



www.ptinews.com

Vol 36 No. 09 (24 pages including cover)

Science Service

CONTENTS

NATIONAL SCIENCE BRIEFS: *HUMANOID ROBOT NAO TO BE PROGRAMMED IN HINDI* TECHNOLOGY HAS MADE BUREAUCRATS' JOB CHALLENGING: MEENA* VENUS MISSION: ISRO INVITES PROPOSALS FOR SPACE EXPERIMENTS * CENTRE MOVE ON ANTIMICROBIAL RESISTANCE A BIG STEP: GREEN BODY* INDIA CHANGES DEFINITION OF BLINDNESS, OPTS FOR WHO CRITERIA* INDIA AN IMPORTANT PARTNER IN TACKLING CLIMATE CHANGE: UN CLIMATE OFFICIAL* 11 MINISTRIES COME TOGETHER TO CHECK ANTIMICROBIAL RESISTANCE* RAILWAYS TO EXPLORE MODERN TECH TO DETECT RAIL FRACTURE* INDIA, NEIGHBOURS PUSH FOR LEPROSY, KALA-AZAR ELIMINATION BY 2020* AIIMS SYMPOSIUM TO DELIBERATE UPON DENGUE VACCINE IN INDIA* GOOGLE DOODLE PAYS TRIBUTE TO CASSINI'S 'GRAND FINALE *A 13-YEAR-OLD MATHEMATICAL WONDER!* JAMUN USED TO MAKE LOW-COST SOLAR CELLS* DELHI-NCR KIDS EXPERIENCE MOON WALK AT SPACE CAMP* AIR POLLUTION MAY CAUSE YEAR-ROUND RUNNY NOSES: STUDY* AGENCIES ACROSS THE WORLD WORKING TO TACKLE SPACE JUNK: REDDY* HEALTH AUTHORITIES SUSPECT MUTATION IN SWINE FLU VIRUS* KERALA CAPITAL TO HOST NATIONAL WORKSHOP ON SPACE TECH* VAASTU CAN RESCUE FROM PERILS OF UNPLANNED URBANISATION *

INTERNATIONAL SCIENCE BRIEFS: *NOW, SMARTPHONE CONTROLLED SYSTEM TO KEEP DIABETES IN CHECK*TESTOSTERONE INCREASES IMPULSIVE BEHAVIOUR IN MEN: STUDY*TESTOSTERONE MAKES MEN IMPULSIVE: STUDY* SIMPLE, NO-BAKE RECIPE TO MAKE BRICKS FROM MARTIAN SOIL FOUND* SAFER ALTERNATIVE TO LITHIUM-ION BATTERIES DEVELOPED* ANCIENT HUMAN DNA DISCOVERED IN CAVES WITHOUT BONES* NASA'S CASSINI COMPLETES FIRST DIVE BETWEEN SATURN'S RINGS* 'ICEBALL' PLANET DISCOVERED 13,000 LIGHT-YEARS AWAY* NASA'S DAWN SPACECRAFT EXPERIENCES MINOR GLITCH* NEW ROBOTIC SYSTEM CAN 3D PRINT BUILDINGS* 'SPECIAL STATUS FAILS TO CURB ILLEGAL TREE LOSS IN FORESTS' * SCIENCE BEHIND PERFECT THROW DECODED* EXERCISE 'KEEPS THE MIND SHARP' IN OVER-50S: STUDY* FISH AND CHIPS MAY HOLD HUMAN DNA CLUES* SELF-CHARGING SMARTPHONE BATTERIES IN THE OFFING* TINY SILICA 'CAGES' TO KEEP VACCINES SAFE AT HIGH TEMPERATURES*

GLOBE SCAN: * HUMAN VISION INSPIRES NEW CAMERA SYSTEM* NASA'S CASSINI COMPLETES FINAL FLYBY OF SATURN'S MOON TITAN* NASA'S SUPER PRESSURE BALLOON SUCCESSFULLY LAUNCHED* BLOOD PRESSURE DRUG MAY HELP TREAT SKIN CANCER: STUDY* NASA'S PEGGY WHITSON BREAKS RECORD FOR TIME SPENT IN SPACE*NEW VENDING MACHINE AT US VARSITY OFFERS MORNING AFTER PILLS* PLAYING ON SWINGS MAY MAKE KIDS COOPERATE: STUDY* NEW MATERIAL STRONGER THAN COPPER MAY POWER 'SMART' TEXTILES* NEW GOOGLE EARTH VR TO TAKE YOU TO ANY ADDRESS IN WORLD*

FOR SUBSCRIPTION

Quality Publications from PTI

Besides news and photo services, India's premier news agency offers a host of other services.

The services are:

PTI ECONOMIC SERVICE

A fortnightly journal providing analytical reports on the state of Indian economy and trends in the corporate world

Subscription: Rs 8,750 per annum

DATA INDIA

A reference weekly providing a digest on the happenings in India in a user-friendly alphabetical listing. A must for every library, educational institution and an excellent source of information for those who want to keep themselves upto date on happenings in India.

Subscription:

- * for libraries and educational institutions Rs 2,500 per annum
- * for others Rs 3,125 per annum

PTI SCIENCE SERVICE

A journal published fortnightly containing reports on developments in the fields of science and technology with particular reference to India.

Subscription:

- * for educational and other charitable institutions Rs 2,000 per annum
- * Others Rs 6,750 per annum (for A class newspapers)
- * Others Rs 3,500 per annum (for B class newspapers)

PTI FEATURES

A package of four weekly feature articles on topical national, international and general events.

Subscription: Rs 8,500 per annum

ALL SUBSCRIPTION PAYABLE IN ADVANCE

For further information on PTI services please contact, **Marketing Officer**, at:

The Press Trust of India Ltd, PTI Building, 4, Parliament Street, New Delhi 110 001.

e-mail: trans@pti.in

HUMANOID ROBOT NAO TO BE PROGRAMMED IN HINDI

French humanoid robot NAO is being programmed to understand commands in Hindi by an Udaipur-based engineering college.

Techno India NJR Institute has purchased the programmable robot from its French developer Aldebaran Robotics for research and education purposes and is working on its language programming.

“We purchased the robot for our students of computer science. The robot works on artificial intelligence and can work in 18 languages. We are updating its language programming and it will be able to follow instructions in Hindi and work accordingly,” the institute’s director, R S Vyas, said today.

He said that further customisation as per Indian needs will also be done so that the robot can be used efficiently in the country.

Vyas claimed that Techno India NJR Institute is the first college in Rajasthan to purchase the robot which can perform several things such as interaction with humans, recognise shapes and objects, access the internet among others.

TECHNOLOGY HAS MADE BUREAUCRATS’ JOB CHALLENGING: MEENA

The advancement of science and technology has not made the working of civil servants easier, rather it has made our job challenging, Rajasthan’s top bureaucrat O P Meena said today.

Addressing the bureaucrats on the Civil Services Day, the Chief Secretary said the working atmosphere for civil servants today was challenging and that they should work as a team to successfully implement the policies and programmes of the government.

“Expectations (from us) have increased. Science and technology has progressed, but they have not simplified or made our work easier. Rather the working atmosphere for us has become more challenging,” he said.

He said the officers who joined the civil services 25-30 years ago were more fortunate as they did not face the challenges that the present day officers face.

“You (officers) are less fortunate...those who joined the services 25-30 before were more fortunate. Media was not that powerful like it is today...had no sharp eyes on us. Today, the atmosphere for you (new officers) is challenging,” he said.

Meena also underlined the attitudinal change among the people towards the civil servants, adding that it was a matter of concern.

“There is a change in people’s outlook towards civil servants. It can be a cause of concern for us. There is no dispute

or issue on our functioning, but people talk about our behaviour and sometimes question it,” he said.

Additional Chief Secretary Public Works department D B Gupta, Secretary to CM K K Pathak and ADG Crime P K Singh gave presentations on the challenges before civil servants.

VENUS MISSION: ISRO INVITES PROPOSALS FOR SPACE EXPERIMENTS

India has moved a step closer to its maiden mission to Venus with its space agency ISRO announcing that proposals have been sought for space-based experiments to study the planet.

The Announcement of Opportunity (AO) is for space experiments by institutions in the country, and the last date for receiving the proposals is May 19, 2017, the Bengaluru-headquartered Indian Space Research Organisation (ISRO) said.

Those sending the proposals may be currently involved in planetary exploration studies, or development of science instruments for space, or willing to develop the experiments, the ISRO said in an announcement on its website.

Though no time-frame has been set by the ISRO for the ambitious mission, indications are that the Indian Venusian orbiter mission may not happen before 2020.

The maiden mission to Venus, the second planet of the Solar System named after the Roman goddess of love and beauty, is in all probability going to be a modest orbiter mission.

ISRO Chairman A S Kiran Kumar had earlier said that the mission to Venus is on the horizon and studies are underway.

“Beyond that, Mars second mission and Venus mission are all on the horizon, we have to go through the various studies and then formulate, get the approval and move. Right now, they are all in the study phase,” he said while referring to the two new bold inter-planetary sojourns to Earth’s immediate neighbours.

Venus is often described as the “twin sister” of the Earth because of the similarities in size, mass, density, bulk composition and gravity.

It is believed that both planets share a common origin, forming at the same time out of a condensing nebulosity around 4.5 billion years ago.

Stating that exploration of Venus began in the early 1960s, ISRO said the planet has been explored by flyby, orbiter, a few lander missions and atmospheric probes.

The ISRO said that in spite of great progress made in exploring Venus, there still exist gaps in our basic understanding about surface/sub-surface features and processes, super rotation of Venusian atmosphere and its evolution and interaction with solar radiation/solar wind.

The planet is around 30 per cent closer to the sun as compared to Earth resulting in much higher solar flux.

Pointing out that the payload capability of the proposed

National Science Briefs

satellite is likely to be 175 kg with 500W of power, the space agency said these values are to be tuned based on the final configuration.

The proposed orbit is expected to be around 500 x 60,000 km around Venus, and the orbit is likely to be reduced gradually, over several months to a lower apoapsis, it said. The point on an orbit which is closest to the orbited body is called the periapsis and the furthest point is the apoapsis.

A mission to explore Venus was first mentioned in the Department of Space demands for grants 2017–18.

Scripting space history, India on September 24, 2014, had successfully placed its low-cost Mars spacecraft in orbit around the Red Planet on its very first attempt.

ISRO is expected to launch its second lunar mission Chandrayaan 2 during the first quarter of 2018.

It will be another feather in the cap for India if ISRO's mission to Venus turns out to be successful.

On a visit to India in February, Michael M Watkins, Director of the Jet Propulsion Laboratory of NASA, said a mission to Venus is very-very worthwhile as so little is understood about that planet and NASA would definitely be willing to partner in India's maiden voyage to the planet.

Towards that, NASA and ISRO have already initiated talks in February on trying to jointly undertake studies on using electrical propulsion for powering this mission.

India's original inter-planetary dreamer K Kasturirangan, former chairman of ISRO, says, "India should be part of this global adventure and exploring Venus and Mars is very worthwhile since humans definitely need another habitation beyond Earth."

CENTRE MOVE ON ANTIMICROBIAL RESISTANCE A BIG STEP: GREEN BODY

The Centre's recent move to come out with an action plan to tackle Antimicrobial Resistance (AMR) is a "big" step to increase inter-agency cooperation to tackle the public health challenge, a green body said today.

Around 11 ministries, including health, environment, agriculture and food and public distribution, had yesterday adopted the 'Delhi Declaration' and pledged to work on "mission mode" to develop a national action plan (NAP) to combat AMR.

