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Science Service

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RUMOURS HIT IMMUNISATION PROGRAMME IN MUSLIM-DOMINATED MEWAT

Haryana's Muslim-dominated Mewat district has the lowest immunisation rate among children under the age of 6 years, which is a matter of concern for the authorities who are now trying to rope in the clerics to address the situation.

The immunisation rate here is 13 per cent, much lower than the state average of 62.2 per cent, according to the National Family Health Survey.

Officials say the rate of immunisation in Mewat is low mainly because of rumours which started spreading more than 3 months back that the vaccines being administered under the Central government's Indradhanush programme would have sterilising effect on the children.

With an aim of addressing the situation, top officials of the district and National Health Mission (NHM) today held an interaction with the Accredited Social Health Activists (ASHAs) and the clerics, who agreed to render their help by negating the rumours.

Maulana Yahya Kareemi, president of Al-aman Islamic Centre, Mewat, said he would speak about the "misinformation" related to the immunisation during the prayers at the mosque, including on Fridays when the number of devotees swells.

"We have 400-500 youth coming to our institute every day and the number rises to over a thousand on Fridays. If the administration wants, we can spread the word quelling misinformation related to immunisation," he said.

The Indradhanush programme is aimed at guarding children against diseases like polio, BCG, pentavalent (diphtheria, tetanus, whooping cough, hepatitis b, haemophilus, influenza type-B) rubella-measles.

Officials said the immunisation rate had risen to 30 per cent but it started sliding post-February after a video went viral on social media, claiming that the injections being administered would make the children sterile and check the population of the minority community.

"As of now, no such injection or tablet has been invented which could render children sterile," asserted Mewat Deputy Commissioner Mani Ram Sharma, while rubbing the rumours.

He told the gathering, which included several clerics, that the region has several people affected by polio as the Meo community had skipped the polio vaccination drive 15 years back, again due to unfounded apprehensions.

"I see 15-20 physically disabled youngsters coming to see me at my office every day to seek assistance in the form of employment or finances," the IAS officer said.

"We can tell only you (the ASHAs and religious leaders), but it is for you to spread the word among the stakeholders and

raise awareness at grassroots level," Sharma said.

Director of the National Health Mission in Haryana Amaneet P Kumar said two problems have plagued Mewat: immunisation and institutional deliveries.

Kumar, an IAS officer, also rejected the rumours and said, "They are wrong. We should have faith in science."

On their part, the ASHA workers highlighted the reasons, like vehement denial by some people, for the low immunisation rate.

"People hurl strong words at us, they shut their doors at us but we still make an effort to go back to such houses to ensure that no child is left out," said 48-year-old Rehmani, ASHA at Karedi village in Nagina block.

Raziya, ASHA coordinator at Mewat, highlighted the insufficient number of ASHAs and Auxiliary Nurse Midwifery (village level health workers) in the district.

"At present there are 874 ASHAs in Mewat as against a stipulated requirement of over 1400," said Raziya.

As per the guidelines, she said, one ASHA is required for every thousand people.

Also one Auxiliary Nurse Midwifery (ANM) is needed for every 5,000 people but in the district it is an ANM per 15-17,000 people.

Another Islamic scholar, Hakim uddin, told the gathering of Muslim clerics and government officials besides Haryana Waqf Board CEO Hanif Qureishi, that any rumour must be checked.

He also asked the community members to shun any "negative mindset" about government measures and instead verify reports/rumours.

Qureishi, who is also the Commissioner of Police, Faridabad, said it was sad that health indicators in Mewat were the "lowest".

"Its ramifications would not appear now but after 15-20 years," he remarked.

Appealing to the community members for support in the immunisation drive, Qureishi underlined that in a democracy, the government has a social responsibility to look after the welfare of the people.

"But the people have a freedom of choice, no decision can be imposed on them," he said.

"This is your (religious leaders') responsibility to spread the message for welfare of the children, both for their safety as well as education," he added.

ACTIVISTS DEMAND DISSOLUTION OF GEAC FOR CLEARING GM MUSTARD

A day after India's bio-tech regulator GEAC gave its nod to commercial use of GM mustard, activists opposing the move asked the government to reject the proposal and dissolve the GEAC immediately.

The 'Coalition for a GM-Free India', a platform of

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hundreds of organisations representing farmers, consumers, and scientists, wrote to Union Environment Minister Anil Dave expressing “disappointment and shock” over the approval by the Genetic Engineering Appraisal Committee (GEAC). They demanded the regulatory body be immediately dissolved given its “repeated unaccountable functioning”.

Meanwhile, Environment activists Vandana Shiva asserted that GM mustard will lead to “genetic contamination” of pure organic mustard and pollution of food.

The GEAC, India’s GM crop regulator, had yesterday recommended the commercial use of genetically modified mustard in a submission to the environment ministry amid opposition by anti-GM groups, including RSS-affiliated bodies.

Environment Minister Anil Madhav Dave now has to take the final call on approval of GM Mustard.

Ministry sources told PTI that although they were expecting the approval from the Minister today itself, the process has been delayed by a week.

“By clearing GM mustard, the GEAC has shown itself to be anti-science, anti-farmers, anti-environment and anti-consumers.

“We appeal to you (Dave) to summarily reject the application for approval of GM-Mustard. We also urge you to dissolve the GEAC immediately, given their repeated unaccountable functioning,” the Coalition said in the letter written to Dave.

The Centre for Genetic Manipulation of Crop Plants (CGMCP), Delhi University South Campus, had submitted an application to the GEAC for the environmental release of GM mustard (Brassica juncea) hybrid DMH-11 and the use of parental events (varuna bn 3.6 and EH2 mod bs 2.99) for the development of a new generation of hybrids.

With its green signal, the GEAC has pushed the hybrid plant developed by scientists at the Delhi University closer to becoming the country’s first edible GM crop.

“The GEAC is a compromised body, which works only for corporate interests. Every word of their safety dossier was prepared by corporations.

“And in fact most of the members of the GEAC have been directly associated with corporates and lobby groups and now are only serving to promote their corporate interests,” Shiva said in a letter to Dave.

The Coalition also said the GM HT Mustard is a “hazardous” herbicide-tolerant food crop, which has adverse impact on a large number of Indian farmers, agricultural workers and consumers.

It said that previously, it has shown, through rigorous analysis of all available materials that how it will increase chemicals in food and farms and how regulators should have never allowed it to proceed this far.

“The appraisal was shoddy while the tests were rigged

and many tests not taken up. The need for GM mustard was never questioned and answered.

“The GEAC has ignored all the many valid questions raised by scientists and others and chose to function in an unscientific and biased fashion. Importantly, there was no integrity apparent in the processes adopted,” the Coalition said in a statement.

It said when the rest of the world is shunning GM crops, India would be “foolish” to rush into GM mustard commercialisation.

“There is absolutely no reason, not a single one, why the GEAC should have recommended this for approval. Herbicide Tolerant crops increase chemical usage.

“Our conservative estimates show that even 25 per cent adoption of GM mustard in India’s mustard cultivation area will lead to more than 4 crore employment days being lost by poor women in mustard growing areas, which are mainly BJP- ruled states,” the Coalition said.

MAKE SCIENCE AND TECHNOLOGY MORE INCLUSIVE: PREZ

President Pranab Mukherjee said science and technology must be made “more inclusive” and not just benefit “a select few” sectors.

“Our pursuits in science and technology have to be more inclusive and encompassing, improving the lives of our vast population,” Mukherjee said while addressing an event to mark the 19th National Technology Day here.

The President said that disparities between haves and have-nots, urban and rural areas, and exclusion or marginalisation of certain groups could give rise to social unrest.

“It is crucial that more technological innovations are geared towards eliminating these disparities and differences. In our endeavour for global excellence, not even a single citizen should be left behind,” he said.

Emphasising that developments in science and technology should not be confined to a few areas, he called for “ground- breaking innovations” in key sectors such as energy, education, health care and agriculture.

“While we applaud significant achievements, we must also contemplate whether the technological developments have been limited to only a few sectors,” he said.

Underlining that “technology for sustainable and inclusive growth” was the need of the hour, he said innovators, technocrats, entrepreneurs and policymakers had an important role to play in this.

Mukherjee said progress and growth of the country would be sustainable only if development for all was the overarching goal.

“In the wake of new demands of economic growth, it

is necessary to embark on translating science and technology into developmental needs in all sectors such as infrastructure, agriculture, health, communication and education,” he said.

The President also advocated the use of technology to create stable employment opportunities, encourage entrepreneurship and build growth models that allowed for the inclusion of women and the disadvantaged.

“This will lead to the empowerment of citizens, which is the hallmark of a strong nation,” he said.

Mukherjee presented awards to scientists and others on the occasion at Vigyan Bhawan, where Union Ministers Harsh Vardhan and Y S Chowdary were also present.

‘GREAT DELHI SMOG’ OF NOV 2016 MAY HAVE CAUSED DEATHS: EXPERTS

The November-2016 smog episode in Delhi, when air pollution had hit perilous levels, might have temporarily triggered a “spike” in the rate of death in the national capital, according to experts.

In the first week of November last year, Delhi’s air quality had plunged, as the toxic smoke of the Diwali fireworks and the hostile weather conditions, trapped the pollutants, which in turn shrouded the city, severely affecting even visibility.

Anurag Agarwal, a scientist with the Delhi-based CSIR-Institute of Genomics and Integrative Biology, said the situation could very well have been like London’s Great Smog of 1952, which had caused at least 4,000 deaths.

“There could have been a spike. During the London smog there was a big jump in the rate of death. But we don’t have a system where we maintain a proper and full-proof record of deaths occurring in the city,” he told PTI.

But how will one establish causality i.e. how will it be possible to link the temporary spike in death rate, if any, to rise in pollution levels?

Anumita Roychowdhury, head of Centre for Science and Environment’s (CSE) air pollution lab, said causality has been established in cases of few other severe spells of smog, and even in India data is available which indicates towards the same.

“An AIIMS study has shown how during winters there is a rise in the number of hospitalisations of those suffering from cardiac and respiratory ailments. So we may not have data immediately about any such rise during last November but existing data clearly shows something similar could have occurred,” she said.

Agarwal, who focuses on the biological and clinical aspects of respiratory diseases, explained how the London death figures were arrived at and said the same procedure can be applied here.

He said two sets of data: a) the actual death rate observed during the smog episode, and b) the death rate recorded during

the corresponding period the previous year when pollution levels were low, would have to be factored in.

“You extrapolate the previous year’s death rate as the baseline death rate. Then the actual death rate observed during the corresponding period will have to be subtracted from the baseline rate. The result would be the excess death rate,” he said.

