

## SpaceX's Satellites to Boost Internet Services



**S**paceX successfully launched the FALCON-9 rocket carrying 60 Starlink satellites on 23 May 2019. This was the heaviest payload carried up by SpaceX till date. The array of satellites were deployed at an altitude of 440 km which then used onboard propulsion to reach an operational height of 550 km. The main purpose of the mission is to provide reliable and affordable high-speed broadband internet services around the globe.

The problem with the present internet beaming satellites in space is their much higher altitudes i.e. geostationary orbits because of which signals need to travel a longer distance from space and back leading to delay in accessing information. Therefore,

to overcome the problem, Space X proposed the Starlink satellites at much lower orbits to minimise this latency issue. This was the first batch of satellites, thousands of such launches are required to have moderate broadband coverage. Once the mission is complete, the orbiting array of satellites will provide high-speed and uninterrupted internet services to the whole planet.

The solar-powered small satellites weighing 500 pounds will communicate with one another in the space via radio and optical links. The user terminals from the ground will then be connected with the network which can be installed anywhere with the view of the sky. With these satellites passing overhead, web access should be persistent, unlike

the latency issues that are normal with conventional communication satellites.

Keeping in view the risk of in-flight collision and space debris, SpaceX has equipped each spacecraft with a startracker navigation system same as used in Cargo and Crew Dragon spacecraft developed by SpaceX. The startracker system enables the SpaceX to point the satellites with precision enabling the satellites to track on-orbit debris and autonomously avoiding a collision. Additionally, 95 per cent of all components of this design will rapidly burn in the Earth's atmosphere at the end of each satellite's lifecycle.

*Source:* SpaceX ([www.spacex.com](http://www.spacex.com))

## Better Education Links to Good Heart Health

**A** new study has emphasised the role of better education than wealth in tackling cardiovascular diseases. The study explored the association between education and wealth, on the one hand, and cardiovascular diseases and mortality due to them, on the other, to assess which marker was the stronger predictor of outcomes and examined whether any difference in socioeconomic status influenced the levels of risk factors and how the diseases are managed.

"How much money you have tends to be a strong predictor of health outcomes, but education seems to be a far more robust measure to use across countries," says Dr Scott Lear, Simon Fraser University, Canada.

In this cohort study, the researchers looked at 367 urban

and 302 rural communities in 20 countries including India, Pakistan, Bangladesh, China, Canada, Sweden, Poland, and others. These countries include low-income, middle-income and high-income categories. They recruited adults aged between 35 and 70, prepared two questionnaires to collect data on families and households and a third to get information on cardiovascular risk factors. Physical examinations supplemented the exercise.

Over a mean follow-up duration of seven and a half years, there were 7,744 deaths due to cardiovascular diseases and 6,936 cases of major cardiovascular diseases. Mortality varied substantially by education and country income, with the highest mortality in low-income countries and in those with the lowest levels of education, across country income categories. The group with the lowest level of education in low-income countries had cardiovascular mortality five times that of people with the highest level of education in high-income countries.

The study has highlighted that education was an important factor as being educated gives a person the ability to obtain

# First Exoplanet of its Kind Found in Neptunian Desert

**A**STRONOMERS have discovered a rare sub-Neptune-sized transiting exoplanet which is 20% smaller than Neptune and about three times the size of the earth orbiting its host star in the harsh conditions of Neptunian Desert. The planet has been formally named as NGTS-4b, however, due to its rare existence researchers have nicknamed it as the “Forbidden Planet”. The planet was discovered by using the state-of-the-art Next Generation Transit Survey (NGTS) observing facility by an international collaboration of astronomers led by the University of Warwick, UK.



The newly found planet is 920 light years away from the earth revolving around the host star in only 1.3 days which is equivalent to the earth’s orbit around the sun in one year. The planet is 1000 degrees Celsius and hotter than Mercury.

The Forbidden Planet retains its own atmosphere in hellish Neptunian Desert which surprised the astronomers that it’s surviving at such a close distance to its host star. The planet is the first of its kind found in Neptunian Desert. Neptunian Desert is the region close to the stars where Neptune-sized planets do not exist as planets cannot maintain their gaseous atmosphere and evaporate leaving behind the rocky core due to irradiation from stars.