The highlights of the NAP include conducting national-level surveillance of antibiotic resistance in humans, animal and the environment, surveillance of antibiotic use in humans and animals and monitoring of antibiotic residues in food animals and the environment.

"The Delhi Declaration and India's NAP on AMR is a big step in the right direction to increase inter-agency cooperation to tackle the public health challenge of AMR," the Centre for Science and Environment (CSE) said.

AMR has become a global public health threat as antibiotics used to treat diseases, including common infections, are increasingly becoming ineffective.

Misuse of antibiotics in human health and its misuse in food animal production such as in case of chicken, fish, dairy and honey compound the problem.

In addition, AMR can also spread through waste from healthcare facilities, animal farms, animal food processing units and pharmaceutical manufacturing units.

The CSE said the declaration is a much-needed coordinated move to combat AMR and the NAP is "comprehensive and ambitious" and reflects the much-needed multi-stakeholder approach.

"The NAP on AMR is ambitious, comprehensive and multi- sectoral. We now need to ensure its effective implementation through sustained political will, multi-ministerial involvement, funding support from the government and suitable state-level action plans," said Chandra Bhushan, deputy director general of the CSE.

The CSE said that the NAP's success, however, would depend on national-level programmes to support small-scale animal farms, a new AMR-centric approach to manage waste from animal farms, animal food processing and pharmaceutical manufacturing sector and health care facilities.

"There is a global momentum to address AMR. With a high load of infectious diseases and the existing poor state of sanitation, hygiene and waste management, India cannot afford any more delays on this critical issue.

"There is an imperative to institutionalise an approach which is aggressive enough to tackle this problem," said Amit Khurana, head, food safety programme, CSE, who was part of the team that developed the plan.

The highlights of the NAP on animal and environmental aspects include restricting and phasing out of non-therapeutic use of antibiotics in food animals, such as antibiotic use as growth promoter and in disease prevention.

It also includes restricting and regulating feed and feed premix containing antibiotics, eliminating use of critically important antimicrobials for humans in food animals and regulating availability of antibiotics in bulk and those sold online, including feed and feed premix.

The NAP also envisages reducing environmental spread of AMR through necessary laws and surveillance of waste from animal farms, animal food processing, pharmaceutical sector and health care facilities and introducing programmes to support small and mid-size animal farmers to help them reduce antibiotic use among others.

Briefing the reporters after an inter-ministerial meeting on AMR yesterday during which the declaration was adopted, Health Minister J P Nadda had said strategies will be worked out to promote rational use of antibiotics among people, animal,

food and agriculture sectors, besides curbing their use for boosting growth in animals.

“Antimicrobial resistance is a serious threat to global public health that requires action across all government sectors. Single, isolated interventions have limited impact and coordinated action is required to minimise the emergence and spread of AMR,” Nadda had said.

INDIA CHANGES DEFINITION OF BLINDNESS, OPTS FOR WHO CRITERIA

India has changed its over four-decade-old definition of blindness, bringing it in line with the WHO criteria, a step that would drastically bring down the number of people considered “blind” in the country.

According to the new definition, a person who is unable to count fingers from a distance of three metres would be considered “blind” as against the earlier stipulation of six metres, which was adopted in 1976.

The aim of revising the definition is also to be able to generate data which can be compared with global estimates and achieve the WHO goal of reducing the blindness prevalence of India to 0.3 per cent of the total population by 2020.

The notification in this regard has been issued by the Union Health Ministry.

Going by the new definition, the population of blind people in India will reduce from 1.20 crore (as per National Blindness survey 2007 data) to 80 lakh.

“Because of the earlier definition, we were projecting a higher figure of blind people from India at any international forum, presenting ourselves in poor light.

“Also, the data that we generated under the programme could not be compared with the global estimates as other countries were following the WHO definition,” said Dr Promila Gupta, Deputy Director General of National Programme for Control of Blindness (NPCB).

Further, India has to achieve the goal set by the WHO which recommends reducing the prevalence of blindness to 0.3 per cent by 2020 to achieve the elimination of avoidable blindness.

“It would have been extremely difficult to achieve the WHO goal using the earlier NPCB definition since we had been addressing an extra 4 million (40 lakh) individuals blind due to refractive errors. Whereas, by adopting the blindness criteria of WHO, India now can achieve the goal,” said Professor Praveen Vashist, in-charge Community Ophthalmology at Dr R P Centre for Ophthalmic Sciences, AIIMS.

Also, the name of the scheme, ‘National Programme for Control of Blindness’ has been changed to ‘The National Programme for Control of Blindness and Visual Impairment’.

“The programme, henceforth, will not only focus on

the blind persons but also those with some kind of visual impairment. With the change in nomenclature, the number of beneficiaries will now increase to 40 million,” Dr Vashist added.

The previous definition of blindness was adopted at the time of the inception of the NPCB in 1976.

“The probable reason for keeping 6 metres as the cut off distance for defining blindness in India was to include economic blindness cases which referred to a level of blindness which prevents an individual to earn his or her wages.

“In contrast, the WHO definition adopts a criteria for blindness that is which hampers the routine social interaction of a person (social blindness),” Gupta said.

INDIA AN IMPORTANT PARTNER IN TACKLING CLIMATE CHANGE: UN CLIMATE OFFICIAL

A top UN climate official expressed interest in “engaging” with Indian institutions working in the field of climate change while acknowledging India as an “important” partner in tackling the global issue.

United Nations Framework Convention on Climate Change (UNFCCC) Executive Secretary Patricia Espinosa met Environment Minister Anil Madhav Dave, who stressed the importance of adopting sustainable lifestyles to address the issue of climate change.

Espinosa is on a two-day visit to India and this is her first visit to the country as the UNFCCC Executive Secretary.

During the meeting, Dave highlighted India’s Science Express Climate Action Special (SECAS) train being run as an ongoing climate change awareness programme for various sections of society, especially students.

“The Environment Minister also emphasised the importance of sustainable lifestyles in addressing climate change issues,” it said.

Earlier, in a meeting with Environment secretary Ajay Narayan Jha, Espinosa acknowledged India as an important partner in pursuing the agenda of climate change.

“She expressed interest in engaging with Indian institutions playing a major role in climate action in India. She dwelt upon the synergy between the Sustainable Development Goals (SDGs) and climate actions,” the official statement said.

She praised India’s actions as an example for many other countries and emphasised the need to showcase these efforts on international platforms.

Meanwhile, Jha highlighted India’s actions to address climate change, including the goals to reduce the emission intensity of its GDP by 33-35 per cent from 2005 levels by 2030, increasing the share of non-fossil fuel sources in the electricity mix, afforestation efforts and the world’s largest renewable energy programme being pursued in India.

He also underlined the climate change governance

structure to monitor climate change actions in India, which includes the Prime Minister's Council on Climate Change chaired by the Prime Minister and Executive Committee on Climate Change, chaired by the Principal Secretary to the Prime Minister.

The issues of adequate means of implementation including climate finance, capacity building and technological support to developing countries were also flagged during the meeting.

"It was also highlighted that the core principles of equity and CBDR-RC (Common but Differentiated Responsibilities and Respective Capabilities) need to be operationalised in the Paris Rule Book," the statement said.

11 MINISTRIES COME TOGETHER TO CHECK ANTIMICROBIAL RESISTANCE

The Health Ministry has chalked out an action plan and brought on board 10 other ministries to promote rational use of antibiotics in veterinary and food sector besides curbing their use for growth promotion in animals.

As the per its National Action Plan, the ministry seeks to set up a surveillance system to check antimicrobial resistance (AMR) and also stop use of antibiotics for growth promotion and prophylaxis (control of infection) in animals.

"The use of antibiotics for growth promotion has emerged in the wake of escalated livestock farming. Farm owners mix antibiotics in the feed given to animals to speed up their growth and also to control infections which leads to antimicrobial resistance in them.

"Further, when we drink their milk, have meat or even the poultry products, the strains of antibiotics get into our body and leading to antibiotic resistance in our body," a health ministry official said.

Antimicrobial resistance occurs when microorganisms such as bacteria, fungi and parasites develop a resistance to antimicrobial drugs like antibiotics, antifungals, antivirals, antimalarials, and anthelmintics.

Microorganisms that develop antimicrobial resistance are sometimes referred to as "superbugs".

As a result, the medicines become ineffective and infections persist in the body, increasing the risk of spread to others.

The ministries which will work together on this issue include Ministry of Agriculture & Farmers Welfare, AYUSH, Chemicals and Fertilizers, Consumer Affairs, Food and Public Distribution, Environment and Science and Technology.

Union Health Minister J P Nadda will chair a high-level inter-ministerial consultation on antimicrobial resistance on April 19 with all the ministries concerned.

"The action plan is aimed at establishing regulations for use of antibiotics in humans as well as in veterinary and food

sector and also for effluent treatment to safeguard the environment," the official said.

"Uncontrolled use of antibiotics in human as well as in veterinary and increased use of antibiotics as growth promoters in animals along with inadequate implementation of regulations for schedule H1 and schedule X drugs in humans are major challenges before us," the official said.

RAILWAYS TO EXPLORE MODERN TECH TO DETECT RAIL FRACTURE

Faced with increased number of derailments, the Railways will explore possibilities of acquiring advanced system for rail fracture detection and track monitoring to enhance safety.

Aiming at augmenting the pace of modernized technological adaptations, the Research and Development Standards Organization (RDSO) of the Railways will hold a two-day global technology conference here next month.

With four lead thrust areas - safety, reliability, capacity enhancement and customer service, the meet beginning from May 3 envisages bringing in new perspectives and insights in planning for future rail transportation growth in the country and for assessing contemporary global technologies relevant to adoption.

Several experts from rail transportation development and allied technological industries, academia and research fraternity across the world are slated to deliver presentations and interact with experts of Indian Railways for identification of appropriate cutting edge technologies and systems available worldwide for adaptation.

Besides safety, the conference will also explore on capacity enhancement, congestion reduction and enhanced customer service.

INDIA, NEIGHBOURS PUSH FOR LEPROSY, KALA-AZAR ELIMINATION BY 2020

Countries in the WHO South-East Asian Region including India today resolved to fast-track efforts to eradicate and eliminate neglected tropical diseases (NTD) such as leprosy, lymphatic filariasis and kala-azar by 2020.

These diseases, the global health body said, affect the most marginalised and neglected population, pushing them further into poverty and a life marred by deformity and stigma.

Among the six WHO regions, South-East Asia continues to bear the second highest burden of NTDs.

It has the highest burden of lymphatic filariasis, accounting for 53 per cent of global population requiring preventive chemotherapy.

The region also accounts for 74 per cent of new leprosy cases reported globally, nearly 41 per cent of global kala-azar cases

and 42 per cent of children who require preventive chemotherapy for soil-transmitted helminths.

Adopting a 'Call for Action' at a high-level ministerial meeting in Jakarta, the member countries pledged according the highest priority to accelerating efforts against NTDs.

"WHO South-East Asia made the battle against NTDs a regional health priority and a flagship programme in 2014. We are seeing significant progress.

"Last year alone India was declared yaws-free, and Maldives and Sri Lanka eliminated lymphatic filariasis as a public health problem. Our region continues to undertake the largest preventive chemotherapy campaign in the world," said Poonam Khetrpal Singh, Regional Director, the WHO SEAR.

The call stressed on promoting innovation and research to improve surveillance, diagnosis and treatment for further reducing NTD diseases burden.