Agarwal said his institute had thought about undertaking a similar exercise but later shelved it as not all deaths are recorded in Delhi at this point in the absence of a centralised digital register of medical records.

However, Mukesh Khare, professor of environmental engineering in IIT-Delhi, sounded sceptical about any relation between death rate and pollution level, saying the London episode cannot be compared to what Delhi experienced.

“This is primarily, because the meteorological conditions in the two cities vary widely. There may have been a spurt in respiratory diseases, but one cannot say the same about deaths,” he said.

The November spell of smog was such that for the first time in history of the city, schools had to be shut, coal-based power plants were closed, as part of a raft of emergency measures declared by the Delhi government.

The Centre for Science and Environment (CSE) had described the situation as alarming and the smog episode as the worst in 17 years.

AIR PURIFIERS IN SCHOOLS? SNIFF OF DISAPPROVAL FROM EXPERTS

Installing air purifiers in classrooms is “impractical” and can trigger a spike in the levels of Carbon dioxide instead of containing air pollution, experts have opined.

They welcomed the decision by the Delhi government to put on hold a directive asking schools to install air purifiers.

The government, however, has not specified any reason behind suspending the circular within days of issuing it to schools.

Anurag Agrawal of the CSIR Institute of Genomics and Integrative Biology told PTI the cost aspect of installing air purifiers at such a large scale makes it potentially “impractical”.

“Air purifiers typically work by trapping the fine particulate matter in HEPA (High efficiency particulate air) filters. These filters need to be replaced frequently otherwise they get blocked,” he said.

The Delhi government runs around 1,100 schools.

Anumita Roychowdhury of the Centre for Science and Environment (CSE) said that in a “dynamic environment” like a classroom installing air purifiers does not serve the purpose because even if the room is sealed, its doors will have to be opened and shut frequently.

“That way one will lose what is being purified. It may also lead to a spike in the levels of Carbon dioxide in the room

which makes people lethargic. So it is not really the option,” she said.

Agrawal said there would not be any increase in the levels of CO₂, if purifiers that release strong drafts of air to purify the zone around it are installed. But such purifiers are more expensive.

“We have seen such experiments in China where giant purifiers have been installed to create a buffer zone of clean air but it won’t really be feasible in a classroom environment,” he said.

In its previous circular, dated April 26, the government had not specified on the kind of purifiers it was planning to install.

“The ambient air quality of Delhi needs to be improved. In view of the gravity of harm to human health due to inferior ambient air quality, schools should take action to install air filters as per need,” the earlier communication had said.

HP DISTRICTS WITH HIGHER SEX RATIO REPORTED FEWER SEXUAL ASSAULT CASES: STUDY

Districts in Himachal Pradesh, where the sex ratio is higher, reported fewer sexual assault cases against women, according to a study by the Regional Forensic Science Laboratory here.

The study was based on the trends of the sexual assault cases against women received in the laboratory between 2011 and 2015 for five districts in the state.

According to the study, in the five districts under the central zone of the state — Mandi, Bilaspur, Kullu, Lahaul and Spiti, and Hamirpur — the number of sexual assault cases was higher where the number of women per thousand men was low.

The Deputy Director of the laboratory, Rajesh Verma said out of about 400 cases, 42.5 per cent were from Mandi district, 28.6 per cent from Kullu, 14.8 per cent from Bilaspur, 12.5 per cent from Hamirpur and around 1.5 per cent from Lahaul and Spiti district.

Sexual assault cases every year per lakh population were found to be the highest in Kullu district at 5.1, followed by Lahaul and Spiti at 3.9, Mandi at 3.3, Bilaspur at 3 and Hamirpur at 2.1.

These figures made more sense when compared with the social indicators for these districts according to the 2011 census data.

The study revealed that the strongest correlation was observed with the sex ratio (number of females per thousand males) in each district.

There was a high negative correlation of these case figures with the sex ratio of the districts. It revealed that sexual assault cases tend to be lower in the districts where the sex ratio

was higher.

In Hamirpur district, where the average number of cases per year per lakh population was the lowest at 2.1, the sex ratio was the highest at 1,096 females per 1,000 males.

As per the studies conducted by the Junga Forensic laboratory in Shimla, last year the average number of cases per year per lakh population in Kinnaur district was 6.1, which was the highest and the female population there was 818 per 1,000 males.

Verma said a statistical model based on these trends was successful in estimating the number of sexual assault cases in all the districts of Himachal Pradesh and compared well with the figures reported.

It was observed that the society where females were more in number and educated a lesser number in sexual assault cases were reported.

US DOING LITTLE TO TACKLE CLIMATE CHANGE, SAY GREEN BODIES

Green bodies criticised the US president’s claim that “major polluting nations” like India were contributing “nothing” towards tackling climate change, saying the US was itself “doing little” to fight the menace.

The climate action pledges taken by India to curb emissions were “much more” than that of US, the green bodies claimed.

An Environment Ministry source said that India was “doing a lot” in terms of climate change.

“The statement (made by US President Donald Trump) is not correct. The climate pledges to curb green house gas emissions taken by India are much more ambitious than those taken by the US or the European Union,” Vijeta Rattani, climate analyst at Centre for Science and Environment (CSE) said.

President Donald Trump had yesterday promised to make a “big decision” on the “one-sided” Paris climate deal soon as he alleged that the US was being unfairly targeted by asking to pay money while major polluting nations like Russia, China and India were contributing “nothing”.

The Paris climate deal within the UN Framework Convention on Climate Change was signed in 2015 by 194 countries and ratified by 143.

It aims to hold the increase in average global temperature to below 2 degrees above pre-industrial level by reducing greenhouse gas emissions.

On the point raised by Trump that the US was being made to pay billions of dollars, Rattani said as per the commitments made, it is the developed countries who have pledged to provide financing to developing countries (for cleaner energy and address climate change).

“He (Trump) is not going by the principle of equity. It

was the US because of which, the Paris agreement was weakened and was not so ambitious,” Rattani said.

Meanwhile, the source in the Environment Ministry said the US has not honoured its commitments in the context of financing and technology transfer.

“The US president, much before being elected to his present office, had been saying similar things on the issue of climate change,” the source said.

Trump had recently signed an executive order to nullify his predecessor Barack Obama’s climate change efforts, raising questions over America’s leadership in the international campaign against global warming.

Trump signed the order at the Environmental Protection Agency (EPA), keeping his campaign promise to support the coal industry.

“If Trump and his administration think they can hold the world hostage and use blackmail to gain special treatment for their fossil-fuel addiction then they are clearly mistaken.

“The rest of the world will not let a climate sceptic government dictate their pace or slow down the global clean energy transition,” Greenpeace India said.

The green body said that the safety of climate is reliant on the commitment to robust climate action that almost 200 countries agreed to in Paris.

“If the Trump administration plans to stay in Paris only to undermine the agreement, then other leaders should call the US government out and hold them to account,” the NGO said.

Trump had yesterday claimed that it was estimated that compliance with the agreement could ultimately shrink America’s GDP by USD 2.5 trillion over a 10-year period.

KERALA FISHERMEN SEEK “FISH FAMINE” PACKAGE FROM CENTRE

A group of Kerala fishermen sought a “fish famine” package from the Centre to compensate the losses suffered due to a sharp decline in the availability of fish during the last three years.

The demand was made during an interactive meeting with Union Minister of State for Agriculture and Farmers Welfare Sudarshan Bhagat at the Central Marine Fisheries Research Institute (CMFRI) here.

According to the fishermen, there was a drastic decline in fish landings in Kerala after 2012, resulting in a huge loss to the fisheries sector.

“The decline of sardine, which is the most consumed fish in Kerala, has left our lives in lurch. CMFRI studies show that the fisheries sector in the State has seen loss to the tune of Rs 10,000 crore,” they said.

“Many of us are debt-ridden due to this. Hence, a fish

famine package is the need of the hour to support the fishermen community,” said Charles George, state president of Matsyathozhilali Aikyavedi.

He also said that the Union government should consider the request of fisherfolk to form a separate Ministry for fisheries at the Centre.

They also demanded that an independent harbour be constructed at Vypeen in Ernakulam for traditional fishermen operating from this area in large numbers.

The fishermen urged the Minister to include cage fish farming activities under the Prime Minister’s Mudra Bank Loan scheme.

Also, they wanted insurance protection be extended to cage fish farming to support the farmers during times of crisis.

The Union Minister in his reply, said the department would take action after examining the issues raised by the stakeholders at the meeting.

He said a stakeholder meeting will be conducted at CMFRI to evaluate the issues related to the pollution of Periyar river and others hampering development of fisherfolk and fish farmers.

CMFRI director A Gopalakrishnan said the institute had set up a working group of experts for framing guidelines in connection with the National Mariculture Policy to be submitted to the Union government.

3D SUBSURFACE URBAN STUDY IN VARANASI

IIT Kharagpur in collaboration with British Geological Survey will undertake the first major 3D sub-surface urban study in India zeroing on the ancient city of Varanasi.

The project leader from IIT-Kharagpur’s department of geology and geophysics, Abhijit Mukherjee said “Cities across the world are working with geoscientists to improve their understanding of the sub-surface in their urban planning. In India, what can be a better place than Varanasi, the oldest known city in India, to set the foundation of the future city?”

“As part of the project, three dimensional modelling of the geology under Varanasi will be prepared to help improve the building of new transport and service infrastructure, the preservation of archaeological sites, management to cope with the hazard of flooding and sustainability of water supplies,” he said.

The project includes application of geo-scientific methods like drilling, geological, geophysical, tectonics, hydrogeological and remote sensing. “It aims to delineate the evolution of Varanasi,” he said.

Director Science, British Geological Survey, Martin Smith said “The retrieved information on rock and sediment lithologies, physical and chemical characteristics, geo-technical properties, hazard potential and groundwater distribution and flow will lead

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to construction of a multi-scale 3D conceptual model to allow visualisation of the ground beneath the city.”

It would be the first major 3D subsurface urban study and planning of its kind in India, with the ultimate aim of developing methodologies and input of suburban geology for planning and hazard risk assessment, Smith said.

“The ultimate aim is to develop the methodologies and approaches of urban geosciences and engineering of Varanasi as a pilot for other Indian cities,” Mukherjee said.

The project involves Prof Probal Sengupta (Geology and Geophysics - IIT-KGP) and Prof Joy Sen (Architecture and Regional Planning RGC SIDM, IIT-KGP) as co-investigators.

“Varanasi is a living lens of the IIT-KGP’s SandHi (Scientific Approach to Networking & Designing of Heritage) project, Sen had told PTI at a SandHi programme earlier.

In North America, Europe and other parts of Asia city planners are increasingly linked to consortia of national geological surveys and academic researchers.

