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Editor's comment

Home truth

HOME SECRETARY Theresa May urged communities to recognise the rights and responsibilities of living in a tolerant society at the Tory party conference this week. While British people are free to practise their faith and establish their own faith schools, she argued, living in a pluralistic society also meant respecting other people's rights to do the same.

Tragically this is not being played out in towns and cities across the UK where hundreds of young men and, increasingly, women are leaving their homes to join Islamic fighters in the Middle East. Some have been calling for Muslims to carry out home-grown terrorist attacks in the west, while others are travelling to war-torn regions to bear jihadist children to continue the spread of Islam.

Politicians have a duty to try and reach out to the masses, but disillusioned youngsters who have been radicalised are not going to listen to the ramblings of white middle-class bobs in Westminster. It is everybody's responsibility, but those in the Muslim community should especially work to ensure these vitriolic messages are questioned and youngsters are given a strong sense of identity.

As May said: "Let the message go out that we know Islam is a religion of peace and it has nothing to do with the ideology of our enemies."

New world order

US PRESIDENT Barack Obama made no secret of his admiration for former Indian prime minister Manmohan Singh. But that now appears to be a distant memory, erased by the blitzkrieg that is Narendra Modi.

Younger by almost two decades to his predecessor, India's prime minister created headlines during his five-day visit to the US.

There has been scepticism about the scope of the US-Indian relationship, but Obama and Modi have shown they are ready for the absolute commitment it will take to make this partnership one of the defining ones in today's world.

Both sides agree there will be some disagreements, but acknowledge the bigger picture – enhancing trade and business ties with New Delhi and Washington DC as mutual beneficiaries. It is a promising start, but Modi should follow up his words with action and the US needs to understand that change takes time.

Tell us what you think

Want to say something about the stories in *Eastern Eye* or simply got a viewpoint you think should be heard? We want to hear from you so write to us and we will consider publishing your response, if it is topical. We reserve the right to edit letters. Email editor@easterneye.eu

Mangalyaan: The power of science and simplicity

AN INSIGHT INTO INDIA'S HISTORIC SPACE FIRST



by DR ROBERTO TROTTA
Astrophysicist

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 at 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 truly is great 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 frosty voyage during which most systems are shut down, only to be reawakened at arrival, would be sufficient to give any mission engineer shivers.

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

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

And after all of that has been executed 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 about 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 country like India where two thirds of the population live on less than \$2 (£1.23) a day.

It is tempting to take the intellectual shortcut



VICTORY: Indian Space Research Organisation staff celebrate the spacecraft's success

of thinking that those resources would be better spent on providing some of those citizens living in poverty with better access to water, food and sanitation.

But in the long run this would be a false economy: the sense of pride, inspiration and enthusiasm for science that Mangalyaan has provided is invaluable, and no doubt it will help in nurturing interest and passion for technology and fundamental science in a new generation of Indians.

In today's world, those are the ingredients for long-term success and economic growth for the entire nation, 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 heart.

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?

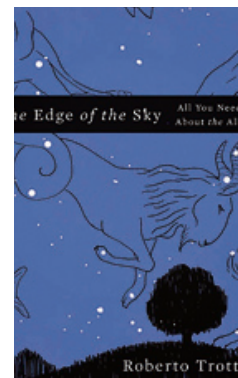
Not unlike the goals of Mangalyaan, the answers to those questions might not change our lives in the immediate future – but it will revolutionise our understanding of our place in the cosmos, and with it the meaning of our being here.

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 paves the way for an even stronger Indian 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'

INDIA'S spacecraft has beamed back its first photos of Mars, showing its crater-marked surface, as the country glowed 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 Facebook page, 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 organisation's senior scientist, V Koteswara Rao, said the spacecraft, called the Mars Orbiter Mission, has taken a dozen photos and that everything was working well.

"The Mars colour camera on board started working soon after Orbiter stabilised in the elliptical orbit of

Mars and has taken a dozen quality pictures of its surface and its surroundings," Rao said.

"The camera will also take images of the Red Planet's two moons and beam them to our deep space network centre (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 10-month journey, all on a shoestring 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 Thursday, with the *Hindustan Times* declaring "Martian 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 are hampering India's efforts to compete with China and Russia as a cheaper option for launching satellites.

The Mangalyaan 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 billion (£617m) 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 accomplished about 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 company executives and experts do not see that changing any time soon, with the absence of too few launch facilities and bureaucratic delays hampering growth.



GROUND-BREAKING: The surface of Mars is seen in this photo taken by Mangalyaan