The member countries also pledged to increase monetary and human resources in a sustainable manner, to meet newer challenges as NTDs get increasing confined to smaller geographical pockets, closer to elimination.

The WHO South-East Asia Region is targeting elimination of lymphatic filariasis, kala-azar, schistosomiasis, trachoma and leprosy as a public health problem and is also seeking to end yaws.

Out of the nine countries endemic for lymphatic filariasis (LF) in the region, Maldives and Sri Lanka have eliminated the disease as a public health problem.

Thailand and Bangladesh have completed mass drug administration (key initiative for LF elimination) in all endemic areas, while India became the first country globally to be verified for yaws elimination and formally acknowledged to be yaws free in 2016.

The region is closer to achieving elimination of kala-azar as a public health problem, the health body said.

The Jakarta Call also sought innovative approaches to increase community participation and monitor progress on a real time basis at the lowest possible administrative level and introduce new tools as soon as they are made available.

"Though more countries are getting closer to eliminating various NTDs, challenges remain, which need to be dealt with on a priority," the Regional Director said.

AIIMS SYMPOSIUM TO DELIBERATE UPON DENGUE VACCINE IN INDIA

A symposium by AIIMS in collaboration with France will deliberate upon launching clinical trials to establish the safety and efficacy of dengue vaccine in India.

The two-day symposium 'AIIMS-FAM Dengue, Zika and Chikungunya', which began here today, is being held in collaboration with The Fondation de l'Académie de Médecine

(FAM-Medical Academy Foundation) of France.

"The conference will also focus on areas like virology, epidemiology and expansion of diseases, scientific advance on diagnosis and care and prevention and control of diseases," AIIMS Director, Randeep Guleria said.

Experts from Philippines and Brazil, countries where the vaccine has been launched, will participate in the symposium to share their success stories.

"The symposium is being held at an appropriate time, especially when the risk of dengue and chikungunya is round the corner with the monsoon coming up. Therefore, we not only need to be prepared, but also see how we can move forward in areas of research, prevention and management of these diseases," Guleria said.

He said India goes through the same cycle of dengue outbreak every year even as there is a surge in such cases.

"And then we forget about it once the monsoon is over," he lamented.

The AIIMS director stressed on the need for developing preventive strategy like identifying and treating high-risk individuals.

"We have put in place a system so that these patients are admitted and treated without delay. Dengue has a very low mortality if it is diagnosed early. The disease is often reported late, leading to high mortality," Guleria said.

The symposium will also see experts discuss the mosquito-borne Zika virus, transmitted by the bite of Aedes mosquito, which also causes dengue.

"Zika is being reported in south-east Asia, and also in Thailand and Singapore. We have a lot of people going to these countries as tourists as well as for business.

"We do not want to miss out on those who get infected and come back during the incubation period when the symptoms (of such diseases) are mild. They come back into the community and spread the vector-borne disease. So, the government is keen on having a programme for monitoring of Zika," the official said.

Many Indian states have been battling the outbreak of dengue and Chikungunya since the past decade, with over 40,000 such cases reported last year. As many as 4,431 cases of dengue were reported in Delhi alone in 2016.

Meanwhile, Sanofi Pasteur and Panacea Biotech have approached the Central Drugs Standard Control Organisation for grant of marketing permission to conduct the clinical trials of dengue vaccine in India.

GOOGLE DOODLE PAYS TRIBUTE TO CASSINI'S 'GRAND FINALE'

Google dedicated a quirky doodle to NASA's Cassini spacecraft as it began its final set of 22 orbits of Saturn before the

National Science Briefs

probe plunges into the ringed planet to bring an end to its 20-year-long journey.

The colourful, animated doodle, created by US artist Nate Swineheart, depicts a cute little Cassini spacecraft as an interstellar photographer, waiting with a camera.

As Saturn comes into view, Cassini clicks multiple images of Saturn, and then takes a selfie.

The spacecraft will indulge in series of swoops between Saturn and its rings that are part of Cassini's dramatic "Grand Finale," a set of orbits offering scientists an unprecedented look at the second largest planet in our solar system.

"By plunging into this fascinating frontier, Cassini will help scientists learn more about the origins, mass, and age of Saturn's rings, as well as the mysteries of the gas giant's interior. And of course there will be breathtaking additions to Cassini's already stunning photo gallery," Google said.

Cassini is a joint endeavour of NASA, the European Space Agency (ESA), and the Italian space agency (ASI).

The spacecraft began its 2.2 billion-mile journey 20 years ago and has been hanging out with Saturn since 2004.

Later this year, Cassini will say goodbye and become part of Saturn when it crashes through the planet's atmosphere.

A 13-YEAR-OLD MATHEMATICAL WONDER!

Complex calculations are a source of nightmares for most, but for 13-year-old Aditi Sharma who can perform mathematical problems in a matter of seconds, it is, quite literally, child's play.

Aditi emerged as the winner of the 'listening competition' in the 12th State level Abacus and Mental Arithmetic Championship held here recently, where 60 students aged between 5-13 years showcased their calculation skills using UCMAS, an ABACUS arithmetic technique.

Aditi orally solved calculations from one-digit to four-digit numbers up to 100 rows at a speed "faster than one takes to write on paper".

"I take an hour-long class and practise it back at home for 10 minutes on a regular basis and that is how I only take few seconds to solve all the calculations requiring 1 to 5 digits. Not only have my calculation skills got sharper and faster, my learning speed has also increased," Aditi said.

She was awarded with a trophy and a cash prize of Rs 5,100.

Students Daksh Agarwal and Anish Roy Chowdhary who were the first and the second runners-up respectively, received cash prizes of Rs 3,100 and Rs 2,100 respectively.

"UCMAS is an international concept developed from 'Zhusuan Methodology' for brain development of children of age group 5-13 years.

"It effectively activates children's latent mental power

and develops mental and creative skills and a photographic memory resulting in self-reliance and self-confidence," Rajeev Garg, organiser of the championship, said.

JAMUN USED TO MAKE LOW-COST SOLAR CELLS

Plucking and feasting on fresh, delectable jamuns is a favourite childhood pastime during summer months, but scientists at IIT Roorkee have found a novel use for the juicy Indian fruit - making inexpensive solar cells.

Researchers used naturally occurring pigment found in jamun as an inexpensive photosensitiser for Dye Sensitised Solar Cells (DSSCs) or Gratzel cells.

Gratzel cells are thin film solar cells composed of a porous layer of titanium dioxide (TiO₂) coated photoanode, a layer of dye molecules that absorbs sunlight, an electrolyte for regenerating the dye, and a cathode.

These components form a sandwich-like structure with the dye molecule or photosensitizer playing a pivotal role through its ability to absorb visible light.

"The dark colour of jamun and abundance of jamun trees in IIT campus clicked the idea that it might be useful as a dye in the typical Dye Sensitised Solar Cells (DSSC)," lead researcher Soumitra Satapathi, assistant professor at Indian Institute of Technology (IIT) Roorkee in Uttarakhand, told PTI.

Researchers extracted dyes from jamun using ethanol. They also used fresh plums and black currant, along with mixed berry juices which contain pigments that give characteristic colour to jamun.

The mixture was then centrifuged and decanted. The extracted coloured pigment called anthocyanin was used as a sensitiser.

"Natural pigments are way economical in comparison to regular Ruthenium-based pigments and scientists are optimising to improve the efficiency," said Satapathi, who is also a visiting professor at the University of Massachusetts Lowell in the US.

"The increasing pressure on fossil fuels and concern of global warming has inspired continuous search for alternate energy," said Satapathi

Uncertainty over the pace at which new large dams or nuclear plants can be built means strong reliance on solar power - an area where India has high potential and equally high ambition - to deliver on the country's pledge to build up a 40 per cent share of non-fossil fuel capacity in the power sector by 2030, researchers said.

"In principle, we have a large social need for renewable energy especially solar energy. For quite sometime, our lab is actively engaged in low cost high efficiency solar cells production," said Satapathi.

The research team, which includes Nipun Sawhney and

Anubhav Raghav, is very optimistic that the process can easily be replicated for mass production of solar cells.

The simplicity and cost effectiveness of the overall fabrication process, widespread availability of fruits and juices, and ease of extraction of anthocyanin dyes render them novel and inexpensive candidates for solar cells application, researchers said.

The research was published in the Journal of Photovoltaics.

DELHI-NCR KIDS EXPERIENCE MOON WALK AT SPACE CAMP

Walking on the moon is a dream that each one of us has harboured at some point, but three students from Delhi-NCR had the chance to realise it at a space camp in the US Space and Rocket Center (USSRC).

Harshita Puri, Pranav Kaushik (Ambience Public School) and S Aditya - all class 12 students - were part of a week-long programme during which they joined a team of 320 students from 45 countries, training as astronauts and experiencing the life of a NASA scientist.

Sharing her experience, Harshita from Greenwood Public School in Gurgaon told PTI, "It was a lot of fun and a totally new experience. We were tied to a rope and there was very less gravity. The earth was not pulling us and we had to put a lot of energy to come down."

Aditya from Delhi Public School in Rohini here, has always been inspired by Neil Armstrong and walking on the moon was like a "dream come true" for him.

"I was always inspired by Neil Armstrong and it was a dream come true for me," he said.

The camp also served as a platform for the three of them to interact with students from other countries and explore their common love for science.

"Meeting students from around the world who share the same passion for rockets, jets, space shuttles, and the moon walk was extremely exciting.

"We learnt a lot from the experiences of scientists and astronauts. What's really great is that the programme combines science and engineering with fun and friendship for life," Pranav said.

The three students were among the total 17 students from across the country who were chosen for the once-in-a-lifetime learning experience at the Honeywell Leadership Challenge Academy (HLCA) at the USSRC in Huntsville in Alabama.

The unique leadership programme meant exclusively for the children of Honeywell employees, included activities like rocket designing, building and testing; participation in simulated astronaut training, shuttle missions and a moon walk.

The participants also met scientists, engineers, and

former astronauts, who reinforced core leadership capabilities and shared their first-hand experiences.

For Aditya, meeting retired American NASA astronaut Robert Lee Gibson, who is said to have symbolically ended the Cold War with Russia after shaking hands with a Russian cosmonaut in space, was one of the most exciting experiences.

"We shook hands with Gibson who ended the Russian - American cold war after shaking hands with a Russian cosmonaut in space!" Aditya told PTI.

The programme is designed to highlight the importance of science, technology, engineering and mathematics (STEM) for students between the ages of 16-18 years.

"The act of bringing this global Honeywell community together with space camp allows these students to plan for a future of improving life on our planet and beyond," Deborah Barnhart, CEO and executive director, USSRC, said.

"They bring the best of their diverse cultures to the space camp, where they use teamwork and technology to prepare for a future they have yet to imagine," she said.

AIR POLLUTION MAY CAUSE YEAR-ROUND RUNNY NOSES: STUDY

Air pollution in cities like New Delhi or Beijing may cause people to have year-round runny noses and chronic sinus problems, warn scientists including one of Indian origin.

Although human population studies have linked air pollution to chronic inflammation of nasal and sinus tissues, direct biological and molecular evidence for cause and effect has been scant.

Researchers found that mice continually exposed to dirty air have that direct biological effect.

Scientists have long known that smog, ash and other particulates from industrial smokestacks and other sources that pollute air quality exacerbate and raise rates of asthma symptoms, but had little evidence of similar damage from those pollutants to the upper respiratory system.

The new findings have broad implications for the health and well-being of people who live in large cities and industrial areas with polluted air, particularly in the developing world.

