Mangalyaan: The power of science and simplicity

by DR ROBERTO TROTTA
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ON SEPTEMBER 24, 2014, the Indian space probe Mangalyaan made history by successfully entering into Mars orbit after a journey of 400 million kilometres.

This was a momentous achievement for the Indian space programme: not only did the Indian scientists and engineers succeed in their first attempt at something that had defeated none other than NASA, the celebrated American Space Agency, several times before; they did so on what is to be considered a shoe-string budget.

At a cost of less than six US cents per Indian citizen, the Mangalyaan mission got its value for money. By comparison, the European Space Agency mission Mars Express – itself hailed at the time as a very cheap space probe – cost over five times as much.

NASA’s Maven Mars probe, which reached Mars just two days ahead of the Indian spacecraft, has a price tag 10 times as big.

It is impossible to overstate how difficult it is, even in this day and age, to send a space probe to another planet. The tremendous vibrations during the launch phase, the several high-precision slingshot passages around the Earth that are needed to send the probe on its long interplanetary journey; the frenzy voyage during which most systems are shut down, only to be re-activated at arrival, would not be sufficient to give any mission engineer shivers.

Add to that the threat of speed, light; as it is, it is, at 300,000 km/sec, any command sent via radio waves (a form of light) to the probe as it slingshots around Earth would take over five minutes to reach the satellite.

This means that the final, high-precision, high-risk se-con to enter into a stable orbit around Mars has to be carried out by the spacecraft itself, without any direct control from Earth.

And all of this has been achieved with the exacting precision that interplanetary travel requires. The real mission has only just started.

For the next six months, Mangalyaan’s five instruments will probe the atmosphere of Mars, as well as its surface, looking for better clues as to what happened to the water on Mars and how the planet itself was formed.

Some might question the wisdom of spending all this money and effort on such a mission in a world where, in its economy, and for all of its citizens.

The power of enthusiasm and passion for science is often undervalued in our society, which tends to reward more tangible and measurable outcomes. This is perhaps a consequence of a way of communicating science that, all too often, focuses on people’s minds and forgets to speak to their hearts.

As a professional astrophysicist, I am fortunate to be able to devote my working life to some of the deepest and most intriguing questions ever: What is the fundamental nature of the cosmos? What are dark matter and dark energy made of? What is the destiny of the Universe?

Unlike the goals of Mangalyaan, the answers to those questions might not change our lives in the immediate future – but it will revolutionise our understanding of our place in the Cosmos, and with it the meaning of our being here.

In my first book for the public, The Edge of the Sky, I took an approach that, in its economy, is akin to that used by Mangalyaan’s designers: banking on the power of simplicity, and believing that often less is more, I endeavoured to describe the entire Universe (the ‘All-There-Is’) using only the most common, 1,000 words in the English language.

So a spacecraft bound for Mars becomes in the simple, straight-forward language of my book, a ‘space-car flying to the red Crazy-Star, named after the Fight-God, where it will look for little life’; a telescope is a ‘Big-Seer’; scientists are ‘Student-People’, our galaxy is ‘the White Road’, and other galaxies become ‘Star Crowds’.

It is my hope that, just like the Mangalyaan success proves the way for an even stronger link in science and technology in the future, my book might help enthuse a younger generation in the power of science – and the way science can change the way we see the All-There-Is.

Dr Roberto Trotta is a theoretical cosmologist in the Astrophysics Group of Imperial College London where he is senior lecturer in astrophysics. The Edge of the Sky: All You Need to Know About the All-There-Is (Basic Books) will be published on October 9.

Landmark photographs from Mars: ‘The view is nice up here’

INDIAN SPACECRAFT has beamed back its first photos of Mars, showing its cratered surface, as the country gloated with pride last Thursday (25) after winning Asia’s race to the Red Planet.

The Indian Space Research Organisation (ISRO) uploaded one of the photos to its website, showing an orange surface with dark holes, taken from a height of 7,300 kilometres (4,536 miles).

ISRO also posted the photo on Twitter, with the caption “The view is nice up here.”

The camera will also take images of the Red Planet’s two moons and beam them to a deep space network in Bangalore. Health and other parameters of the spacecraft are fine and all the essential functions are performing normally.

India became the first Asian country to reach Mars last Wednesday (24) when the unmanned Mangalyaan spacecraft entered the planet’s orbit after a 498-month journey, all on a shoe-string budget.

The $74 million (£45.6m) mission, which is designed to search for evidence of life on the planet, is a huge source of national pride for India.

India now joins an elite club of the United States, Russia and Europe who can boast of reaching Mars. More than half of all missions to the planet have ended in failure.

The mission’s success received front-page coverage in Indian newspapers on Tuesday, with the Hindustan Times declaring “Marsian Race Won” and the Times of India, “India enters super exclusive Mars club.”

However, some firms are frustrated at what they say is the slow execution of projects and lack of government support, which is hampering India’s efforts to compete with China and the US as a cheaper option for launching satellites.

The Mangalyaan probe was built in 15 months with two-thirds of its parts manufactured by domestic firms such as Godrej & Boyce and India’s largest engineering company, Larsen & Toubro.

Prime minister Narendra Modi has said he wants to expand India’s 50-year-old space programme. The government has increased funding for space research by 50 per cent to almost $1.6 billion (£1.017bn) this financial year.

But the programme is still small and the small number of launches limits the growth potential of private companies that supply them.

Between 2007 and 2012, ISRO succeeded in half of its planned 60 missions, government data showed. The government cited ‘development complexity’ as the reason for the delay in some missions. Between 2012 and 2017 the target is 58.

Some companies executives and experts do not see that changing any time soon, with the absence of too few launch facilities and bureaucratic delays hampering growth.