SCIENCE EXPRESS TO POPULARISE SCIENCE

The Science Express Climate Action Special (SECAS II), an innovative mobile science exhibition on a 16-coach AC train, will stop at 68 stations across the country in its current phase tour till September.

“The Science Express 9th Phase is covering around 70 stations for science popularisation in nearby areas,” the Secretary Department of Science and Technology, Prof Ashutosh Sharma told media at a recent DST programme in the city.

“The exhibition is a good opportunity to generate dialogue and discussion on science-related issues,” Sharma said.

The current ninth phase of the Science Express (SECAS II), flagged off on February 17 this year will be completed on September 8, this year, covering 19,000 km, a Central government press statement said.

The SECAS is a unique collaborative initiative of DST, Ministry of Environment, Forest & Climate Change, Department of Biotechnology, Ministry of Railways, Wildlife Institute of India and Vikram A Sarabhai Community Science Centre.

Science Express Phase I to IV had showcased cutting edge research in science and technology being carried worldwide, Phase V to VII was based on the theme of biodiversity and as ‘Science Express Biodiversity Special’ it showcased the rich biodiversity of India. Phase VIII as ‘Science Express Climate Action Special’ highlighted the global challenge of climate change, the release said.

Climate change is an important environmental issue with many short term and long term impacts, from shifting weather patterns that threaten food production to rising sea level that increase the risk of catastrophic flooding, the impact of climate change are not just global in scope but more severely affect the

poor. Since its launch in October 2007, over 1.61 crore people had visited Science Express.

INDIA TO REPLACE MAITRI STATION IN ANTARCTICA, EXPAND RESEARCH ACTIVITY

India has decided to replace the Maitri research station in Antarctica with a new one in the next three to four years.

The country is also drafting laws to safeguard its interest in Antarctica and is poised to expand its research activity in the coldest continent.

“The Maitri station will be replaced by a new station in the next three to four years,” Ministry of Earth Sciences secretary Madhavan Nair Rajeevan said here today.

Speaking on the sidelines of a programme to formally commence ship building by Titagarh Wagons Ltd, he said India is poised to expand its research activity in the coldest continent and a new ship, with special ice-cutting facility, will be procured for the purpose.

Rajeevan said the country is also drafting its own laws to safeguard its interest in Antarctica, which has to be vetted by the Law Ministry.

“India does not have laws for Antarctica and is currently governed by international laws,” he said.

IITS TO WORK ON FORMAL METHODS OF SAFETY CRITICAL SYSTEM

The HRD ministry in partnership with the Railways under its IMPRINT programme is setting up the country’s first knowledge centre on Formal Methods on Safety Critical Systems to be located at IIT Kharagpur.

An IIT-KGP spokesperson said the Centre, named ‘FMSAFE’ will function as a networked knowledge and research centre in collaboration with IIT-Kanpur and IIT-Bombay.

“India is recognised for its competence in software development, but design and validation of safety critical embedded software requires a different skill set,” Prof Pallab Dasgupta from IIT-KGP, who is leading FMSAFE, said.

“What will be needed is a deep understanding on what is safety critical in Indian operating contexts. This is what the new centre aims at,” Dasgupta said.

“Safety and reliability of electronics and software will be the determining factor for widescale automation in all sectors of technology. Through this centre we will bring the best experts on formal methods in the country together to accelerate the growth of safe embedded system solutions in the country,” IIT-KGP director Prof P P Chakrabarti said.

Chakrabarti is also involved with the centre in his personal capacity as a renowned computer scientist.

Impacting Innovation and Research Technology (IMPRINT) is a pan-IIT and IISC joint initiative to develop a road map for research to solve major engineering and technology challenges in ten technology domains relevant in country.

Formal methods are a new genre of technique which use logic-based artificial intelligence theories to prove the correctness of software and electronic systems before they are deployed in critical safety applications.

These methods have been recommended in many international safety standards and are widely practiced by companies like Intel, Microsoft and Google.

A coordinated formal methods programme will then help indigenous developers in the country to aim for high degree of safety assurance, essential for global competence, Dasgupta said.

A modern car features millions of software code as most of its systems – braking, fuel injection, steering – are controlled by software which runs on embedded processors.

Almost all safety critical systems today rely on correct functioning of software-driven electronic components – railway signalling systems, temperature control in atomic reactors, real time operation in smart electrical grids, and automated healthcare devices like pacemakers and insulin pumps.

However, despite extensive verification practices for such systems failures due to design errors continue and questions are raised to what extent software and electronics can be allowed to drive highly safety critical systems.

BARC, HAL, Indian Railways, Intel, Microsoft, TCS, Tata Motors, Synopsys have evinced interest in the system.

The formal methods research group at IIT-KGP already has long standing technology development partnerships with companies and PSUs, including Intel, General Motors, Synopsys, SRC, HAL and Railways. The new centre will build upon the existing foundations.

Students working on cutting edge projects under this centre will spend time in the three IITs along with Prof Sandeep Shukla from IIT Kanpur and Prof Supratik Chakraborty from IIT-Bombay, an IIT-KGP spokesperson said.

BHITARKANIKA NATIONAL PARK CLOSED FOR CROC BREEDING

With the onset of the breeding season of estuarine crocodiles, Bhitarkanika National Park authorities today clamped three-month-long prohibition on entry of tourists and visitors to the wetland sites of the park.

The national park would reopen for visitors on August 1, said park officials. Prohibition is being imposed in view of the breeding season of salt-water crocodiles. Human interference would disturb the breeding animals, they said.

As the reptiles often turn violent and attack intruders

during breeding period, the authorities put this restriction to ensure the safety of humans and provide congenial environment to the breeding crocodiles, said Divisional Forest Officer, Rajnagar Mangrove (wildlife) Forest Division, Bimal Prasanna Acharya.

As per the latest head count of these animals, 1671 estuarine crocodiles were counted living along the Bhitarkanika's water bodies.

Keeping in view commencement of the breeding season, the Forest department is prioritising safety of local people. Local residents need to remain watchful and vigilant. People could ensure their own safety by keeping safe distance from crocodile-infested water-bodies, Acharya said.

Crocodiles are found straying from their habitats into water bodies in and around the human settlements. Man-crocodile conflict often reaches a flash point in peripheral villages of Bhitarkanika wildlife sanctuary during this period, the DFO said.

The species are itinerant in nature and stray into adjoining water-bodies because of its increase in hyper-salinity contents. After a temporary sojourn, they leave for their permanent habitation corridors within the Bhitarkanika habitation corridors, according to Forest officials.

Wildlife researchers studying on salt water crocs are of the view that habitat of these species is getting squeezed in about 26 square km of water bodies within the national park. These reptiles prefer the ideal water bodies because of its salinity contents. The salinity level in some of the water bodies might be dropping proving less ideal for crocodiles.

IIT-B RESEARCHER WORKING ON CO2 EMISSIONS GETS INSA MEDAL

Vikram Vishal, an assistant professor in the Department of Earth Sciences at IIT Bombay, has won the prestigious Indian National Science Academy (INSA) medal in the Young Scientist category for 2017.

The award carries a bronze medal and a cash prize of Rs 25,000, a release from the IIT Bombay said here today.

The award is considered to be the highest recognition for young scientists in the country, it said.

Vishal is currently working on research “which attempts to reduce carbon dioxide (CO₂) emissions and their environmental impact by capturing the natural gases”, it said.

His research “looks at capturing the carbon dioxide released when coal is burnt or created as a by-product in other industries and injecting it back into the rock deep underground so that it is not released into the atmosphere,” the release added.

Due to vast geological diversity, India offers ample opportunities for the storage of carbon dioxide, and injection of carbon dioxide will also lead to “enhanced recovery of methane to partly meet our growing energy demands”, Vishal said.

UN TECHNOLOGY INNOVATION LAB TO BE SET UP IN NAYA RAIPUR

The United Nations will set up a technology innovation laboratory in Naya Raipur, the new capital of Chhattisgarh, officials said today.

A meeting, presided over by Chhattisgarh Chief Minister Raman Singh, was held at his official residence here.

During the meeting, a tripartite memorandum of understanding (MoU) among state government's Electronics and Information Technology department, International Institute of Information Technology (IIIT), Naya Raipur and the Telecommunications and IT division of the United Nations, officials said.

Expressing happiness over the development, Raman Singh said the lab would help create a new identity for Chhattisgarh and its capital.

"This state-of-the-art lab would help Chhattisgarh achieve the dream of 'smart village' and Digital India. The country will also benefit from it," Singh said.

The lab will also help in research in different areas, he said adding that the development goals of the UN can also be achieved with its help.

According to the officials, the Chhattisgarh Infotech Promotion Society (CHIPS) vice chairman A M Parial, IIIT vice chancellor P K Sinha, and head of UN's Telecommunications and IT division signed the MoU.

Senior state officials said considering the Chhattisgarh government's IT, innovation and start-up policies, the UN decided to set up the lab in the state. The UN is setting up similar labs in other cities in the country, they said.

GOOGLE CELEBRATES 181ST BIRTHDAY OF EYE TEST INVENTOR

Google dedicated its doodle to mark the 181st birthday of French ophthalmologist Ferdinand Monoyer, who invented the popular eye test that is now used in clinics across the world.

The colourful animated doodle, shows a pair of eyes taking an eye exam - squinting at the hard-to-read alphabet chart.

It then finds Monoyer's name on the chart and is seen to be visibly overjoyed.

"Ferdinand Monoyer, born on this date in 1836, rose to prominence as one of France's most famous ophthalmologists," Google said.

Monoyer is known to have developed the dioptre, the unit of measurement for vision that is still used today. The dioptre measures the distance one would have to be from a text to be able to read it.

Most notably, he devised an eye chart where every row

represents a different dioptre, from smallest to largest.

"If you look closely at today's Doodle, you might be able to spot a tribute to another of Monoyer's signatures: his name, hidden in the chart," Google said.

A FREE CONDOM BANK PROMOTES SAFE SEX FOR LGBTQ

Simran Shaikh knows what she is talking about.

At 14, Shaikh, a transgender, fled home and took to prostitution. Thanks to unsafe sex, she fell prey to a sexually transmitted disease.

Now the president of of Impulse India, a global branch of the international safer sex coalition and community platform created by AIDS Healthcare Foundation (AHF), Shaikh seeks to spread awareness - and condoms - in its bid to promote safe sex.

As part of AHF, she has been advocating safe sex through several campaigns, the most recent one being the opening of a condom bank that supplies free condoms online.

Shaikh says lack of awareness about safe sex among LGBTQ community increases the risks of them developing sexually transmitted diseases.

"Youngsters who are working as sex workers are more at risk because they lack counselling," she says.