"In places like New Delhi, Cairo or Beijing, where people heat their houses with wood-burning stoves, and factories release pollutants into the air, our study suggests people are at higher risk of developing chronic sinus problems," said Murray Ramanathan, associate professor at the Johns Hopkins University School of Medicine in the US.

Chronic sinusitis can cause congestion, pain and pressure in the face, and a stuffy, drippy nose.

Numerous studies have reported significant social implications of chronic sinonasal disease, including depression, lost productivity and chronic fatigue.

National Science Briefs

To see how pollution may directly affect the biology of the upper airways, the researchers exposed 38 eight-week-old male mice to either filtered air or concentrated Baltimore air with particles measuring 2.5 micrometers or less, which excludes most allergens, like dust and pollen.

The aerosolized particles, although concentrated, were 30 to 60 per cent lower than the average concentrations of particles of a similar size in cities like New Delhi, Cairo and Beijing.

Nineteen mice breathed in filtered air, and 19 breathed polluted air for 6 hours per day, 5 days a week for 16 weeks.

The researchers used water to flush out the noses and sinuses of the mice, and then looked at the inflammatory and other cells in the flushed-out fluid under a microscope.

They saw many more white blood cells that signal inflammation, including macrophages, neutrophils and eosinophils, in the mice that breathed in the polluted air compared with those that breathed in filtered air.

For example, the mice that breathed in the polluted air had almost four times as many macrophages than mice that breathed filtered air.

“We’ve identified a lot of evidence that breathing in dirty air directly causes a breakdown in the integrity of the sinus and nasal air passages in mice,” said Ramanathan.

“Keeping this barrier intact is essential for protecting the cells in the tissues from irritation or infection from other sources, including pollen or germs,” he said.

AGENCIES ACROSS THE WORLD WORKING TO TACKLE SPACE JUNK: REDDY

The space debris has emerged as a new cause of global concern prompting the relevant agencies world-wide to make a joint bid to find a solution to the menace, says defence minister’s Scientific Advisor Satheesh Reddy.

“Space debris is a serious concern for the entire world. The ISRO has conducted a conference on this. That is going to be an emerging subject and also a serious issue as a large number of satellites are launched every year all over the world.

“All space agencies of respective countries (including ISRO) are working to have a coordinated system to tackle this problem,” Reddy told PTI on the sidelines of a programme at Osmania University here.

According to European Space Agency (ESA), over 4,900 space launches since 1957 have led to an on-orbit population of more than 18,000 tracked objects. Only 1,100 are functional spacecraft. The remaining are space debris - the objects no longer serving any useful purpose.

About 64 per cent of the routinely-tracked objects are fragments from some 250 breakups, explosions and collisions of satellites or rocket bodies. In addition, there is an evidence of a much larger population of the debris that cannot be tracked

operationally.

An estimated 7,00,000 objects larger than 1 cm and 170 million objects larger than 1 mm are expected to be orbiting around earth.

This large amount of space hardware has a total mass of more than 7,500 tonnes.

Speaking about the research programmes in Space Science, Reddy said that Osmania University has the calibre to undertake the subject and work with the government.

“Osmania University has a very good telescope with a very good object viewing capacity. Why not Osmania University revive its subject and work in this area so that we have much more flexibility tomorrow in launching our satellites,” Reddy said.

Replying to a query, he said India needs a large number of cyber security professionals in future and universities across the country need to focus on the subject, given its importance.

According to him, only National Institute of Technology, Kurukshetra is offering a masters degree in cyber security.

HEALTH AUTHORITIES SUSPECT MUTATION IN SWINE FLU VIRUS

The health authorities in Telangana suspect that the H1N1 virus, that causes swine flu, may have mutated.

The state is witnessing swine flu cases even in the summer season though it is not unusual, an official said.

“Most probably yes, due to the high replication rate there could be an antigenic drift which could have milder mutations,” state-run Nizam’s Institute of Medical Sciences (NIMS) Director K Manohar told PTI yesterday, when asked if they suspect that the virus has mutated.

The authorities are awaiting a confirmation on whether the virus has mutated.

“After confirmation of the probable mutation we have to study the disease profile and observe,” he said.

Manohar said, “It is not unusual to see swine flu cases in summer. There is a difference of occurrence in the northern hemisphere and in the southern hemisphere. But cases can occur in summer as well as in winter.”

He also said that it cannot be predicted if a virulent form of H1N1 would be seen when the high temperatures subside and the monsoon sets in.

According to a swine flu bulletin issued by Telangana government on April 12, as many as 9,382 samples were tested for swine flu from August 1, 2015 to April 11 this year in the state and out of them 1,343 were found to be positive.

There were 22 deaths because of swine flu and other complications during the period.

As per the figures, 11 of 77 samples tested on April 11 were found positive for the virus.

Sufficient stock of medicines and testing kits were available in the state at all levels, the bulletin said.

KERALA CAPITAL TO HOST NATIONAL WORKSHOP ON SPACE TECH

A two-day national workshop on space technology will be held here from May 19.

Indian Society of Systems for Science & Engineering's Thiruvananthapuram chapter is organising the event jointly with Vikram Sarabhai Space Centre (VSSC), Kerala State Remote Sensing & Environment Centre (KSREC) and National Institute of Rural Development & Panchayati Raj (NIRD&PR).

Titled "Space Applications for Sustainable Growth and Advancement (SAGA 2017)," the workshop covers application of space technology in areas like agriculture, fisheries, land resource management, irrigation, climatic studies, navigation and disaster management, a release said here today.

The workshop gains importance with the increased use of space technologies ensuring safety and improving the common man's quality of life, it said.

VAASTU CAN RESCUE FROM PERILS OF UNPLANNED URBANISATION

Vaastu shastra should be followed to curb ongoing unplanned urbanisation, the head of Ranbir and Chitra Gupta School of Infrastructure Design and Management, IIT-KGP, Prof. Joy Sen said today.

"Incorporating Vaastu principles in designs of buildings could make buildings more eco-friendly since principles of layout, measurements, ground preparation, space arrangement and spatial geometry are well defined in Vaastu Shastra," Sen told

PTI on the sidelines of a discussion on 'Vaastu in Global Perspective'.

Terrestrial science, solar science and ecological science are merged into one in Vaastu science, he said.

"Remember how old buildings had 'Purber verandah' (verandahs with east open), 'Garomer ghar' (summer rooms) and 'Siter ghar' (winter rooms). All that is gone in most modern buildings," the academician said.

"The architecture of the Tagore household at Jorasanko embodies the concept of shared living and meditation," he said, adding that the concept of such old buildings were in sync with nature and ecology.

"Go through the lanes and by-lanes in Lucknow, Varanasi and in parts of north Kolkata, and see the buildings. You will understand what I am talking about," he said.

Pointing out that well known real estate firms these days are incorporating features of Vaastu Shastra in their buildings, Sen said, "In recent times, many leading architects are considering about following Vaastu features in their works and that is a good sign."

"But there should be more awareness," he added. Prof Sen also talked about a project on the heritage city of Varanasi.

"Our Project Varanasi is based on eco-tourism, heritage tourism, on the river, the participation of communities and their economy for centuries," he said.

The workshop was organised jointly by Chitra Gupta School of Infrastructure Design and Management, IIT-KGP and Management and another organisation 'Unlimited Potential'.

"The aim of the workshop was to provide a basic understanding on various principles of designing and managing built environment, based on ancient knowledge of Vaastu and Fengshui and their applicability in specific contexts" said Dr Ankhi Banerjee, the coordinator of the workshop.

NOW, SMARTPHONE CONTROLLED SYSTEM TO KEEP DIABETES IN CHECK

Scientists have successfully engineered cells to produce insulin under the command of a smartphone, helping keep blood sugar levels within normal limits in diabetic mice.

The new system developed by researchers, including those from East China Normal University, involves engineering insulin-producing cells to do their work when illuminated with infrared light.

Human cells can be genetically engineered into living factories that efficiently manufacture and deliver hormones and signalling molecules, but most synthetic biological circuits do not offer the same degree of sensitivity and precision as digital sensors, researchers said.

They placed the cells in an insulated sheath that also contained red LED lights - then, they placed the sheath under the skin of test mice.

They controlled the lights remotely via smartphone app, sending signals to a control box containing a coil that activated the lights.

The smartphone received data from an embedded blood glucose metre. The result was a closed-loop system in which the glucose metre automatically conducted glucose testing on a periodic basis.

The smartphone app analysed the data to determine when and how much insulin needed to be produced.

It then sent a signal to the control box, activating the LED lights, causing the cells to produce and release insulin into the bodies of the mice.

The researchers tested their system with mice over a period of several weeks and report that it successfully maintained insulin levels.

“Successfully linking digital signals with engineered cells represents an important step toward translating similar cell-based therapies into the clinic,” researchers said.

The study was published in the journal *Science Translational Medicine*.

TESTOSTERONE INCREASES IMPULSIVE BEHAVIOUR IN MEN: STUDY

The male hormone, testosterone, hampers decision making and increases impulsive behaviour in men, a new study has found.

Researchers, including those from California Institute of Technology in the US, found that men given doses of testosterone performed more poorly on a test designed to measure cognitive reflection than a group given a placebo.

“What we found was the testosterone group was quicker

to make snap judgements on brain teasers where your initial guess is usually wrong,” said Colin Camerer, Professor at Caltech.

“The testosterone is either inhibiting the process of mentally checking your work or increasing the intuitive feeling that ‘I’m definitely right,’” said Camerer.

The study, which is one of the largest of its type ever conducted, included 243 males who were randomly selected to receive a dose of testosterone gel or placebo gel before taking a cognitive reflection test.

A math task was also given to control for participant engagement, motivation level, and basic math skills.

The results show that the group that received testosterone scored significantly lower than the group that received the placebo, on average answering 20 per cent fewer questions correctly.

The testosterone group also “gave incorrect answers more quickly, and correct answers more slowly than the placebo group,” the researchers wrote in the study published in the journal *Psychological Science*.

The same effect was not seen in the results of the basic math tests administered to both groups.

The results “demonstrate a clear and robust causal effect of (testosterone) on human cognition and decision-making,” researchers said.

They believe that the phenomenon they have observed can be linked to testosterone’s effect of increasing confidence in humans.

Testosterone is thought to generally enhance the male drive for social status, and recent studies have shown that confidence enhances status.

“We think it works through confidence enhancement. If you are more confident, you will feel like you are right and will not have enough self-doubt to correct mistakes,” Camerer said.

Camerer said the results of the study raise questions about potential negative effects of the growing testosterone-replacement therapy industry, which is primarily aimed at reversing the decline in sex drive many middle-aged men experience.

TESTOSTERONE MAKES MEN IMPULSIVE: STUDY

Male hormone, testosterone, hampers decision making and increases impulsive behaviour in men, a new study suggests.

Researchers, including those from California Institute of Technology in the US, found that men given doses of testosterone performed more poorly on a test designed to measure cognitive reflection than a group given a placebo.

“What we found was the testosterone group was quicker to make snap judgements on brain teasers where your initial guess is usually wrong,” said Colin Camerer, Professor at Caltech.

“The testosterone is either inhibiting the process of

mentally checking your work or increasing the intuitive feeling that ‘I’m definitely right,’” said Camerer.

The study, which is one of the largest of its type ever conducted, included 243 males who were randomly selected to receive a dose of testosterone gel or placebo gel before taking a cognitive reflection test.

A math task was also given to control for participant engagement, motivation level, and basic math skills.

