night; traveling more than 5km over the lunar surface; detection of water; and precision landing near an Apollo site or other lunar sites of interest (such as landing/crash sites of man-made space hardware). Lastly, a \$1 million award will go to the team that demonstrates the greatest attempts to promote diversity in the field of space exploration.

The Google Lunar XPRIZE has three primary goals: 1) Kickstart a new commercial lunar industry, 2) Drive new scientific and technological breakthroughs, and 3) Inspire the next generation of explorers, scientists, and engineers. The competition aims to drastically reduce the cost of exploration by providing new capabilities to access the Moon and its unique resources.

The competition is administered by the XPRIZE Foundation, The X PRIZE Foundation is an educational 501(c)3 nonprofit organization whose mission is to bring about radical breakthroughs for the benefit of humanity. The XPRIZE Foundation has a dedicated small team working on this prize as well as specialist consultants.

### 2. Outreach Activities

#### 2.1 Social Media

All teams competing for the Google Lunar X PRIZE are required to blog about their activities, to produce video content and to maintain an active presence on social media channels. Google Lunar X PRIZE

provides a weekly round-up of the highlights posted by teams during the week, which can be found on the homepage at: <http://www.googlelunarxprize.org/>

## 2.1 MoonBots Competition

MoonBots is a competition, run by Google Lunar XPRIZE, that challenges small teams of students from all over the world to design, program and construct robots from LEGO® MINDSTORMS® to perform simulated lunar missions.

In Moonbots 2012, the third annual contest, teams of young people were challenged to study the history of heritage artefacts left on the Moon, while getting an opportunity to learn about the new and exciting things that private industry and government are doing in the arena of space exploration. The Grand Prize winner, Team Hungarobots from Hungary, earned a VIP trip to test their creations at the Pacific International Space Center for Exploration Systems in Hilo, Hawaii. The team, comprised of 16- and 17-year-olds from the town of Sopron, Hungary, was introduced to the competition by the Google Lunar XPRIZE team, Puli Space. The student competition attracted 147 teams from 22 countries who each submitted a video about space exploration and their proposed designs. From there, a panel of judges selected 30 finalists, each of whom were tasked with building and programming a LEGO MINDSTORMS robot, creating an original one-of-a-kind lunar landscape for their robot to explore.

For 2013, the XPRIZE Foundation has launched the After Earth Challenge to celebrate the new summer blockbuster "After Earth." The theme of this competition explores the importance of space exploration & the relationship between sustainability & survival. Google Lunar XPRIZE is launching its next MoonBots challenge in early 2014.

## 2.1 MoonBots for informal education

Google Lunar XPrize has produced a kit to simulate the MoonBots competition on a scale more easily accessible to informal science educators. MoonBots: A Google Lunar XPRIZE MINDSTORMS Challenge Kit includes:

- Multiple 2' (0.6m) high x 4' (1.2m) wide corrugated plastic panels and supports. These can be assembled to create a three-sided enclosure with panoramic lunar backdrop of different sizes, from 3' x 6' (0.9m x 1.8m) to 6' x 6' (1.8 x 1.8m)

- Two vinyl lunar crater play mats 3'x6' (0.9mx1.8m) each
- A set of lunar exploration related LEGO mission models pieces
- A LEGO Mindstorms NXT robotics kit
- Instructions on building a sample robot and the mission models
- A custom designed Raspberry Pi module, plus a joystick, for controlling the robot without a laptop or familiarity with MINDSTORMS programming

25 kits are being distributed to science centres around the world, free of charge, to tie in with the launch of the planetarium show.

## 2.1 Digital Planetarium Show

Google Lunar XPRIZE, in collaboration with NSC Creative, is producing a fulldome planetarium show, 'Back to the Moon – For Good'. The planetarium show will be available in early November 2013, at a no-cost lease. The 23-minute show chronicles the progress of teams around the world as they compete for the largest incentivized prize in history, by landing a robotic spacecraft on the Moon for the first time in more than 40 years. The show opens with the first era of space exploration in the 60s and 70s and what those landers and orbiters taught us about our nearest neighbour including the discovery of the Moon's origin, composition, structure and the accessibility of raw materials on its surface. The audience is introduced to the various teams competing for the Google Lunar XPRIZE, taken through a successful launch, landing and lunar surface travel, and given glimpses of a plausible scenario for our future on the Moon. The show highlights the human spirit of competition and collaboration as teams take on the challenge.

At the time of submission, 85 planetaria worldwide have signed up to lease the show and it is hoped that more than 400 planetaria worldwide will show 'Back to the Moon - For Good.'

## 4. Conclusions

Google Lunar XPRIZE has designed a suite of outreach activities to engage and involve an international audience spread across the globe. Over the final two years of the competition, these outreach activities will help raise awareness of the competition and its objectives.