Shaikh told PTI that there had been a drastic cut in the supply of free condoms by the government in the past few years, making the condom bank a necessity for the community.

"Initially, the government of India played an active role in supplying free condoms to sex workers. But with time, the free supply has reduced. The initiative taken by AHF will help fill up that gap," she says.

Teri Ford, Chief of Global Advocacy and Policy for AHF, says in the absence of availability of sufficient numbers of free condoms, the situation for sex workers is becoming "vexatious".

"Organisations like UNAIDS, USAID and the Global Fund are drastically cutting funding and the distribution of free condoms. We see this as an emergency," says Ford.

According to her, using a condom is the best preventive measure against STDs, and to make their condom bank successful, AHF will be offering a doorstep delivery of condoms free of cost for individuals who contact them.

"There is a toll free number as well as an e-mail address on our website. If someone gives us information we will be shipping condoms to their doorsteps completely free of cost. It is basically an emergency supply of the product," says Ford.

The initiative is also an attempt to shun taboos associated with the topic of sex, which makes it difficult for people to ask for a condom publicly.

"The whole point is to educate people to stay healthy," she says.

When asked how their initiative is going to benefit people who don't have access to the internet, especially in village areas, Ford says they are getting on board NGOs operating in such areas to expand the reach of the programme.

"The store will be accessible to NGOs to help people who are in need of condoms but are unable to get access. We are going to fill that gap," she says.

HEALTH SUMMIT HIGHLIGHTS IMPORTANCE OF ORGANIC MEDICINES

Highlighting the importance of consuming natural and organic medicines, a health and science summit was organised.

The Herbal Science summit focused on traditional health practices and upheld the need to learn not only from the teachings of our ancestors but also from nature.

Inaugurated by Mandira Bedi, the event also saw the India launch of the products by Planet Herb Lifesciences (PHL), a leading wellness and healthcare company in Sri Lanka, Russia and the UAE.

"I am a true believer of originality and purity. Our body loves an organic routine. It is stress free and uplifts not only our system, but also our spirit! It is a great path to wellness and a healthy lifestyle," Bedi said.

Speakers like celebrity dietician Dr Tripti Tandon, Dr Aru Handa, senior consultant at MEDANTA-MEDCITY and Dr Dolly Marya, senior consultant obstetrician and gynaecologist at The Marya Clinic and Max Smart also talked about how herbal therapy was the right option for treating chronic ailments.

The event also provided an opportunity and platform for alternative practitioners to explore the best case reports where ultimate results have been achieved to justify curing and healing by various herbal medicines.

"Residing in the beautiful state of Uttarakhand, we felt that organic wellness and holistic living, which were the way of life of our country, were getting extinct and becoming old fashioned. To reintroduce age old methods with modern technology was the idea with which Planet Herbs was born," V K Dhawan, CEO, PHL, said.

IIT SCIENTISTS CREATE LOW-COST SOLAR CELLS USING JAMUN

Scientists at IIT Roorkee have used the juicy, delectable Indian summer fruit Jamun to create inexpensive and more efficient solar cells.

Researchers used naturally occurring pigment found in jamun as an inexpensive photosensitizer 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 sensitizer.

"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.

'NASA WILL NOT FLY ASTRONAUTS ON FIRST SLS ROCKET LAUNCH'

NASA will not fly astronauts on the first integrated flight of the Space Launch System (SLS) rocket and Orion spacecraft, a part of exploration missions that will take humans to deep space, and eventually to Mars.

In February, NASA began an effort looking at the feasibility of putting crew aboard the first launch of the SLS rocket and Orion - for its Exploration Mission-1, or EM-1.

After weighing the data and assessing all implications, the NASA will continue pursuing the original plan for the first launch, as a rigorous flight test of the integrated systems without crew, the US space agency said.

NASA will also adjust the target launch date for the EM-1 mission to 2019, and will execute its normal process in the coming weeks to determine an official revised launch date.

Engineers will apply insights gained from the effort to the first flight test and the integrated systems to strengthen the long-term push to extend human presence deeper into the solar system.

NASA said it is technically capable of launching crew on EM-1, however, after evaluating cost, risk and technical factors in a project of this magnitude, it would be difficult to accommodate changes needed to add crew at this point in mission planning.

The agency confirmed that the baseline plan to fly EM-1 without crew is still the best approach to enable humans to move sustainably beyond low Earth orbit.

"We appreciate the opportunity to evaluate the possibility of this crewed flight," said NASA acting Administrator Robert Lightfoot.

"The bi-partisan support of Congress and the President for our efforts to send astronauts deeper into the solar system than we have ever gone before is valued and does not go unnoticed. Presidential support for space has been strong," said Lightfoot.

Exploration Mission-1 is the first in a broad series of exploration missions that will take humans to deep space, and eventually to Mars.

"We are considering additional ground testing of the heat shield prior to EM-1 as well as the possibility of advancing the ascent abort test for the Orion launch abort system based on findings from the study," said William Gerstenmaier, associate administrator for NASA's Human Exploration and Operations Mission Directorate.

"Conducting these tests in advance of EM-1 would provide additional data that will advance our systems knowledge faster and possibly improve the robustness of the overall plan for sending humans into deep space," said Gerstenmaier.

PRINTING ELECTRONICS ON HUMAN SKIN COMES CLOSER TO REALITY

Scientists have developed a "revolutionary" new 3D printing technique which could be used to print electronics directly on human skin.

A one-of-a-kind 3D printer built at the University of Minnesota in the US can print touch sensors on a model hand.

"While we have not printed on human skin yet, we were able to print on the curved surface of a model hand using our technique," said Michael McAlpine, associate professor at University of Minnesota.

"We also interfaced a printed device with the skin and were surprised that the device was so sensitive that it could detect your pulse in real time," said McAlpine.

The ultimate wearable technology could eventually be used for health monitoring or by soldiers in the field to detect dangerous chemicals or explosives, researchers said.

McAlpine and his team made the unique sensing fabric with a one-of-a-kind 3D printer they built in the lab.

The multifunctional printer has four nozzles to print the various specialised "inks" that make up the layers of the device - a base layer of silicone, top and bottom electrodes made of a conducting ink, a coil-shaped pressure sensor, and a sacrificial layer that holds the top layer in place while it sets.

The supporting sacrificial layer is later washed away in the final manufacturing process.

All of the layers of "inks" used in the flexible sensors can set at room temperature. Conventional 3D printing using liquid plastic is too hot and too rigid to use on the skin.

These flexible 3D printed sensors can stretch up to three times their original size.

"This is a completely new way to approach 3D printing of electronics," said McAlpine, lead researcher on the study published in the journal *Advanced Materials*.

"We have a multifunctional printer that can print several layers to make these flexible sensory devices. This could take us into so many directions from health monitoring to energy harvesting to chemical sensing," McAlpine added.

HUMAN SENSE OF SMELL RIVALS THAT OF DOGS: STUDY

Our sense of smell may not be as inferior to animals as thought, and may even be at par with the sniffing power of dogs, according to new research that busts a myth which has survived for the last 150 years.

Scientists reviewed existing research, examining data and delving into the historical writings that helped create the long-held misconception that human sense of smell was inferior

because of the size of the olfactory bulb. "For so long people failed to stop and question this claim, even people who study the sense of smell for a living," said John McGann, associate professor at Rutgers University in the US.

"The fact is the sense of smell is just as good in humans as in other mammals, like rodents and dogs," said McGann.

Humans can differentiate between maybe one trillion different odours, which is far more, than the claim by "folk wisdom and poorly sourced introductory psychology textbooks," that insist humans could only detect about 10,000 different odours, he said.

According to McGann, 19th century brain surgeon Paul Broca is the culprit for the falsehood that humans have an impoverished olfactory system.

This an assertion even influenced Sigmund Freud to insist that this deficiency made humans susceptible to mental illness, said McGann.

"It has been a long cultural belief that in order to be a reasonable or rational person you could not be dominated by a sense of smell. Smell was linked to earthly animalistic tendencies," he said.

The truth about smell, is that the human olfactory bulb, which sends signals to other areas of a very powerful human brain to help identify scents, is quite large and similar in the number of neurons to other mammals, McGann said.

The olfactory receptor neurons in the nose work by making physical contact with the molecules composing the odour, and they send this information back to that region of the brain.

"We can detect and discriminate an extraordinary range of odours. We are more sensitive than rodents and dogs for some odours," McGann said in the study published in the journal Science.

"We are capable of tracking odour trails, and our behavioural and affective states are influenced by our sense of smell," he said.

In Broca's 1879 writings, he claimed that the smaller volume of the olfactory area compared to the rest of the brain meant that humans had free will and did not have to rely on smell to survive and stay alive like dogs and other mammals.

McGann said that there is no support for the notion that a larger olfactory bulb increases sense of smell based solely on size.

The idea that humans don't have the same sense of smell abilities as animals flourished over the years based on some genetic studies which discovered that rats and mice have genes for about 1000 different kinds of receptors that are activated by odours, compared to humans, who only have about 400.

The problem with this continuing myth, McGann said, is that smell is much more important than we think.

It strongly influences human behaviour, elicits memories and emotions, and shapes perceptions.

SOON, BATTERY-FREE MEDICAL IMPLANTS POWERED BY BODY'S FLUIDS

Scientists have developed a new energy storage device which operates using fluids in the human body, and could lead to longer-lasting, battery-free pacemakers and other implantable medical devices.

The bio-friendly energy storage system called biological super-capacitor is powered by charged particles, or ions, from the body's fluids like blood serum and urine.

Pacemakers - which help regulate abnormal heart rhythms - and other implantable devices have saved countless lives. However, they are powered by traditional batteries that eventually run out of power and must be replaced, meaning another painful surgery and the accompanying risk of infection.

In addition, batteries contain toxic materials that could endanger the patient if they leak.

Now, researchers from University of California, Los Angeles (UCLA) and the University of Connecticut in the US propose storing energy in those devices without a battery.

The super-capacitor they invented charges using electrolytes from biological fluids like blood serum and urine, and it would work with another device called an energy harvester.

It converts heat and motion from the human body into electricity - in much the same way that self-winding watches are powered by the wearer's body movements.

That electricity is then captured by the super-capacitor.

"Combining energy harvesters with super-capacitors can provide endless power for lifelong implantable devices that may never need to be replaced," said Maher El-Kady, a UCLA postdoctoral researcher.

Modern pacemakers are typically about 6 to 8 millimetres thick, and about the same diameter as a 50-cent coin; about half of that space is usually occupied by the battery.

The new super-capacitor is only 1 micrometre thick - much smaller than the thickness of a human hair - meaning that it could improve implantable devices' energy efficiency.