The results show that the group that received testosterone scored significantly lower than the group that received the placebo, on average answering 20 per cent fewer questions correctly.

The testosterone group also “gave incorrect answers more quickly, and correct answers more slowly than the placebo group,” the researchers wrote in the study published in the journal *Psychological Science*.

The same effect was not seen in the results of the basic math tests administered to both groups.

The results “demonstrate a clear and robust causal effect of (testosterone) on human cognition and decision-making,” researchers said.

They believe that the phenomenon they have observed can be linked to testosterone’s effect of increasing confidence in humans.

Testosterone is thought to generally enhance the male drive for social status, and recent studies have shown that confidence enhances status.

“We think it works through confidence enhancement. If you are more confident, you will feel like you are right and will not have enough self-doubt to correct mistakes,” Camerer said.

Camerer said the results of the study raise questions about potential negative effects of the growing testosterone-replacement therapy industry, which is primarily aimed at reversing the decline in sex drive many middle-aged men experience.

SIMPLE, NO-BAKE RECIPE TO MAKE BRICKS FROM MARTIAN SOIL FOUND

Future explorers on Mars may be able to turn the planet’s red soil into bricks stronger than steel-reinforced concrete, without using an oven or additional ingredients, scientists have found.

Applying pressure to compact the soil - equivalent of a blow from a hammer - would be sufficient to make these bricks, according to researchers from the University of California San Diego.

“The people who will go to Mars will be incredibly brave. They will be pioneers. And I would be honoured to be their brick maker,” said Yu Qiao, a professor at UC San Diego.

Proposals to use Martian soil to build habitats for manned missions on the planet are not new. However, this is the

first that shows astronauts would need minimal resources to do so.

Previous plans included nuclear-powered brick kilns or using complex chemistry to turn organic compounds found on Mars into binding polymers.

The researchers were initially trying to cut down on the amount of polymers required to shape Martian soil into bricks, and accidentally discovered that none was needed.

To make bricks out of Mars soil simulant, without additives and without heating or baking the material, two steps were key, they said.

One was to enclose the simulant in a flexible container, in this case a rubber tube. The other was to compact the simulant at a high enough pressure.

The amount of pressure needed for a small sample is roughly the equivalent of someone dropping 5 kg hammer from a height of one metre, Qiao said.

Researchers investigated the strength of the bricks and found that they are stronger than steel-reinforced concrete.

The process produces small round soil pallets that are about an inch tall and can then be cut into brick shapes.

The researchers believe that iron oxide, which gives Martian soil its signature reddish hue, acts as a binding agent.

They studied the structure of the Mars soil simulant with various scanning tools and found that the tiny iron particles coat the simulant’s bigger rocky basalt particles.

The iron particles have clean, flat facets that easily bind to one another under pressure.

Researchers said their method may be compatible with additive manufacturing or 3D printing.

To build up a structure, astronauts could lay down a layer of soil, compact it, then lay down an additional layer and compact that, and so on.

The findings were published in the journal *Scientific Reports*.

SAFER ALTERNATIVE TO LITHIUM-ION BATTERIES DEVELOPED

Scientists have developed a safer alternative to fire-prone lithium-ion batteries, which are common in household devices such as smartphones and laptops.

Researchers at the US Naval Research Laboratory (NRL) developed the nickel-zinc (Ni-Zn) batteries in which a three-dimensional (3D) Zn “sponge” replaces the powdered zinc anode, or positively charged electrode, traditionally used.

With 3D Zn, the battery provides an energy content and rechargeability that rival lithium-ion batteries while avoiding the safety issues that continue to plague lithium.

“The 3D sponge form factor allows us to reimagine zinc, a well-known battery material, for the 21st century,” said

International Science Briefs

Debra Rolison from NRL's Advanced Electrochemical Materials group.

Zinc-based batteries are the go-to global battery for single-use applications, but are not considered rechargeable in practice due to their tendency to grow conductive whiskers (dendrites) inside the battery, which can grow long enough to cause short circuits.

"The key to realising rechargeable zinc-based batteries lies in controlling the behaviour of the zinc during cycling," said Joseph Parke, lead author of the research paper published in the journal *Science*.

"Electric currents are more uniformly distributed within the sponge, making it physically difficult to form dendrites," said Parke.

With the benefits of rechargeability, the 3D Zn sponge is ready to be deployed within the entire family of Zn-based alkaline batteries across the civilian and military sectors, researchers said.

"We can now offer an energy-relevant alternative, from drop-in replacements for lithium-ion to new opportunities in portable and wearable power, and manned and unmanned electric vehicles, while reducing safety hazards, easing transportation restrictions, and using earth-abundant materials," said Jeffrey Long from NRL.

ANCIENT HUMAN DNA DISCOVERED IN CAVES WITHOUT BONES

Scientists have successfully retrieved DNA of extinct human ancestors from caves with no skeletal remains, an advance that could shed new light into human evolution and history.

While there are numerous prehistoric sites in Europe and Asia that contain tools and other human-made artefacts, skeletal remains of ancient humans are scarce.

Researchers of the Max Planck Institute for Evolutionary Anthropology in Germany have therefore looked into new ways to get hold of ancient human DNA.

From sediment samples collected at seven archaeological sites, the researchers "fished out" tiny DNA fragments that had once belonged to a variety of mammals, including our extinct human relatives.

They retrieved DNA from Neanderthals in cave sediments of four archaeological sites, also in layers where no hominin skeletal remains have been discovered.

In addition, they found DNA of Denisovans in sediments from Russia.

These new developments now enable researchers to uncover the genetic affiliations of the former inhabitants of many archaeological sites which do not yield human remains.

By looking into the genetic composition of our extinct relatives, the Neanderthals and Denisovans, the researchers can

shed light on our own evolutionary history.

However, fossils of ancient humans are rare, and they are not always available or suitable for genetic analyses.

"We know that several components of sediments can bind DNA," said Matthias Meyer of the Max Planck Institute.

"We therefore decided to investigate whether hominin DNA may survive in sediments at archaeological sites known to have been occupied by ancient hominins," said Meyer.

Researchers collected sediment samples covering a time span from 14,000 to over 550,000 years ago.

Using tiny amounts of material the researchers recovered and analysed fragments of mitochondrial DNA - genetic material from the mitochondria, the "energy factories" of the cell - and identified them as belonging to twelve different mammalian families that include extinct species such as the woolly mammoth, the woolly rhinoceros, the cave bear and the cave hyena.

The researchers then looked specifically for ancient hominin DNA in the samples.

"From the preliminary results, we suspected that in most of our samples, DNA from other mammals was too abundant to detect small traces of human DNA," said Viviane Slon, PhD student at the Max Planck Institute.

"We then switched strategies and started targeting specifically DNA fragments of human origin," Slon said.

Nine samples from four archaeological sites contained enough ancient hominin DNA for further analyses, researchers said.

Eight sediment samples contained Neanderthal mitochondrial DNA from either one or multiple individuals, while one sample contained Denisovan DNA.

Most of these samples originated from archaeological layers or sites where no Neanderthal bones or teeth were previously found.

NASA'S CASSINI COMPLETES FIRST DIVE BETWEEN SATURN'S RINGS

NASA's Cassini spacecraft has successfully executed its historic first-ever dive through the narrow gap between the planet Saturn and its rings, marking the beginning of the 'Grand Finale' of the 20-year-long journey.

The spacecraft is in the process of beaming back science data collected during its passage, through NASA's Deep Space Network Goldstone Complex in California's Mojave Desert.

"In the grandest tradition of exploration, NASA's Cassini spacecraft has once again blazed a trail, showing us new wonders and demonstrating where our curiosity can take us if we dare," said Jim Green, director of the Planetary Science Division at NASA in the US.

As it dove through the gap, Cassini came within about 3,000 kilometres of Saturn's cloud tops and within about 300

kilometres of the innermost visible edge of the rings.

While mission managers were confident Cassini would pass through the gap successfully, they took extra precautions with this first dive, as the region had never been explored.

“No spacecraft has ever been this close to Saturn before. We could only rely on predictions, based on our experience with Saturn’s other rings, of what we thought this gap between the rings and Saturn would be like,” said Earl Maize of NASA’s Jet Propulsion Laboratory in the US.

“I am delighted to report that Cassini shot through the gap just as we planned and has come out the other side in excellent shape,” said Maize.

The gap between the rings and the top of Saturn’s atmosphere is about 2,000 kilometres wide.

The best models for the region suggested that if there were ring particles in the area where Cassini crossed the ring plane, they would be tiny, on the scale of smoke particles.

The spacecraft zipped through this region at speeds of about 124,000 kilometres per hour relative to the planet, so that small particles hitting a sensitive area could potentially have disabled the spacecraft.

As a protective measure, the spacecraft used its large, dish-shaped high-gain antenna four meters across as a shield, orienting it in the direction of oncoming ring particles.

This meant that the spacecraft was out of contact with Earth during the ring-plane crossing on April 26.

Cassini was programmed to collect science data while close to the planet and turn toward Earth to make contact about 20 hours after the crossing. Its next dive through the gap is scheduled for May 2.

Launched in 1997, Cassini arrived at Saturn in 2004. Following its last close flyby of the large moon Titan on April 21, Cassini began what mission planners are calling its “Grand Finale.”

During this final chapter, Cassini loops Saturn approximately once per week, making a total of 22 dives between the rings and the planet.

Data from this first dive will help engineers understand if and how they will need to protect the spacecraft on its future ring-plane crossings.

The spacecraft is on a trajectory that will eventually plunge into Saturn’s atmosphere - and end Cassini’s mission - on September 15.

‘ICEBALL’ PLANET DISCOVERED 13,000 LIGHT-YEARS AWAY

Scientists have discovered a new, frozen planet that has the same mass as that of Earth and is located 13,000 light-years away.

The finding may help understand the types of planetary

systems that exist beyond our own.

The planet is likely far too cold to be habitable for life as we know it, however, because its star is so faint, researchers said.

“This ‘iceball’ planet is the lowest-mass planet ever found through microlensing,” said Yossi Shvartzvald, a postdoctoral fellow at NASA’s Jet Propulsion Laboratory in the US.

Microlensing is a technique that facilitates the discovery of distant objects by using background stars as flashlights.

When a star crosses precisely in front of a bright star in the background, the gravity of the foreground star focuses the light of the background star, making it appear brighter.

A planet orbiting the foreground object may cause an additional blip in the star’s brightness.

In this case, the blip only lasted a few hours. This technique has found the most distant known exoplanets from Earth, and can detect low-mass planets that are substantially farther from their stars than Earth is from our sun.

The newly discovered planet, called OGLE-2016-BLG-1195Lb, aids scientists in their quest to figure out the distribution of planets in our galaxy.

An open question is whether there is a difference in the frequency of planets in the Milky Way’s central bulge compared to its disk, the pancake-like region surrounding the bulge.

The planet is located in the disk, as are two planets previously detected through microlensing by NASA’s Spitzer Space Telescope.

“Although we only have a handful of planetary systems with well-determined distances that are this far outside our solar system, the lack of Spitzer detections in the bulge suggests that planets may be less common toward the center of our galaxy than in the disk,” said Geoff Bryden, astronomer at JPL.

Although the new planet is about the same mass as Earth, and the same distance from its host star as our planet is from our sun, the similarities may end there.

It is nearly 13,000 light-years away and orbits a star so small, scientists are not sure if it is a star at all. It could be a brown dwarf, a star-like object whose core is not hot enough to generate energy through nuclear fusion.

This particular star is only 7.8 per cent the mass of our Sun, right on the border between being a star and not.