Despite the conditions of the Neptunian Desert, the NGTS-4b exists which led the researchers to believe that maybe it was formed at some other location but moved into the Neptunian Dessert within the last one million years or the planet was itself bigger and the atmosphere is still in the process of evaporation.

Source: The University of Warwick ([warwick.ac.uk](http://warwick.ac.uk))



effective care in several ways. The individual was able to seek timely help or information on how and where to obtain care and overcome the various barriers that exist both through formal channels and social networks. For instance, a person with a lower level of education is more likely to live in a neighbourhood with reduced access to health-care facilities.

“Education is actually what we consider as a modifiable factor, whereas wealth is not as modifiable. If we give people money they don’t suddenly become healthy, but if we strive to better educate our

population, that will result in improved health because there is a more direct link between education and health outcomes,” Dr Lear says.

He noted that the study’s strength lay in its range and variability achieved from different geographical settings. “One of the unique aspects (of the study) is bringing together countries from different parts of the world that have a wide range of development. That allows us to look at factors that would vary to a greater extent than they would if we just looked exclusively at western countries.”

The study was led by Simon Fraser University, Canada and several institutions across the world were involved. The findings of the study have been published in the journal *The Lancet: Global Health*.

Jyoti Sharma, *India Science Wire*

## Teachers of the (Not-so-Distant) Future

**A** Finnish primary school's new language teacher has endless patience, encourages questions from the students and can dance the Gangnam style. The name of this teacher extraordinaire is Elias, a robot.

Elias is a language teaching machine that is a blend of a humanoid robot and mobile application. It is one of the four robots in a pilot program at a primary school in the Southern City of Tampere, Finland.

Elias is programmed to understand and speak 23 languages, although during the initial periods of experimentation, it communicates only in English, Finnish and German.

What makes Elias truly fascinating is its capability to understand a student's requirements and encourage learning, owing to software that it is equipped with. It can frame questions according to the student's dexterity and also provide feedback to the teachers about a student's predicament, if any, in the process of learning.

The purpose of the pilot project, it is said, is to study the impact that robots can have on the quality of teaching and learning.

Teachers who have worked with the machines have offered positive comments considering it to be a part of a new curriculum that enables the students to get involved in the learning process by

motivating them and making them active. They have also suggested that teachers be open-minded about the new change that has already been seen in the Middle East, Asia and the United States.

At the start of a semester, Ashok Goel, a computer science professor in the United States provided a list of nine teaching assistants to the students of his course. These nine teaching assistants would answer the questions posed by the students in the courses' online forum. Of the nine teaching assistants, Jill Watson was found to be most efficient in responding to the students queries that one of the students had even considered nominating Jill Watson as an outstanding TA (Teaching Assistant) in the CIO (Course Instructor Opinion) survey.

Jill Watson was an Artificial Intelligence (AI) bot developed by Prof. Goel with the help of some of his students and IBM.

Prof. Goel and his teaching assistants receive more than 10,000 questions a semester from students on the course's online forum and it was to answer most of the questions, especially those that were repeated, that Prof. Goel trained the system to answer questions correctly by feeding forum posts from the class's previous semesters. After several attempts that involved fine-tuning of the software by adding layers of decision-making to it, the AI bot reached a stage where it could answer the questions correctly, just like a human. The AI also made use of informal phrases that added credulity to its answers and made it hard to distinguish its answers from that of the



other teaching assistants.

Therefore, if AI can deceive us into believing they are humans, can humans retain their identity? More importantly, will machine teaching completely replace the traditional teaching methodology that we have come to accept as unchangeable?

Rose Luckin, a professor of learner-centred design at University College London, puts it aptly: "What we are very interested in is the right blend of human and artificial intelligence in the classroom – identifying that sweet spot." That "sweet spot" when identified will revolutionise education for the good.

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## Parity in Disparity

**A** N educational project with AngelXpress slum children over three months studying their lifestyle and eating habits has revealed that many children were anaemic.

After speaking to social service workers working with slum children in Mumbai and doctors I tried to draw a comparison of lifestyle and food habits among the urban poor and rural poor.