It also can maintain its performance for a long time, bend and twist inside the body without any mechanical damage, and store more charge than the energy lithium film batteries of comparable size that are currently used in pacemakers.

The new biosupercapacitor comprises a carbon nanomaterial called graphene layered with modified human proteins as an electrode, a conductor through which electricity from the energy harvester can enter or leave.

The new platform could eventually also be used to develop next-generation implantable devices to speed up bone growth, promote healing or stimulate the brain, said Richard Kane from UCLA, who led the study published in the journal Advanced Energy Materials.

NASA DETECTS SIGNS OF WATER ON DISTANT 'WARM NEPTUNE'

Scientists using NASA telescopes have detected “a strong water signature” in the atmosphere of a distant Neptune-sized planet, that could help understand more about the birth and development of planetary systems.

The study, combining observations from NASA's Hubble and Spitzer space telescopes, shows that the distant planet HAT-P-26b has a primitive atmosphere composed almost entirely of hydrogen and helium.

Located about 437 light-years away, HAT-P-26b orbits a star roughly twice as old as our Sun.

The analysis is one of the most detailed studies to date of a “warm Neptune,” or a planet that is Neptune-sized and close to its star.

The researchers determined that HAT-P-26b's atmosphere is relatively clear of clouds and has a strong water signature, although the planet is not a water world. This is the best measurement of water to date on an exoplanet of this size.

Compared to Neptune and Uranus, the planets in our solar system with about the same mass, HAT-P-26b likely formed either closer to its host star or later in the development of its planetary system, or both.

“Astronomers have just begun to investigate the atmospheres of these distant Neptune-mass planets, and almost right away, we found an example that goes against the trend in our solar system,” said Hannah Wakeford, a postdoctoral researcher at NASA's Goddard Space Flight Centre in the US.

To study HAT-P-26b's atmosphere, the researchers used data from transits - occasions when the planet passed in front of its host star.

During a transit, a fraction of the starlight gets filtered through the planet's atmosphere, which absorbs some wavelengths of light but not others.

By looking at how the signatures of the starlight change as a result of this filtering, researchers can work backward to figure out the chemical composition of the atmosphere.

Researchers pooled data from four transits measured by Hubble and two seen by Spitzer. Together, those observations covered a wide range of wavelengths from yellow light through the near-infrared region.

“To have so much information about a warm Neptune is still rare, so analysing these data sets simultaneously is an achievement in and of itself,” said Tiffany Kataria of NASA's Jet Propulsion Laboratory in the US.

Researchers were also able to use the water signature to estimate HAT-P-26b's metallicity - an indication of how rich the planet is in all elements heavier than hydrogen and helium. It gives more clues about how a planet formed.

They determined its metallicity is only about 4.8 times that of the Sun.

“This analysis shows that there is a lot more diversity in the atmospheres of these exoplanets than we were expecting, which is providing insight into how planets can form and evolve differently than in our solar system,” said David K Sing of the University of Exeter in the UK.

The research was published in the journal *Science*.

CHINA PROVIDING STUDENTS LUNAR LIFESTYLE EXPERIENCE

Chinese students will live in a ‘Lunar Palace’ - a cabin that simulates Moon-like environment - for a year, to test a life support system that may allow future astronauts to spend longer periods of time in space.

Eight postgraduate students from Beihang University in China are divided into two groups.

The first four have already stepped into the cabin called ‘Yuegong-1’ (Lunar Palace-1). They will stay there for 60 days, before being replaced by a second group who will stay there for 200 days.

After that, the first group will return to the cabin for the remaining 105 days.

The experiment, code-named “Yuegong-365,” is the university's second attempt to see how the Bioregenerative Life Support System (BLSS) works in a Moon-like environment, after a successful 105-day trial was conducted in 2014.

The BLSS is a system where animals, plants and microorganisms co-exist. Water and food can be recycled in the system, creating an Earth-like environment.

“The latest test is vital to the future of China's Moon and Mars missions and must be relied upon to guarantee the safety and health of our astronauts,” said Liu Zhiheng of the Chinese Academy of Sciences.

“Yuegong-1” consists of a major living space and two plant cabins or greenhouses, state-run Xinhua news agency reported.

The major cabin covers 42 square metres, the size of a very small urban apartment, while each of the plant cabins is 3.5 metres high and 50 to 60 square metres in area.

The major cabin hosts four bed cubicles, a common room, a washroom, a waste-treatment room and an animal-raising room. The system allows four “astronauts” to conduct research while their basic needs are met.

The purpose of the programme is to test the stability of the BLSS when astronauts with different metabolic rates take turns to live in the cabin and when they face sudden situations such as blackouts, said Liu Hong, chief designer of Yuegong-1.

MASSIVE LAVA WAVES SPOTTED ON JUPITER'S MOON IO

Scientists have detected two massive waves sweeping across the largest lava lake on Jupiter's moon Io - the most volcanically active body in our solar system.

Taking advantage of a rare orbital alignment between two of Jupiter's moons, Io and Europa, researchers at University of California (UC) Berkeley have obtained an exceptionally detailed map of the largest lava lake on Io.

On March 8 in 2015, Europa passed in front of Io, gradually blocking out light from the volcanic moon. Since Europa's surface is coated in water ice, it reflects very little sunlight at infrared wavelengths, allowing researchers to accurately isolate the heat emanating from volcanoes on Io's surface.

The infrared data showed that the surface temperature of Io's massive molten lake steadily increased from one end to the other, suggesting that the lava had overturned in two waves that each swept from west to east at about a kilometre per day.

Overturning lava is a popular explanation for the periodic brightening and dimming of the hot spot, called Loki Patera after the Norse god. The most active volcanic site on Io, Loki Patera is about 200 kilometres across. The hot region of the patera has a surface area of 21,500 square kilometres.

"If Loki Patera is a sea of lava, it encompasses an area more than a million times that of a typical lava lake on Earth," said Katherine de Kleer, a graduate student at UC Berkeley.

"In this scenario, portions of cool crust sink, exposing the incandescent magma underneath and causing a brightening in the infrared," said de Kleer.

"This is the first useful map of the entire patera. It shows not one but two resurfacing waves sweeping around the patera. This is much more complex than what was previously thought," said Ashley Davies, of the NASA's Jet Propulsion Laboratory in the US.

"This is a step forward in trying to understand volcanism on Io, which we have been observing for more than 15 years, and in particular the volcanic activity at Loki Patera," said Imke de Pater, a UC Berkeley professor of astronomy.

The images were obtained by the twin 8.4-metre mirrors of the Large Binocular Telescope Observatory in the mountains Arizona, linked together as an interferometer using advanced adaptive optics to remove atmospheric blurring.

3D-PRINTED 'BIONIC SKIN' TO GIVE ROBOTS SENSE OF TOUCH

Scientists have developed a 3D printed stretchable electronic fabric that could give robots the ability to feel their environment.

This "revolutionary" 3D printing process is a major step forward in printing electronics on real human skin, researchers said.

"This stretchable electronic fabric we developed has many practical uses," said Michael McAlpine, associate professor from University of Minnesota in the US.

"Putting this type of 'bionic skin' on surgical robots would give surgeons the ability to actually feel during minimally invasive surgeries, which would make surgery easier instead of just using cameras like they do now.

"These sensors could also make it easier for other robots to walk and interact with their environment," said McAlpine, lead researcher on the study published in the journal *Advanced Materials*. McAlpine said this new discovery could also be used to print electronics on real human skin.

This ultimate wearable technology could eventually be used for health monitoring or by soldiers in the field to detect dangerous chemicals or explosives, researchers said.

"While we have not printed on human skin yet, we were able to print on the curved surface of a model hand using our technique," McAlpine said.

"We also interfaced a printed device with the skin and were surprised that the device was so sensitive that it could detect your pulse in real time," said McAlpine.

McAlpine and his team made the unique sensing fabric with a one-of-a-kind 3D printer they built in the lab.

The multifunctional printer has four nozzles to print the various specialised "inks" that make up the layers of the device - a base layer of silicone, top and bottom electrodes made of a conducting ink, a coil-shaped pressure sensor, and a sacrificial layer that holds the top layer in place while it sets.

The supporting sacrificial layer is later washed away in the final manufacturing process.

All of the layers of "inks" used in the flexible sensors can set at room temperature. Conventional 3D printing using liquid plastic is too hot and too rigid to use on the skin.

These flexible 3D printed sensors can stretch up to three times their original size.

"This is a completely new way to approach 3D printing of electronics," McAlpine said.

"We have a multifunctional printer that can print several layers to make these flexible sensory devices. This could take us into so many directions from health monitoring to energy harvesting to chemical sensing," McAlpine added.

NASA'S MARS PLANS MAY INCLUDE YEAR-LONG MISSION TO MOON

NASA is planning a year-long manned mission to orbit the Moon in 2027 as a part of its preparations to send humans to Mars in the 2030s.

International Science Briefs

The US space agency is building a “deep-space gateway” around the Moon to test for operations and technology required for NASA’s journey to the red planet.

Eventually, the lunar presence would also serve as a launching point for the spacecraft that will carry humans to Mars, said Greg Williams, deputy associate administrator for policy and plans at NASA’s Human Exploration and Operations Mission Directorate.

Williams provided a detailed look at the first two phases of NASA’s current plan to send humans to Mars at the Humans to Mars Summit in Washington DC.

The year-long lunar mission will be preceded by at least five missions - four of them crewed - which will deliver hardware such as a crew habitat, Williams said.

The last piece of delivered hardware would be the Deep Space Transport vehicle that would later be used to carry a crew to Mars, he said.

“If we could conduct a yearlong crewed mission on this Deep Space Transport in cislunar space, we believe we will know enough that we could then send this thing, crewed, on a 1,000-day mission to the Mars system and back,” Williams was quoted as saying by the ‘Space.com’.

Currently, the lunar stages of the plan to get humans to Mars rely heavily on NASA’s Space Launch System (SLS) rocket to send the necessary payloads and crews to cislunar space - the region between Earth and the Moon.

ASTRONAUTS’ EXERCISE CAPACITY REDUCES IN SPACEFLIGHT: STUDY

Astronauts aboard the International Space Station (ISS) or in deep space missions have lower physical fitness and exercise capacity as their heart and blood vessels become less effective at transporting oxygen to muscles, a new study has found.

Researchers set out to find why astronauts’ exercise capacity decreases between 30 and 50 per cent in long-duration spaceflight.

“It is a dramatic decrease,” said Carl Ade, assistant professor at Kansas State University in the US.

“When your cardiovascular function decreases, your aerobic exercise capacity goes down. You can’t perform physically challenging activities anymore,” said Ade.