Alternatively, it could be an ultra-cool dwarf star much like TRAPPIST-1, which was recently found to host seven Earth-size planets.

Those seven planets all huddle closely around TRAPPIST-1, even closer than Mercury orbits our sun, and they all have potential for liquid water.

However, OGLE-2016-BLG-1195Lb, at the sun-Earth distance from a very faint star, would be extremely cold - likely even colder than Pluto is in our own solar system, such that any surface water would be frozen.

NASA'S DAWN SPACECRAFT EXPERIENCES MINOR GLITCH

NASA's Ceres-orbiting Dawn spacecraft has encountered a technical glitch while preparing to observe a mysterious crater on the dwarf planet.

However, the malfunctioning will not significantly impact the rest of the extended mission at Ceres, NASA said.

The spacecraft was positioning itself directly between the dwarf planet's mysterious Occator Crater and the Sun, when one of its two remaining reaction wheels stopped functioning on April 23.

The observations from this position may yield new insights about the bright material in the centre of the crater.

By electrically changing the speed at which these gyroscope-like devices spin, Dawn controls its orientation in the zero-gravity, frictionless conditions of space.

The team discovered the situation during a scheduled communications session on April 24, diagnosed the problem and returned the spacecraft to its standard flight configuration on April 25.

The failure occurred after Dawn completed its five-hour segment of ion thrusting on April 22 to adjust its orbit, but before the shorter manoeuvre scheduled for April 23-24.

The orbit will still allow Dawn to perform its opposition measurements. The reaction wheel's malfunctioning will not significantly impact the rest of the extended mission at Ceres, NASA said.

Dawn completed its prime mission in June 2016, and is now in an extended mission. It has been studying Ceres for more than two years, and before that, the spacecraft orbited giant asteroid Vesta, sending back valuable data and images. Dawn was launched in the year 2007.

The Dawn operations team has been well prepared to deal with the loss of the reaction wheel, NASA said.

The spacecraft is outfitted with four reaction wheels. It experienced failures of one of the wheels in 2010, a year before it entered orbit around Vesta, and another in 2012, as it was completing its exploration of that fascinating world.

When a third reaction wheel stopped working this week, the spacecraft correctly responded by entering one of its safe modes and assigning control of its orientation to its hydrazine thrusters.

NEW ROBOTIC SYSTEM CAN 3D PRINT BUILDINGS

MIT scientists have designed a new robotic system that can 3D print the basic structure of an entire building, an advance that would make building houses a faster, less expensive process.

The building could also be completely customised to the needs of a particular site and the desires of its maker.

Even the internal structure could be modified in new ways, researchers said.

Different materials could be incorporated as the process goes along, and material density could be varied for optimum combinations of strength, insulation, or other properties.

"Ultimately, this approach could enable the design and construction of new kinds of buildings that would not be feasible with traditional building methods, said Steven Keating, from Massachusetts Institute of Technology (MIT) in the US.

The system consists of a tracked vehicle that carries a large, industrial robotic arm, which has a smaller, precision-motion robotic arm at its end.

This highly controllable arm can then be used to direct any construction nozzle, such as those used for pouring concrete or spraying insulation material, as well as additional digital fabrication end effectors, such as a milling head.

Unlike typical 3D printing systems, most of which use some kind of an enclosed, fixed structure to support their nozzles and are limited to building objects that can fit within their overall enclosure, this free-moving system can construct an object of any size.

The researchers used a prototype to build the basic structure of the walls of a 50-foot-diameter, 12-foot-high dome - a project that was completed in less than 14 hours of "printing" time.

For these initial tests, the system fabricated the foam-insulation framework used to form a finished concrete structure.

This construction method, in which polyurethane foam molds are filled with concrete, is similar to traditional commercial insulated-concrete formwork techniques.

The system can be adapted to existing building sites and equipment, and that it will fit existing building codes without requiring whole new evaluations, Keating explains.

Ultimately, the system is intended to be self-sufficient, researchers said.

It is equipped with a scoop that could be used to both prepare the building surface and acquire local materials, such as dirt for a rammed-earth building, for the construction itself. The whole system could be operated electrically, even powered by solar panels.

The idea is that such systems could be deployed to remote regions, for example in the developing world, or to areas for disaster relief after a major storm or earthquake, to provide durable shelter rapidly.

The ultimate vision is "in the future, to have something totally autonomous, that you could send to the moon or Mars or Antarctica, and it would just go out and make these buildings for years," said Keating.

'SPECIAL STATUS FAILS TO CURB ILLEGAL TREE LOSS IN FORESTS'

Protected forests in developing nations, including India, are losing large number of trees due to illegal logging and other exploitative methods and creating significant carbon emissions, despite their special status, a new study has showed.

Safeguarded areas worldwide are being exploited rather than saved for conservation. Incentives for exploitation - such as illegal logging, agriculture and palm oil plantation - are outweighing the benefits of protection, researchers say.

The University of Edinburgh study found that intervention is needed in these areas to combat their disproportionate carbon emissions.

The study, published in Scientific Reports, outlines that deforestation rates are slowing in Brazil, but increasing throughout South East Asia, including India.

Indonesia is the second largest source of gross emissions from protected areas, after Brazil.

It produces disproportionately more emissions from its protected areas than any other country. Indonesia's protected areas total only 15 per cent of Brazil's comparative areas but produce emissions equivalent to 25 per cent of those from Brazil. This is despite Indonesia accepting USD 1 bn from Norway to reduce deforestation over a seven-year period.

Cambodia has lost 16.5 per cent of its protected forest carbon in only 12 years.

Over the same period, significant loss in protected forest areas occurred in Guatemala (9.4 per cent); Mozambique (8.1 per cent); Cote D'Ivoire (8.0 per cent) and Grenada (6.7 per cent).

More than a quarter - 27.3 per cent - of all emissions from the world's protected areas are produced by only 1.1 per cent of these forests.

Forest loss accounts for approximately 18 per cent of the world's carbon emissions, researchers say.

The loss increases atmospheric greenhouse gas, changes the global climate and reduces the availability of the Earth's carbon sinks - anything that absorbs more carbon than it releases as carbon dioxide.

Carbon emissions increase when trees are burnt and cleared from land, releasing harmful levels of carbon dioxide into the atmosphere.

Researchers hope the study may inform conservation strategies to limit the risk to protected forests.

Murray Collins, from Edinburgh's School of Geosciences, who led the study, said: "A relatively small number of the world's protected areas are experiencing disproportionate levels of protected forest loss and are therefore creating significant carbon emissions."

"There is a real danger for the future of these forests

and the global climate. It is troubling that these areas are being so heavily affected by illegal forest loss. The international community has an opportunity to reduce carbon emissions by ensuring that conservation and protected area status is enforced."

SCIENCE BEHIND PERFECT THROW DECODED

Scientists, including one of Indian origin, have mathematically calculated the best strategy for the perfect throw - be it a dart, a basket ball or even a crumpled piece of paper.

Researchers, who looked at the physics behind releasing a projectile with the human arm in a series of calculations, suggest that a slow underarm throw is the best strategy for getting a piece of paper into a nearby bin.

According to the researchers from the Yale University in the US, faster throws tend to be less accurate.

This is because the ball travels in a nearly straight line, so any errors in the angle at which the object is released tend to be amplified, they said.

"What we find is that almost the slowest arc is often the most accurate," said Madhusudhan Venkadesan, assistant professor at Yale.

"We have compared these calculations to published data of people throwing into wastebaskets, we have compared it to a study in dart throwing," Venkadesan was quoted as saying by 'BBC News'.

In sports such as basketball or darts, the strategy depends on conditions and the trade-off needed between speed and accuracy researchers said.

For example, experienced darts players throw overarm at about 5.5 metres per second, optimally releasing the dart 17 to 37 degrees before the arm becomes vertical.

On the cricket pitch, fielders are more likely to strike the wicket with a fast underarm throw.

The study was published in the journal Royal Society Open Science.

EXERCISE 'KEEPS THE MIND SHARP' IN OVER-50S: STUDY

Are you over 50 and showing signs of cognitive decline? Then doing moderate exercise several times a week is the best way to keep your mind sharp, research suggests.

Thinking and memory skills were most improved when people exercised the heart and muscles on a regular basis, a review of 39 studies found.

This remained true in those who already showed signs of cognitive decline.

Taking up exercise at any age was worthwhile for the mind and body, the BBC quoted Australian researchers as saying.

Exercises such as Tai Chi were recommended for people

International Science Briefs

over the age of 50 who could not manage other more challenging forms of exercise, the study in the British Journal of Sports Medicine said.

Physical activity has long been known to reduce the risk of a number of diseases, including type-2 diabetes and some cancers, and it is thought to play a role in warding off the brain's natural decline as we enter middle age.

The theory is that through exercise the brain receives a greater supply of blood, oxygen and nutrients that boost its health as well as a growth hormone that helps the formation of new neurons and connections.

In this analysis of previous studies, researchers from the University of Canberra looked at the effects of at least four weeks of structured physical exercise on the brain function of adults.

In a variety of brain tests, they found evidence of aerobic exercise improving cognitive abilities, such as thinking, reading, learning and reasoning, while muscle training - for example, using weights - had a significant effect on memory and the brain's ability to plan and organise, the so-called executive functions.

Joe Northey, study author and researcher from the Research Institute for Sport and Exercise at Canberra, said the findings were convincing enough to enable both types of exercise to be prescribed to improve brain health in the over-50s.

"Even if you are doing moderate exercise only once or twice a week there are still improvements in cognitive function, but the improvements were better the more exercise was done," he said.

He said people should be able to hold a conversation while doing moderate exercise.

Dr Justin Varney, lead for adult health and wellbeing at Public Health England, said any physical activity was good for brain and body.

"Whilst every 10 minutes of exercise provides some benefit, doing 150 minutes a week cuts the chances of depression and dementia by a third, and boosts mental health at any age.

"Doing both aerobic and strengthening exercises leads to a greater variety of health benefits," Varney said.

Dr Dean Burnett, lecturer in neuroscience and psychiatry at Cardiff University, said the study gave a clearer picture of how exercise affected the brain - but there were still issues.

"It could lead to increased pressure for the 50-plus age group to exercise more in order to stay mentally healthy, which is good advice but also overlooks the fact that as we age it's increasingly difficult to engage in physical activity, as our bodies are simply less capable of it," he said.

FISH AND CHIPS MAY HOLD HUMAN DNA CLUES

The classic fish and chips dish may hold the key to understanding the origins of DNA memory which is critical to

human development, a new study suggests.

DNA memory is used to tell a cell what its job is and makes sure it stays dedicated to it.

The unusual looking elephant shark (*Callorhynchus milii*), commonly used in fish and chips, is only a very distant relative of humans.

Our ancestors split off from elephant sharks more than 460 million years ago.

Now, scientists at the University of Otago in New Zealand have discovered it has a remarkably similar DNA memory system to our own.

"This memory is made up of tiny chemical tags called methylation, which are used to tell a cell what its job is and make sure it stays dedicated to it," said Tim Hore, of the Department of Anatomy at Otago, who led the research.

The DNA memory system that belongs to humans has only been found in vertebrates - animals with a backbone such as mammals, amphibians and fish.

Researchers have long wondered how it evolved and how far back in evolutionary time it exists.

"The fact elephant sharks also use methylation - tagging to turn off genes tells us this memory system has been around a long time," said Julian Peat of the Anatomy Department at Otago.