The social workers in Mumbai majorly said that the children snacked on packet foods, fell sick often and hence missed school. They were not taken to doctors immediately for treatment. They often suffer from viral infections, short breathing, water borne diseases and skin/eye infections. This

clearly indicates low immunity and lack of hygiene in their environment.

I found that a more affluent rural region in Panchgani, Raigarh district also showed similar trends. Parents fed their children cheap biscuits and snacks rather than healthy food. A social worker in Palghar district, the most malnourishment affected area in Maharashtra, revealed that children came hungry to school. They waited for the free afternoon meal provided by the government and that was their motivation to come to school.

The free lunch is carbohydrate heavy and doesn't have any of the micro nutrients. It fills their stomach but leaves them malnourished. Signs of iron deficiency are visible through dark,

# Bacterial Spray may Conserve Decaying Monuments

A close examination of a sixteenth century Moghul monument facing disfigurement has led scientists to a new method of conserving decaying monuments elsewhere in the country.

The Salabat Khan tomb, located 125 km from Aurangabad in Maharashtra, has been losing its shine and beauty due to white deposits on its surface. The tomb suffers from hard and difficult to remove precipitates of calcium carbonates induced by leaching of lime due to rainwater and certain bacterial growth.

When rainwater seeps into the tomb structure, lime leaches through basaltic rock joints. This leached lime is acted upon by bacteria, which turn it into hard calcified lime. Prof Manager Singh, a researcher from the Delhi-based National Museum Institute of History of Art, Conservation and Museology, decided to

dig deep and collected samples from affected parts of the tomb.

From these samples, Singh identified bacteria responsible for calcification and hardening of lime. The microbial populations are of *Bacillus sp.*, *Arthrobacter sp.*, *Agromyces Indicus* and *Aquamicrobium sp.* He used petrological analysis, X-Ray diffraction to study chemical and physical composition of the calcite deposits. partial sequencing of 16S rRNA gene was done for identification of bacteria.

Singh said the organisms that have disfigured the Salabat Khan Tomb could be deployed to protect exteriors of other decaying monuments. "A spray of organisms identified in this study

along with calcium carbonate can create calcite layer that will help preserve exteriors of monuments," he said while speaking to *India Science Wire*.

In the Salabat tomb which is made up of black basalt stones, the bacteria led to development of white patches on the surface, but on



Prof. Manager Singh



monuments made of limestone or marble the same bacteria can be applied to prevent them from decay, Singh explained. For instance, he said, bacteria could be used to clean limestone sculptures of Amravati and Nagarjunkonda.

In this method, microorganisms are evenly sprayed on the surface and are fed with nutritional medium containing calcium and urea. The bacteria then induce carbonate precipitation by creating low acidic medium and converting dissolved calcium into a protective surface coating of calcium carbonate. A low acidic or alkaline medium is the primary source through which microorganisms promote this precipitation of calcium carbonate, also known as Biocoating.

The white patches on the tomb, meanwhile, have been removed by plugging joints in the structure and extensive physico-chemical processes. The study results have been published in *Current Science*.

Rayies Altaf, *India Science Wire*



Salabat Khan Tomb with white patches (L) and after Cleaning (R)

puffy eyes and marks on their face.

Pediatric doctors revealed that many of the children had respiratory disorders and fell sick often. This leads to overall weak immunity. The government provides iron supplements to children and lactating mothers. But the children tend to spit out the medication as they don't like the taste.

We are reaching a crisis where the poor can afford packaged foods but cannot afford the illnesses related to this lifestyle. They do not realise the repercussions of poor dietary habits on their health and future. Unfortunately, the media with its promotion of unhealthy snacks is equally to blame. The poor are informed enough to check the expiry date of packaged food but not educated enough to understand the food choice for the betterment of their family. They do not know that deficiency of

iron or protein could lead to life threatening diseases.

Children are not malnourished due to starvation. They are malnourished due to unhealthy eating habits. There is dire need to educate the poor on nutrition and impacts of food and poor nutrition.

I plan to educate the children in the slums of Mumbai and small villages around the backwaters of Tapola, Raigarh district, on nutrition, immunity and associated deficiencies, on how to prevent diseases and ensure their life is rich and nourished.

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