“While earlier studies suggest that this happens because of changes in heart function, our data suggests that there are some things happening at the level of the heart, but also at the level of the microcirculation within capillaries,” he said.

In addition to improving astronaut health and providing valuable information for future long-duration spaceflights, the research also can help Earth-bound clinical patients with heart failure, Ade said.

While in outer space or on the ISS, astronauts have to

perform many physically demanding tasks, from the simpler task of opening a capsule door to potentially more intense future planetary tasks such as helping a fallen crew member.

Just as important is making sure astronauts can perform life-saving tasks when they return to gravity - tasks that could include an emergency landing on Earth or performing extravehicular activities on the surface of Mars, Ade said.

For the study, researchers used data from NASA’s Johnson Space Centre on nine astronauts who spent about six months aboard the ISS.

The data included exercise measurements before and after their time in outer space.

The astronauts performed a stationary bike exercise test several months before they launched to the ISS.

The researchers established the astronauts’ exercise capacity through measurements - such as oxygen uptake, cardiac output, hemoglobin concentration and arterial saturation - that illustrate how effectively the body transports oxygen to the muscle mitochondria.

Within a couple of days of returning to earth, the astronauts performed the same stationary bike exercise test to determine changes in aerobic exercise capacity.

By comparing the two sets of data, the researchers saw a 30 to 50 per cent decrease in maximal oxygen uptake.

Maximal oxygen uptake is the maximum rate of oxygen that is consumed during exercise and shows the cardiorespiratory health of a person.

The researchers attribute this decrease to the way that microgravity changes the interaction between blood vessel capillaries and red blood cells, but say that more research is needed to understand what is happening in the capillaries.

“If we can understand why maximal oxygen uptake is going down, that allows us to come up with targeted interventions, whether that be exercise or pharmacological interventions,” Ade said.

“This important new information can help these astronauts and prevent any adverse performance changes in their job,” he said.

GIANT BIRD-LIKE DINOSAUR SPECIES FOUND IN CHINA: STUDY

A new species of giant, bird-like dinosaur which tended to enormous nests that were larger than monster truck tires has been discovered in China, scientists said.

Measuring about eight metres and weighing up to three tonnes, the new species named *Beibeilong sinensis* or baby dragon from China, lived about 90 million years ago during the Cretaceous Period. The giant oviraptorosaur - a type of feathered, wing-bearing, beaked dinosaur closely related to birds - is the largest known dinosaur to have sat on its nest and cared for its

young, researchers said.

The study, published in the journal *Nature Communications*, found the dinosaur species based on a number of large eggs and an associated embryo that were collected in China in the early 1990s but then exported out of the country.

At one time, many fossil eggs collected in Henan were being exported out of China to other countries.

“This particular fossil was outside the country for over 20 years and its return to China finally allowed us to properly study the specimen and name a new dinosaur species, *Beibeilong sinensis* or baby dragon from China,” said Professor Lu Junchang, a paleontologist at Chinese Academy of Geological Sciences.

The eggs are up to 45 centimetres long and weighed about five kilogrammes, making them some of the largest dinosaur eggs ever discovered.

They were found in a ring-shaped clutch, which was part of a nest that was about 2-3 meters in diameter and probably contained two dozen or more eggs.

“For many years it was a mystery as to what kind of dinosaur laid these enormous eggs and nests,” said Darla Zelenitsky, a professor at the University of Calgary in Canada.

“Because fossils of large theropods, like tyrannosaurs, were also found in the rocks in Henan, some people initially thought the eggs may have belonged to a tyrannosaur,” said Zelenitsky.

“Thanks to this fossil, we now know that these eggs were laid by a gigantic oviraptorosaur, a dinosaur that would have looked a lot like an overgrown cassowary.

“It would have been a sight to behold with a three tonne animal like this sitting on its nest of eggs,” Zelenitsky said.

Study of the bones of an embryo that died while hatching out of one of the eggs reveals that the egg-layer is a new species of oviraptorosaur.

Although bones of the adult are not known, it was probably in the ballpark of eight meters long and three tonnes in body mass, based on comparison to close relatives.

Since fossils of smaller-bodied, close relatives have been fossilised while sitting on top of their eggs, researchers describe the new giant oviraptorosaur species as the largest known dinosaur to have sat on its nest and cared for its young.

“The fossils were originally collected by farmers in Henan Province of China in 1993, but were subsequently exported out of China to the US,” said Philip Currie, a professor at the University of Alberta in Canada.

“The eggs and embryo gained worldwide fame when they were featured in a *National Geographic* article in 1996, but it was impossible to describe them in a scientific journal - and to name the new species - until the fossils were repatriated to China,” said Currie.

ESA'S SPACECRAFT SET TO OBSERVE MYSTERIOUS DARK MATTER

European Space Agency's Euclid spacecraft to study the properties and effects of the mysterious dark matter and dark energy is set to launch in 2020.

NASA has delivered three detector for the spacecraft's near-infrared instrument.

“The delivery of these detector systems is a milestone for what we hope will be an extremely exciting mission, the first space mission dedicated to going after the mysterious dark energy,” said Michael Seiffert, from the NASA's Jet Propulsion Laboratory in the US.

The Euclid will carry two instruments: a visible-light imager (VIS) and a near-infrared spectrometer and photometer (NISF).

A special light-splitting plate on the Euclid telescope enables incoming light to be shared by both instruments, so they can carry out observations simultaneously.

The spacecraft will observe billions of faint galaxies and investigate why the universe is expanding at an accelerating pace.

Astrophysicists think dark energy is responsible for this effect, and Euclid will explore this hypothesis and help constrain dark energy models.

This census of distant galaxies will also reveal how galaxies are distributed in our universe, which will help astrophysicists understand how the delicate interplay of the gravity of dark matter, luminous matter and dark energy forms large-scale structures in the universe.

Additionally, the location of galaxies in relation to each other tells scientists how they are clustered.

Dark matter, an invisible substance accounting for over= 80 per cent of matter in our universe, can cause subtle distortions in the apparent shapes of galaxies.

That is because its gravity bends light that travels from a distant galaxy toward an observer, which changes the appearance of the galaxy when it is viewed from a telescope.

Euclid's combination of visible and infrared instruments will examine this distortion effect and allow astronomers to probe dark matter and the effects of dark energy.

Detecting infrared light, which is invisible to the human eye, is especially important for studying the universe's distant galaxies.

Each detector system consists of a detector, a cable and a “readout electronics chip” that converts infrared light to data signals read by an onboard computer and transmitted to Earth for analysis. Sixteen detectors will fly on Euclid, each composed of 2040x2040 pixels.

They will cover a field of view slightly larger than twice the area covered by a full moon. The detectors are made of a

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mercury-cadmium-telluride mixture and are designed to operate at extremely cold temperatures.

ROBOT PERFORMS DELICATE EYE SURGERY ON SIX PATIENTS

A robot has been used to successfully perform a delicate eye surgery on six patients in a world- first trial which shows that robotic procedures can be more accurate than the trained human hand.

In the trial, researchers from the University of Oxford in the UK performed the membrane-removal surgery on 12 patients.

Six of those patients underwent the traditional procedure, and six underwent the new robotic technique.

Researchers found that those patients in the robot group experienced significantly fewer hemorrhages and less damage to the retina.

The robot acts like a mechanical hand with seven independent motors that can make movements as precise as one micron, researchers said.

It operates inside the eye through a single hole less than one millimetre in diameter and goes in and out of the eye through this same hole during various steps of the procedure.

However, the surgeon is in control, using a joystick and touch screen to manoeuvre the robot hand while monitoring movements through the operating microscope.

“The robotic technology is very exciting, and the ability to operate under the retina safely will represent a huge advance in developing genetic and stem cell treatments for retinal disease,” Robert E MacLaren, professor at the University of Oxford was quoted as saying by ‘Live Science’.

“We have demonstrated safety in a delicate operation. The system can provide high precision at 10 microns in all three primary directions, which is about 10 times more precise than what a surgeon can do,” said Marc de Smet from University of Eindhoven in the Netherlands, who helped design the robot.

The team first used the system on a 70-year-old priest from UK, in September last year.

Upon the success of that surgery, they conducted a study on 11 more patients in a randomised clinical trial, hoping to measure the robotic system’s accuracy compared to the human hand.

NEW METER TO HELP PEOPLE CREATE SECURE PASSWORDS

Scientists have unveiled a new, state-of-the-art password meter that offers real-time feedback and advice to help people create better and secure passwords.

The meter works by employing an artificial neural network: a large, complex map of information that resembles the way neurons behave in the brain.

The network “learns” by scanning millions of existing passwords and identifying trends.

If the meter detects a characteristic in your password that it knows attackers may guess, it will tell you.

“Our new meter led users to create stronger passwords that were no harder to remember than passwords created without the feedback,” said said Blase Ur, assistant professor at the University of Chicago in the US.

To evaluate its performance, the team conducted an online study in which they asked 4,509 people to use it to create a password.

“Instead of just having a meter say, ‘Your password is bad,’ we thought it would be useful for the meter to say, ‘Here’s why it’s bad and here’s how you could do better,’” said Nicolas Christin, a professor at Carnegie Mellon University in the US.

The key result is that providing the data-driven feedback actually makes a huge difference in security compared to just having a password labelled as weak or strong.

“The way attackers guess passwords is by exploiting the patterns that they observe in large datasets of breached passwords,” said Ur.

“For example, if you change Es to 3s in your password, that’s not going to fool an attacker. The meter will explain about how prevalent that substitution is and offer advice on what to do instead,” Ur said.

This data-driven feedback is presented in real-time, as a user is typing their password out letter-by-letter.

NOW, TURN ANY SURFACE INTO TOUCHSCREEN USING SPRAY PAINT

Scientists have developed a new technology that can turn any surface - including walls, furniture and steering wheels - into a touch screen using tools as simple as a can of spray paint.

The “trick” is to apply electrically conductive coatings or materials to objects or surfaces, or to craft objects using conductive materials, researchers said.

By attaching a series of electrodes to the conductive materials, researchers from Carnegie Mellon University in the US showed they could use a well-known technique called electric field tomography to sense the position of a finger touch.

“For the first time, we have been able to take a can of spray paint and put a touch screen on almost anything,” said Chris Harrison, assistant professor at Carnegie’s Human-Computer Interaction Institute (HCII).

Until now, large touch surfaces have been expensive and irregularly shaped, or flexible touch surfaces have been largely available only in research labs.

Some methods have relied on computer vision, which can be disrupted if a camera's view of a surface is blocked. The presence of cameras also raises privacy concerns.

With the new technology dubbed *Electrick*, conductive touch surfaces can be created by applying conductive paints, bulk plastics or carbon-loaded films among other materials.