"Our study identifies elephant shark as the most evolutionarily distant animal that shares this DNA-regulation system with us humans, which makes it very interesting to take a closer look at," Peat said.

Hore said with access to this unique genetic resource, the team is excited about further research on the elephant shark and its DNA.

"The elephant shark is something of a living fossil - it is the slowest evolving vertebrate we know of. It only lives in the cooler waters of Australia and New Zealand, so we are really fortunate to have something this valuable to science in our backyard," said Hore.

"So many things remain mysterious about the elephant shark - we do not know whether this methylation memory persists across generations, or if it contributes to how gender is decided," Hore added.

SELF-CHARGING SMARTPHONE BATTERIES IN THE OFFING

Scientists are developing new self-charging batteries that harvest energy from light and could put an end to our smartphone recharging woes.

Lithium-ion batteries have allowed the rapid proliferation of mobile devices such as phones, tablets and computers. These tools however require frequent re-charging because of the limited energy density of their batteries.

"With smart phones now, you can basically carry your

whole office in that device, they are loaded with all sorts of applications so you need a lot of power to use it everyday and sometimes, you don't have access to a plug to recharge," said Professor George P Demopoulos of the McGill University in Canada.

This has led to the development of portable solar chargers but these hybrid devices are difficult to miniaturise due to their complex circuitry and packaging issues.

To solve this problem, researchers are working on a single device capable of harvesting and storing energy using light.

The study shows that a standard cathode from a lithium-ion battery can be "sensitised" to light by incorporating photo-harvesting dye molecules.

"In other words, our research team was able to simulate a charging process using light as a source of energy," said Andrea Paoella, researcher at Hydro-Quebec in Canada.

Scientists will now have to build an anode, the storage component, which will close the device's circuit, allowing energy produced by the cathode to be transferred and stored.

If they succeed, they will have built the world's first 100 per cent self-charging lithium-ion battery.

TINY SILICA 'CAGES' TO KEEP VACCINES SAFE AT HIGH TEMPERATURES

Vaccines and antibodies could be transported and stored without refrigeration by capturing them in tiny silica 'cages', scientists have found.

The discovery by researchers at University of Bath in the UK could make transporting vital medicines to remote or dangerous places much easier, cheaper and safer.

Vaccines and many other medicines contain proteins which break down and become unusable at room temperatures, meaning they must be kept refrigerated for storage and transportation in a so-called "cold chain".

Loss of vaccines through breaks in the cold chain are a

serious global public health issue, in particular for mass childhood vaccination programmes in the developing world.

Breaks in cold chain storage result in the loss of millions of doses of vaccines each year, researchers said.

The team, working with colleagues at the University of Newcastle in the UK, created a technique which can keep proteins intact at high temperatures up to 100 degrees Celsius, by encasing them in silica cages.

Silica, which sand is made from, is non-toxic and inert. Once the protein has been encased in silica it can be stored or transported without refrigeration before the silica coat can be removed chemically, leaving the proteins unaffected.

The method called ensilication will solve the costly and often impractical need for a cold chain to protect protein-based products including vaccines, antibodies and enzymes, researchers said.

"Once the proteins in a vaccine break down and tangle up, it is useless. You can think of it like an egg that has been boiled - it can not be unboiled," said Asel Sartbaeva from Bath's Department of Chemistry.

"The ability to store and transport proteins at room temperatures or even hotter would remove a major logistical problem for safely delivering vaccines and other medicines to patients around the world," said Sartbaeva, who led the project.

"We have demonstrated with ensilication that we can simply and reliably keep proteins from breaking down even at up to 100 degrees Celsius, or store them as a powder for up to three years at room temperature without loss of function.

When a protein in solution is mixed with silica, silicon dioxide binds closely around protein to match its shape and quickly builds up many layers, encasing the protein.

A major advantage of this method is that unlike similar techniques it does not require freeze-drying, something that around half of all vaccines would not survive intact.

The finding was published in the journal *Scientific Reports*.

HUMAN VISION INSPIRES NEW CAMERA SYSTEM

Inspired by how human gaze works, scientists have created a new way for computer-controlled cameras to 'see'.

Researchers from University of Glasgow in the UK developed a method for creating video using single-pixel cameras.

They have found a way to instruct cameras to prioritise objects in images using a method similar to the way our brains make the same decisions.

The eyes and brains of humans, and many animals, work in tandem to prioritise specific areas of their field of view.

During a conversation, for example, visual attention is focused primarily on the other speaker, with less of the brain's 'processing time' given over to peripheral details.

The vision of some hunting animals also works along similar lines.

The team's sensor uses just one light-sensitive pixel to build up moving images of objects placed in front of it.

Single-pixel sensors are much cheaper than dedicated megapixel sensors found in digital cameras, and are capable of building images at wavelengths where conventional cameras are expensive or simply do not exist, such as at the infrared or terahertz frequencies.

The images the system outputs are square, with an overall resolution of 1,000 pixels. In conventional cameras, those thousand pixels would be evenly spread in a grid across the image.

The team's new system instead can choose to allocate its 'pixel budget' to prioritise the most important areas within the frame, placing more higher resolution pixels in these locations and so sharpening the detail of some sections while sacrificing detail in others.

This pixel distribution can be changed from one frame to the next, similar to the way biological vision systems work, for example when human gaze is redirected from one person to another.

"Initially, the problem I was trying to solve was how to maximise the frame rate of the single-pixel system to make the video output as smooth as possible," said David Phillips, from Glasgow's School of Physics and Astronomy.

"However, I started to think a bit about how vision works in living things and I realised that building a programme which could interpret the data from our single-pixel sensor along similar lines could solve the problem," said Phillips, who led the research.

By channelling our pixel budget into areas where high resolutions were beneficial, such as where an object is moving, we could instruct the system to pay less attention to the other areas of the frame, researchers said.

"By prioritising the information from the sensor in this way, we have managed to produce images at an improved

frame rate but we have also taught the system a valuable new skill.

"We are keen to continue improving the system and explore the opportunities for industrial and commercial use, for example in medical imaging," Phillips added.

NASA'S CASSINI COMPLETES FINAL FLYBY OF SATURN'S MOON TITAN

NASA's Cassini spacecraft has completed its last close flyby of Saturn's hazy moon Titan and is beginning its final set of 22 orbits before the probe plunges into the ringed planet to bring an end to its 20-year-long journey.

The spacecraft made its 127th and final close approach to Titan on April 21, passing at an altitude of about 979 kilometres above the moon's surface.

Cassini transmitted its images and other data to Earth following the encounter.

Cassini's radar team will be looking this week at the final set of new images of the hydrocarbon seas and lakes that spread across Titan's north polar region.

The planned imaging coverage includes a region previously seen by Cassini's imaging cameras, but not by radar.

The radar team also plans to use the new data to probe the depths and compositions of some of Titan's small lakes for the first time and look for further evidence of the evolving feature researchers have dubbed the "magic island."

"Cassini's up-close exploration of Titan is now behind us, but the rich volume of data the spacecraft has collected will fuel scientific study for decades to come," said Linda Spilker, the mission's project scientist at NASA's Jet Propulsion Laboratory in the US.

The flyby also put Cassini on course for its dramatic last act, known as the Grand Finale.

As the spacecraft passed over Titan, the moon's gravity bent its path, reshaping the robotic probe's orbit slightly so that instead of passing just outside Saturn's main rings, Cassini will begin a series of 22 dives between the rings and the planet on April 26.

The mission will conclude with a science-rich plunge into Saturn's atmosphere on September 15 this year.

"The spacecraft is now on a ballistic path, so that even if we were to forgo future small course adjustments using thrusters, we would still enter Saturn's atmosphere on Sept. 15 no matter what," said Earl Maize, Cassini project manager at JPL.

Cassini received a large increase in velocity of about precisely 860.5 metres per second with respect to Saturn from the close encounter with Titan.

After buzzing Titan, Cassini coasted onward, reaching the farthest point in its orbital path around Saturn on April 22.

This point, called apoapse, is where each new Cassini lap around Saturn begins.

Technically, Cassini began its Grand Finale orbits at this time, but since the excitement of the finale begins in earnest on April 26 with the first ultra-close dive past Saturn, the mission is celebrating the latter milestone as the formal beginning of the finale.

The spacecraft's first finale dive will take place on April 26. The spacecraft will be out of contact during the dive and for about a day afterward while it makes science observations from close to the planet.

**NASA'S SUPER PRESSURE BALLOON
SUCCESSFULLY LAUNCHED**

NASA successfully launched its football-stadium-sized, super pressure balloon from New Zealand, that will help detect cosmic rays from beyond our galaxy as they penetrate the Earth's atmosphere.

The mission will run for 100 or more days floating at 33.5 km in the southern hemisphere's mid-latitude band.

"Following our 2015 and 2016 New Zealand missions, we've learned key lessons on the balloon design that have gone into perfecting the technology for this year's flight," said Debbie Fairbrother, NASA's Balloon Programme Office chief.

"I'm very proud of the team that delivered us to this point and I'm hopeful that third time's the charm for realising 100 days of flight," said Fairbrother.

While validating the super pressure balloon technology is the main flight objective, the International Extreme Universe Space Observatory on a Super Pressure Balloon (EUSO-SPB) payload is flying as a mission of opportunity.

EUSO-SPB's objective is to detect ultra-high energy cosmic rays from beyond our galaxy as they penetrate the Earth's atmosphere.

As these high-energy particles enter the atmosphere, they interact with nitrogen molecules in the air and create a UV fluorescence light.

EUSO-SPB will observe a broad swathe of the Earth's atmosphere to detect the UV fluorescence from these deep space cosmic rays coming in from above.

"EUSO-SPB is now searching for the most energetic cosmic particles ever observed," said Angela V Olinto, professor at the University of Chicago.

"The origin of these particles is a great mystery that our pioneering mission will help to solve. Do they come from massive black holes at the centre of galaxies? Tiny, fast-spinning pulsars? Or somewhere else?" Olinto asked.

"The international science team is very excited to see our cosmic ray fluorescence detector lifted to suborbital space by this remarkable balloon and departing on this global journey,"

said Lawrence Wiencke, professor at the Colorado School of Mines in the US.

"This balloon will give us a great view, and we are hoping for a record flight," Wiencke said.

At a relatively low cost, NASA's heavy-lift balloons have been critical launch vehicles for testing and validating new technologies and science instruments to assure mission success for costlier, higher-risk follow-on spaceflight missions, said Fairbrother.

Once the technology is validated, the ultimate goal of the EUSO project is to fly from an even higher altitude on the International Space Station to observe a greater atmospheric area for detecting high-energy cosmic rays.

The 18.8-million-cubic-foot (532,000-cubic-meter) Super Pressure Balloon lifted off from NASA's new launch pad adjacent to Wanaka Airport carrying a suspended payload of 2,495 kilograms.

As the balloon travels around the Earth, it may be visible from the ground, particularly at sunrise and sunset, to those who live in the southern hemisphere's mid-latitudes, such as Argentina and South Africa, NASA said.

The progress of the flight, which includes a map showing the balloon's real-time location can be tracked on the NASA website.

**BLOOD PRESSURE DRUG MAY HELP TREAT SKIN
CANCER: STUDY**

A drug commonly used to treat high blood pressure may protect against the sun-induced cell damage that leads to skin cancer, a new study claims.

Researchers from Western University of Health Sciences in the US found that the drug called carvedilol surprisingly showed some protective effects against skin cancer.

They then conducted experiments with cell cultures and mice to see if carvedilol could prevent skin cancer caused by ultraviolet-B (UVB), the portion of sunlight that tends to damage the skin's top epidermal layers and plays a key role in skin cancer development.