Yang Zhang, PhD student at HCII, said that *Electrick* is both accessible to hobbyists and compatible with common manufacturing methods, such as spray coating, vacuum forming and casting/molding, as well as 3D printing.

Like many touchscreens, *Electrick* relies on the shunting effect - when a finger touches the touchpad, it shunts a bit of electric current to ground.

By attaching multiple electrodes to the periphery of an object or conductive coating, Zhang and his colleagues showed they could localise where and when such shunting occurs.

They did this by using electric field tomography - sequentially running small amounts of current through the electrodes in pairs and noting. The trade-off, in comparison to other touch input devices, is accuracy, researchers said.

Electrick can detect the location of a finger touch to an accuracy of one centimetre, which is sufficient for using the touch surface as a button, slider or other control, Zhang said.

Zhang, Harrison and Gierad Laput, another HCII PhD student, used *Electrick* to add touch sensing to surfaces as large as a 4-by-8-foot sheet of drywall, as well as objects as varied as a steering wheel and the surface of a guitar.

The technology was used to make an interactive smartphone case - opening applications such as a camera based on how the user holds the phone - and a game controller that can change the position and combinations of buttons and sliders based on the game being played or the player's preferences.

NEW VIOLINS SOUND BETTER THAN STRADIVARIUS: STUDY

Move over Stradivarius! Despite the lofty reputation of the antique violins crafted by Italian masters, listeners prefer

the newer musical instruments, scientists have found.

The study adds to the long-running debate over which violins best project sound.

Since old Italian instruments are now priced beyond the reach of the vast majority of players, it seems important to test the fundamental assumption of their tonal superiority, according to the study, led by Claudia Fritz from France's National Centre for Scientific Research (CNRS).

Stradivarius violins were made in the 17th and 18th centuries. Today, the instruments often fetch millions of dollars.

Experts say these antiques possess the curious ability to sound quieter under the player's ear, yet project sound farther and better in a concert hall than newer models.

Researchers asked musically versed listeners to compare three Stradivarius violins to three newer models, based on listener preference and sound projection.

One test was conducted in a 300-seat concert hall near Paris, involving 55 listeners. The second involved 82 listeners in an 860-seat hall in New York.

The instruments were played behind a screen by blindfolded soloists - sometimes with an orchestra, sometimes without.

"Regardless of musical experience, listeners preferred new over old violins and found that new violins projected sound better than old violins," according to the researchers.

Both players and listeners were "unable to consistently distinguish new from old violins," they said.

"Contrary to conventional wisdom and practice, soloists might benefit from playing new rather than old violins during auditions and competitions, provided the violins' provenance is shielded from the judges," researchers said.

A 2014 study based on 10 professional violinists also found that musicians - when they were unaware of which were old or new - preferred newer instruments.

The research was published in the journal *Proceedings of the National Academy of Sciences*.

PARIS 1.5 DEGREE CELSIUS TARGET MAY BE SMASHED BY 2026: STUDY

Global temperatures could break through the 1.5 degree Celsius barrier negotiated at the Paris conference as early as 2026, say scientists who predict that a slow-moving, natural climate driver could cause a sharp acceleration in global warming over the next decade.

The Interdecadal Pacific Oscillation (IPO) - a powerful natural climate lever - may have moved into a positive phase.

Since 1999, the IPO has been in a negative phase but consecutive record-breaking warm years in 2014, 2015 and 2016 have led climate researchers to suggest this may have changed.

Scientists at the University of Melbourne in Australia showed that a positive IPO would likely produce a sharp acceleration in global warming over the next decade.

In the past, these positive phases have coincided with accelerated global warming.

“Even if the IPO remains in a negative phase, our research shows we will still likely see global temperatures break through the 1.5 degrees Celsius guardrail by 2031,” said Ben Henley, lead author of the new study published in the journal *Geophysical Research Letters*.

The Paris Agreement’s central aim is to keep the global temperature rise in this century well below two degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.

“If the world is to have any hope of meeting the Paris target, governments will need to pursue policies that not only reduce emissions but remove carbon from the atmosphere,” said Henley.

“Should we overshoot the 1.5 degrees Celsius limit, we must still aim to bring global temperatures back down and stabilise them at that level or lower,” he said.

The IPO has a profound impact on our climate because it is a powerful natural climate lever with a lot of momentum that changes very slowly over periods of 10-30 years.

During its positive phase the ocean temperatures in the tropical Pacific are unusually warm and those outside this region to the north and south are often unusually cool.

When the IPO enters a negative phase, this situation is reversed.

In the past, we have seen positive IPOs from 1925-1946 and again from 1977-1998. These were both periods that saw rapid increases in global average temperatures.

The world experienced the reverse - a prolonged negative phase - from 1947-1976, when global temperatures stalled.

A striking characteristic of the most recent 21st Century negative phase of the IPO is that on this occasion global average surface temperatures continued to rise, just at a slower rate.

“Although the Earth has continued to warm during the temporary slowdown since around 2000, the reduced rate of warming in that period may have lulled us into a false sense of security,” Henley said.

“The positive phase of the IPO will likely correct this slowdown. If so, we can expect an acceleration in global warming in the coming decades,” he said.

“Policy makers should be aware of just how quickly we are approaching 1.5 degrees Celsius. The task of reducing emissions is very urgent indeed,” he added.

NEW DEVICE CAN GENERATE POWER FROM POLLUTED AIR

Scientists have developed a simple device that purifies air and, at the same time, generates power when exposed to light.

The advance by researchers from the University of Antwerp and KU Leuven in Belgium caters to two major social needs: clean air and alternative energy production.

“We use a small device with two rooms separated by a membrane,” said Sammy Verbruggen, Professor at University of Antwerp.

Air is purified on one side, while on the other side hydrogen gas is produced from a part of the degradation= products.

“This hydrogen gas can be stored and used later as fuel, as is already being done in some hydrogen buses, for example,” said Verbruggen.

The heart of the solution lies at the membrane level, where the researchers use specific nanomaterials.

These catalysts are capable of producing hydrogen gas and breaking down air pollution.

“In the past, these cells were mostly used to extract hydrogen from water. We have now discovered that this is also possible, and even more efficient, with polluted air,” said Verbruggen.

The device must only be exposed to light, the researchers said.

Their goal is to be able to use sunlight, as the processes underlying the technology are similar to those found in solar panels.

The difference here is that electricity is not generated directly, but rather that air is purified while the generated power is stored as hydrogen gas.

“We are currently working on a scale of only a few square centimetres. At a later stage, we would like to scale up our technology to make the process industrially applicable.

“We are also working on improving our materials so we can use sunlight more efficiently to trigger the reactions,” Verbruggen added.

NOW, WOODEN FILTER TO PURIFY WATER

Scientists, including one of Indian origin, have found a novel use for wood - to remove toxic impurities from water.

Engineers at University of Maryland in the US started with a block of linden wood, which they then soaked in palladium - a metal used in cars' catalytic converters to remove pollutants from the exhaust.

In this new filter, the palladium bonds to particles of dye.

The wood's natural channels, that once moved water and nutrients between the leaves and roots, now allow the water to flow past the nanoparticles for efficient removal of the toxic dye particles.

The water, tinted with methylene blue, slowly drips through the wood and comes out clear.

"This could be used in areas where wastewater contains toxic dye particles," said Amy Gong, a graduate student at University of Maryland.

The researchers did not compare the filter to other types of filters; rather, they wanted to prove that wood can be used to remove impurities.

"We are currently working on using a wood filter to remove heavy metals, such as lead and copper, from water," said Liangbing Hu, the lead researcher on the project.

"We are also interested in scaling up the technology for real industry applications," said Hu, professor at University of Maryland's Energy Research Centre.

"We found that the wood's channels are actually slightly bent, and they are connected by pores, which slightly increase the time that the water is in contact with the wood," said Siddhartha Das, professor at University of Maryland.

The research was published in the journal ACS Nano.

NEW SMARTWATCH CAN MOVE IN FIVE DIRECTIONS

Scientists have developed a new smartwatch with a display that moves in five different directions - dramatically improving functionality and addressing limitations of today's fixed-face watches.

The watch, named Cito, has the ability to rotate, hinge, translate, rise and orbit.

Beyond making the watches more convenient for users, the technology can provide important benefits to wearers with physical disabilities or other impairments, researchers said.

"Users want smartwatches that fit their lifestyles and needs," said Xing-Dong Yang, assistant professor at Dartmouth College in the US.

"The Cito prototype is an exciting innovation that could give consumers even more great reasons to wear smartwatches," said Yang.

Most smartwatch research primarily addresses how users can more easily input information.

Cito aims to remove awkward moments associated with using smartwatches by improving how the device presents data to the wearer.

Examples of watch movement include automatically orbiting around the wristband to allow viewing when the wrist is facing away from the user; rising to alert the wearer of a notification if the user is playing a game; hinging to allow a companion to view the watch face; and translating to reveal the watch face from underneath a shirt sleeve.

"Consumers will question the need for smartwatches if the devices are just not convenient enough. Cito proves the true potential of smartwatches and shows that they can be functional and fun," said Yang.

The five watch face movements can be performed independently or combined.

"We recognise that our work investigates a radical idea, but our hope is that we also show how a methodical and principled approach can explore any such radical visions," researchers said.

In developing the prototype, researchers conducted two separate studies to confirm the usefulness, social acceptability and perceived comfort of different watch movements and usage contexts.

NEW AI SYSTEM BEATS HUMANS AT PREDICTING COURT OUTCOMES

Scientists have developed a new artificial intelligence system that can predict court decisions better than legal scholars, even with less information.

Researchers, including those from The Stanford Centre for Legal Informatics, used the US Supreme Court Database - which contains information on cases dating back to 1791

Using this, they built an algorithm for predicting any justice's vote at any time.

Researchers drew on 16 features of each vote, including the justice, the term, the issue, and the court of origin. They also added other factors, such as whether oral arguments were heard.

For each year from 1816 to 2015, the team created a machine-learning statistical model. It looked at all prior years and found associations between case features and decision outcomes.

Decision outcomes included whether the court reversed a lower court's decision and how each justice voted. The model then looked at the features of each case for that year and predicted decision outcomes.

Finally, the algorithm was fed information about the outcomes, which allowed it to update its strategy and move on

to the next year. The algorithm correctly predicted 70.2 per cent of the court's 28,000 decisions and 71.9 per cent of the justices' 240,000 votes, according to the study published in the journal PLOS ONE.

Even knowledgeable legal experts are only about 66 per cent accurate at predicting cases, researchers said.

"Every time we've kept score, it hasn't been a terribly pretty picture for humans," Daniel Katz, a law professor at Illinois Institute of Technology in Chicago, was quoted as saying by the 'Science'.

The new algorithm could be used by investors to bet on companies that might benefit from a likely ruling. Appellants could also decide whether to take a case to the Supreme Court based on their chances of winning.

NEW MATERIAL MAY LEAD TO FASTER, POWERFUL ELECTRONICS

Scientists, including those of Indian origin, have discovered a new material with highest- ever conductivity in its class, which could lead to smaller, faster and more powerful electronic devices.

What makes this nano-scale thin film material so unique is that it has a high conductivity, which helps electronics conduct more electricity and become more powerful, said researchers led by the University of Minnesota in the US.

The material also has a wide bandgap, which means light can easily pass through the material making it optically transparent, they said.

In most cases, materials with wide bandgap, usually have either low conductivity or poor transparency.

"The high conductivity and wide bandgap make this an ideal material for making optically transparent conducting films which could be used in a wide variety of electronic devices," said Bharat Jalan, professor at University of Minnesota and the lead researcher on the study.

This includes "high power electronics, electronic displays, touchscreens and even solar cells in which light needs to pass through the device," Jalan said.

Currently, most of the transparent conductors in electronics use a chemical element called indium.

The price of indium has gone up tremendously in the past few years significantly adding to the cost of current display technology, researchers said.

As a result, there has been tremendous effort to find alternative materials that work as well, or even better, than indium-based transparent conductors.

In the new study, researchers developed a transparent conducting thin film using a novel synthesis method, in which they grew a BaSnO₃ thin film (a combination of barium, tin and oxygen, called barium stannate), but replaced elemental tin source

with a chemical precursor of tin.

The chemical precursor of tin has unique, radical properties that enhanced the chemical reactivity and greatly improved the metal oxide formation process.

Both barium and tin are significantly cheaper than indium and are abundantly available.

"We were quite surprised at how well this unconventional approach worked the very first time we used the tin chemical precursor," said Abhinav Prakash, graduate student at University of Minnesota.

"It was a big risk, but it was quite a big breakthrough for us," said Prakash, the first author of the paper published in the journal Nature Communications.

COLOUR-CHANGING STAMP TO MARK RARE SOLAR ECLIPSE EVENT IN US

The US postal agency is issuing a first-of-its-kind postage stamp that morphs when touched - changing from the image of a total solar eclipse to that of the Moon.

On August 21 this year, US will witness a rare celestial event. For the first time in 38 years, the Moon will completely block the solar disk for a few minutes, creating a total eclipse of the Sun.

To mark the historic event, the US Postal Service is issuing the inspired postage stamp.

Conceived by graphic designer Antonio Alcala, the stamp features two layers of photographs.

The first image depicts a picture of a total eclipse observed in Libya in 2006.

When the warmth of your finger touches the black dot, an image of a full moon emerges.

The commemorative stamp uses special temperature-sensitive inks, 'The Quartz' reported.

On the back of the sheet of stamps, a map of the eclipse's shadow path, which will traverse 14 states as it moves east, from Oregon to South Carolina.

The Total Solar Eclipse stamps go on sale on June 20.

NEW SHAPE-CHANGING FOG DISPLAY DEVELOPED

Scientists have developed a futuristic, shape-changing fog display that allows users to interact with virtual 2D and 3D objects floating in mid air.

While shape-changing displays and fog screens already exist, this is the first time the two technologies have been combined, researchers said.

The invention, called MistForm, flexibly adapts to single or multiple users interacting with the floating content, all the while changing shape and position to optimise visibility.

“This has the potential to enable new forms of interaction and collaboration with computers, liberating users from fixed, static screens and opening up whole new interactive spaces,” said Diego Martinez Plasencia, from the at the University of Sussex.

Fog displays scatter light in an uneven way - a different amount of light in different directions.

By understanding these scattering patterns and controlling the shape, common visibility and brightness problems can be addressed.

By making use of shape reconstruction and 3D projection algorithms, MistForm adjusts its shape to better support user interaction, all while removing any image distortion caused by projecting on moving, curved fog surfaces.

“This latest study builds upon early concepts to provide a far more enjoyable and reliable user experience, by combining two exciting technologies to combat the issues of distortion and uneven brightness that we often see with fog screens,” Plasencia said.

“With other 3D display technologies your eyes need to focus on the display surface, even if you see an object “popping out” of the screen,” he said.

“If you then try to touch it, your eyes will need to focus either on your hand or on the display, which soon can lead to eye fatigue,” he added.

MistForm can adapt to these scenarios, moving the display surface so that both the object and the hand remain comfortably visible.

“With this kind of technique, we can provide comfortable direct hand 3D interaction in all the range your arms can reach,” said Plasencia.

MistForm is roughly the size of a 39-inch TV screen and is formed of fog stabilised by curtains of air. The screen can move towards and away from the user and can bend into numerous different shapes.

For example, it can curve around two collaborators, providing optimum visibility for both people, or it can take on a triangular shape if those two people need to work on different areas of the screen independently.

The display is projected from above and motion trackers detect the user’s movements and intentions, allowing the display to adapt accordingly, researchers said.

ANTARCTIC ICE SHEET STABLE SINCE WARMER TIMES: STUDY

Central parts of Antarctica’s ice sheet have been stable for millions of years, even when conditions were considerably warmer than present, new research suggests.

The study of mountains in West Antarctica may help scientists improve their predictions of how the region might

respond to continuing climate change.

The findings could also show how ice loss might contribute to sea level rise.

Although the discovery demonstrates the long-term stability of some parts of Antarctica’s ice sheet, scientists remain concerned that ice at its coastline is vulnerable to rising temperatures.

Researchers from the Universities of Edinburgh and Northumbria in the UK studied rocks on slopes of the Ellsworth Mountains, whose peaks protrude through the ice sheet.

By mapping and analysing surface rocks - including measuring their exposure to cosmic rays - researchers calculated that the mountains have been shaped by an ice sheet over a million-year period, beginning in a climate some 20 degrees Celsius warmer than at present.

The last time such climates existed in the mountains of Antarctica was 14 million years ago when vegetation grew in the mountains and beetles thrived.

Antarctica’s climate at the time would be similar to that of modern day Patagonia or Greenland.

This time marked the start of a period of cooling and the growth of a large ice sheet that extended offshore around the Antarctic continent.

Glaciers have subsequently cut deep into the landscape, leaving a high-tide mark - known as a trimline - in the exposed peaks of the Ellsworth range.

The extended ice sheet cooled the oceans and atmosphere, helping form the world of today, researchers said. The study is among the first to find evidence for this period in West Antarctica.

“These findings help us understand how the Antarctic Ice Sheet has evolved, and to fine-tune our models and predict its future,” said David Sugden, of the University of Edinburgh.

“The preservation of old rock surfaces is testimony to the stability of at least the central parts of the Antarctic Ice Sheet - but we are still very concerned over other parts of Antarctica amid climate change,” Sugden said.

The research was published in Earth and Planetary Science Letters.

TECHNIQUE TO TURN MARS OR MOON ROCKS INTO CONCRETE DEVELOPED

A new form of concrete made using Martian or lunar soil and animal proteins may allow future astronauts to build colonies on Mars and the Moon, according to Stanford and NASA scientists.

To establish settlements on the Moon or Mars, humans would need thousands of tonnes of concrete to survive. Both Mars and the moon are bombarded constantly with both lethal radiation and micrometeorites that would quickly punch holes

into any ordinary structure.

However, since it is nearly impossible to ship such quantities of cement from Earth to Mars, the best way forward would be to start making it in space.

Making Earth-style concrete requires tremendous amounts of heat and energy, which would be very short supply for first human outposts on Mars.

To solve that problem, researchers used animal protein to make a promising form of concrete that could solve problems on Mars as well as Earth.

Living organisms use proteins to make things as tough as shells, bones and teeth, so the researchers including , David Loftus from NASA's Ames Research Centre and Michael Lepech from Stanford University in the US began working on a concrete bound together with a protein from bovine blood.

The protein is a fairly cheap by-product of slaughterhouses, and it is known to become very gluey when mixed with soil.

To replicate the conditions on Mars and the moon, researchers combined the protein with simulated extraterrestrial soils that are similar to what is on Mars and the Moon.

The first batch was as strong as the concrete used for sidewalks and patios - a good start.

It also held up well to a simulated bombardment of micrometeorites, which the researchers replicated by taking the material to the Ames Vertical Gun Range and blasting it with high-speed gas particles.

For the purposes of making concrete on Mars, the idea is to create biological 'factories' of organisms that are genetically engineered to produce the protein binder.

It is the same way that biotech companies use genetically engineered bacteria to make synthetic hormones. The feedstock for those organisms would come from the settlement's recycled organic waste.

One of the big advantages of bio-based concrete is that, unlike in regular concrete, the binding proteins can be recycled time after time. Over years, that can save a lot of energy.

NOISE POLLUTION IN US THREATENS PROTECTED WILDLIFE AREAS

Noise pollution caused by humans is 'pervasive' in the US protected areas, posing a threat to land masses that harbour wildlife and provide places for respite, recreation, and natural resource conservation.

Protected areas in the US represent about 14 per cent of the land mass.

Researchers, including those from Colorado State University in the US, analysed millions of hours of sound measurements from 492 sites around continental US.

The results summarised predictions of existing sound levels, estimates of natural sound levels, and the amount that human-made noise raises levels above natural levels, which is considered noise pollution.

Researchers found that human-made noise doubled background sound levels in 63 per cent of US protected areas, and caused a ten-fold or greater increase in background levels in 21 per cent of protected areas.

In other words, noise reduced the area that natural sounds can be heard by 50 to 90 per cent. This also means that what could be heard at 100 feet away could only be heard from 10 to 50 feet, researchers said.

This reduced capacity to hear natural sound reduces the restorative properties of spending time in nature, such as mood enhancement and stress reduction, interfering with the enjoyment typically experienced by park visitors.

"The noise levels we found can be harmful to visitor experiences in these areas, and can be harmful to human health, and to wildlife," said Rachel Buxton, from Warner College of Natural Resources in the US.

"We were encouraged to see that many large wilderness areas have sound levels that are close to natural levels. Protecting these important natural acoustic resources as development and land conversion progresses is critical if we want to preserve the character of protected areas," she said.

High levels of noise pollution were also found in critical habitat for endangered species, namely in endangered plant and insect habitats.

"Although plants can not hear, many animals that disperse seeds or pollinate flowers can hear and are known to be affected by noise, resulting in indirect impacts on plants," said Buxton.

The study also found that high noise pollution levels within protected areas were in specific locations, where noise reduction techniques may best be targeted.

The biggest noise-causing culprits were roads, aircraft, human development, and resource extraction.

The study was published in the journal Science.