Researchers found that carvedilol exhibited a protective effect in cultured mouse skin cells exposed to UVB and in hairless mice given the drug after UVB exposure.

The experiments showed that carvedilol acted by protecting cells against the cancer-causing DNA damage and cell death produced by UVB.

Hairless mice exposed to UVB and given carvedilol showed decreases in both the severity and number of tumours that developed compared to those not given carvedilol.

The mouse studies also showed that carvedilol delayed skin tumour formation more than sunscreen.

Researchers also discovered that not all beta blockers

show cancer preventive properties, indicating that the cancer-fighting beta blockers likely act on not yet identified molecules.

“We have preliminary data indicating that the cellular targets for carvedilol are not related to the beta-adrenergic receptors that are the commonly accepted targets for all beta blockers,” Bradley T Andresen from Western University of Health Sciences.

“They likely target unexpected mechanisms involved in cancer development,” Andresen said.

NASA'S PEGGY WHITSON BREAKS RECORD FOR TIME SPENT IN SPACE

NASA astronaut Peggy Whitson set a new US record for most cumulative days spent in space, surpassing cosmonaut Jeff Williams' record of 534 days aboard the International Space Station (ISS).

With the recent extension of her stay at the ISS, the Expedition 51 commander has five months to rack up another record, NASA said.

In 2008, Whitson became the first woman to command the space station, and on April 9 this year became the first woman to command it twice.

In March, she seized the record for most spacewalks spanning over 53 hours by a female, breaking Indian-American Sunita Williams' record of seven spacewalks totalling 50 hours and 40 minutes.

Now, after launching on November 17 last year with 377 days in space already under her belt, she has surpassed astronaut Jeff Williams' previous US record of 534 days, 2 hours and 48 minutes of cumulative time in space.

This is Whitson's third long-duration stay onboard the space station, and in March her mission was extended into September, increasing the amount of valuable astronaut time available for experiments on board the station.

When she returns to Earth, she will have spent more than 650 days in space, and decades supporting spaceflight from the ground, NASA said.

Whitson began her NASA career in the 1980s. She held a number of research-related positions, and in 1992 was named project scientist of the Shuttle-Mir Programme.

She made her first trip to the ISS in 2002. Space shuttle Endeavour delivered her and her Expedition 5 crewmates for a 184-day stay in the four modules that made up the space station at the time.

While there, she took part in 21 science investigations and became the first NASA science officer. In 2008, Whitson returned as commander of Expedition 16, and was on hand for the installation of the Harmony node, the Columbus laboratory and the Kibo logistics module.

She spent another 192 days in space and performed her first five spacewalks.

Since returning for her third stay in November last year, Whitson has added another three spacewalks to her list, bringing her total time spent outside the space station to more than 53 hours.

With the title for most spacewalks by a female and most time spent spacewalking by a female already secure, she will add to both numbers on May 12, when she is scheduled to venture out of the station's airlock again.

Between trips to space, Whitson was named chief of the astronaut office in 2009, becoming the first female to hold the position, which she remained in until 2012.

NEW VENDING MACHINE AT US VARSITY OFFERS MORNING AFTER PILLS

In a first, a vending machine designed by a student of Indian origin, that dispenses the morning after pill, has been installed in a university campus in the US.

The machine called “Wellness To Go” was installed in early April in a study room at the University of California, Davis in the US.

In addition to morning after pill or Plan B, the machine - which took two years to build - offers pregnancy tests, tampons, Advil and condoms.

“The more sceptical and negativity I got from other people like ‘oh it’s not gonna happen,’ kind of pushed me more,” said former UC Davis student Parteek Singh.

The vending machine has received both praise and criticism, CNN affiliate ‘KTXL’ reported.

While some students said that the machine promoted unsafe sex as it made getting the morning after pill cheaper and more convenient than buying condoms from a drug store, others felt it is “a great thing for women”.

“This project will make Plan B and other health resources more accessible and affordable impacting 35,000 undergraduate and graduate students at UC Davis,” Singh said.

“Since there is only one pharmacy that is open 24/7, students don’t have the best access to emergency contraception and other over the counter medicine,” he said.

“I feel like every college should have this,” he added.

NOW, DRONES USED TO COLLECT INFO FROM VOLCANIC PLUME

Drones can do more than just capture high-flying footage, say scientists who have successfully used the unmanned aerial vehicles to collect measurements from an inaccessible volcano as it erupted.

Researchers from the Universities of Bristol and Cambridge in the UK carried out many proof-of-concept flights at the summits of Volcan de Fuego and Volcan de Pacaya in

Guatemala. Using lightweight modern sensors they measured temperature, humidity and thermal data within the volcanic clouds and took images of multiple eruptions in real-time.

“These sensors not only help to understand emissions from volcanoes, they could also be used in the future to help alert local communities of impending eruptions - particularly if the flights can be automated,” said Emma Liu, Volcanologist from the Department of Earth Sciences at Cambridge.

This is one of the first times that bespoke fixed-wing unmanned aerial vehicles (UAVs) have been used at a volcano such as Fuego, where the lack of close access to the summit vent has prevented robust gas measurements, researchers said.

The team carried out multiple beyond-visual-line-of-sight (BVLOS) flights from the observatory flying up to 10,000 feet above the launch site to reach the summit of Volcan de Fuego.

“Volcanoes are prodigious sources of volatiles and trace metals and have a key role in the geochemical cycling of these elements through the Earth system,” said Liu.

“Drones offer an invaluable solution to the challenges of in-situ sampling and routine monitoring of volcanic emissions, particularly those where the near-vent region is prohibitively hazardous or inaccessible,” Liu said.

The group plans to return to Guatemala later in the year with a wider range of sensors including a multiGAS gas analyser, a four-stage filter pack, carbon stubs for ash sampling, thermal and visual cameras, and atmospheric sensors.

PLAYING ON SWINGS MAY MAKE KIDS COOPERATE: STUDY

Parents, take note! Encourage your kids to hit the playground swings more often, as the favourite childhood activity can teach children how to get along with each other, scientists say.

The measured synchronous movement of children on the swings can encourage preschoolers to cooperate on subsequent activities, according to a new study.

Researchers from the University of Washington in the US showed the potential of synchronised movement in helping young children develop collaborative skills.

“Synchrony enhances cooperation, because your attention is directed at engaging with another person, at the same time,” said Tal-Chen Rabinowitch, postdoctoral researcher at UW’s Institute for Learning and Brain Sciences (I-LABS).

“We think that being ‘in time’ together enhances social interaction in positive ways,” said Rabinowitch.

Previous studies have linked music and being in sync with other pro-social behaviours, such as helping, sharing and empathising, among young children: For example, marching to a song, might prompt one child to share with another.

In this study, researchers sought to focus on movement

alone, without music, and examined how children cooperated with one another afterward.

They built a swing set that enabled two children to swing in unison, in controlled cycles of time.

Pairs of four-year-olds - who were unfamiliar to one another - were randomly assigned to groups that either swung together in precise time, swung out of sync with each other, or did not swing at all.

The pairs in all three groups then participated in a series of tasks designed to evaluate their cooperation.

In one activity, the children played a computer game that required them to push buttons at the same time in order to see a cartoon figure appear.

Another, called the “give and take” activity, involved passing objects back and forth through a puzzle-like device.

Researchers found that the children who swung in unison completed the tasks faster, indicating better cooperation than those who swung out of sync, or not at all.

On the button-push task, for instance, the pairs who had been swinging together showed a greater tendency to strategically raise their hands before they pushed the button so as to signal their intent to the other child, which proved to be a successful tactic for the task.

For four-year-olds, moving in sync can create a feeling of “being like” another child that may encourage them to communicate more and try to work together, Rabinowitch said.

Children in the study played a computer game after swinging. When both children pushed a button at the same time, a cartoon character appeared on the screen, much to these boys’ delight.

“We didn’t know before we started the study that cooperation between four-year-olds could be enhanced through the simple experience of moving together,” said Meltzoff.

The study was published in the *Journal of Experimental Child Psychology*.

NEW MATERIAL STRONGER THAN COPPER MAY POWER ‘SMART TEXTILES’

Scientists have developed thin carbon nanotube textiles that are highly conductive and about fifty times stronger than copper films, an advance that could pave the way for flexible electronics as well as smart skins and textiles.

“The structural robustness of thin metal films has significant importance for the reliable operation of smart skin and flexible electronics including biological and structural health monitoring sensors,” said Sameh Tawfik, an assistant professor at University of Illinois at Urbana- Champaign.

“To our knowledge, this is the first study to apply the principles of fracture mechanics to design and study the toughness nano-architected carbon nanotube (CNT) textiles,” said Tawfik.

“The theoretical framework of fracture mechanics is shown to be very robust for a variety of linear and non-linear materials,” he added.

Carbon nanotubes, which have been around since the early nineties, have been hailed as a “wonder material” for numerous nanotechnology applications, researchers said.

These tiny cylindrical structures made from wrapped graphene sheets have diameter of a few nanometres - about 1000 times thinner than a human hair, yet, a single carbon nanotube is stronger than steel and carbon fibres, more conductive than copper, and lighter than aluminium.

However, it has proven difficult to construct materials, such as fabrics or films that demonstrate these properties on centimetre or metre scales.

The challenge stems from the difficulty of assembling and weaving CNTs since they are so small, and their geometry is very hard to control.

“The study of the fracture energy of CNT textiles led us to design these extremely tough films,” said Yue Liang, former graduate student at the Kinetic Materials Research group.

Beginning with catalyst deposited on a silicon oxide substrate, vertically aligned carbon nanotubes were synthesised via chemical vapour deposition in the form of parallel lines of 5m width, 10m length, and 20-60m heights.

“The staggered catalyst pattern is inspired by the brick and mortar design motif commonly seen in tough natural materials such as bone, nacre, the glass sea sponge, and bamboo,” Liang added.

“Looking for ways to staple the CNTs together, we were inspired by the splicing process developed by ancient Egyptians 5,000 years ago to make linen textiles,” she said.

“We tried several mechanical approaches including micro-rolling and simple mechanical compression to simultaneously re-orient the nanotubes, then, finally, we used

the self-driven capillary forces to staple the CNTs together,” she added.

“Flexible electronics are subject to repeated bending and stretching, which could cause their mechanical failure. This new CNT textile, with simple flexible encapsulation in an elastomer matrix, can be used in smart textiles, smart skins, and a variety of flexible electronics,” he said.

NEW GOOGLE EARTH VR TO TAKE YOU TO ANY ADDRESS IN WORLD

A new Google Earth Virtual Reality (VR) feature allows users to visit any address in the world and fly over it in 3D with the help of a headset system, according to the company.

Using a new updated feature on Google Earth VR, people can choose their own destinations, as long as they know the address or name of the location.

“People want to quickly find and revisit the places that mean the most to them, whether it is a childhood home or favourite vacation spot,” Joanna Kim, a product manager at Google Earth VR said in a blog post.

Users can type an address or the name of a location, and visit it with a 3D headset system, Kim said.

Sightseers can also visit 27 handpicked locations that are now available on Google Earth VR, including Neuschwanstein Castle that inspired the castle in Disney’s “Sleeping Beauty”, Table Mountain in South Africa and the Perito Moreno Glacier in Argentina.

“When we first launched Google Earth VR, we knew there was something powerful about being able to point anywhere in the world and start flying,” said Kim.

“You could soar over landscapes and cities, and discover locations you did not even know existed,” Kim added.