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## SCIENCE & TECHNOLOGY

### Sun-observing IRIS

- Nasa's sun-observing IRIS (Interface Region Imaging Spectrograph) spacecraft has captured its first stunning close-up of a colossal coronal mass ejection (CME) erupting from the sun.
- The field of view for this imagery is about five times the width of earth and about seven-and-half times its length, a tremendous sheet of solar material can be seen erupting in a latest video released by Nasa.
- The view is unprecedented for IRIS which was launched in June last year to observe the lowest levels of the sun's atmosphere with better resolution than ever before.
- IRIS must commit to pointing at certain areas of the sun at least a day in advance, so catching a CME in the act involves some educated guesses and a little bit of luck.

### Kepler-10c

- Astronomers have discovered the "Godzilla" of all Earths – a new type of rocky planet that weighs 17 times as much as our planet and is more than twice as large in size, a surprising find that could change scientists' understanding of the origins of the universe.
- The newly found mega-Earth, Kepler-10c, circles a Sun-like star once every 45 days. It is located about 560 light-years from Earth in the constellation Draco. Theorists

believed such a world could not form because anything so hefty would grab hydrogen gas as it grew and become a Jupiter-like gas giant. This planet, though, is all solid and much bigger than previously discovered "super-Earths," making it a "mega-Earth."

- Kepler-10c was originally spotted by NASA's Kepler spacecraft. Kepler-10c was known to have a diameter of about 18,000 miles, 2.3 times as large as Earth. This suggested it fell into a category of planets known as mini-Neptunes, which have thick, gaseous envelopes. The team used the HARPS-North instrument on the Telescopio Nazionale Galileo (TNG) in the Canary Islands to measure the mass of Kepler-10c. They found that it weighed 17 times as much as Earth – far more than expected. This showed that Kepler-10c must have a dense composition of rocks and other solids.

### New supercomputer unveiled by IIT-Kanpur

- One of India's top educational institutes, the Indian Institute Of Technology at Kanpur (IIT-K) has unveiled a new supercomputer recently.
- It is the second supercomputer that has been developed by the prestigious institute. The computer has been ranked fifth in the country in terms of performance and 130th in the list of world top 500 supercomputers.

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- According to Srivastava, the machine operate at a peak performance of 307.2 Terra Flops (TF) and a realised performance of about 249 TF.
- They said the new machine would be used for regular education, research and training purposes.
- The machine has been launched after extensive research by a seasoned team and the engineers behind the project felt that this is one of the best supercomputers.
- The project cost Rs 48 crore to the institute.

### Renewable power in Germany

- May 11, 2014 was a red letter day for renewable power in Germany. The biggest clean energy market reached an enviable record of almost 75 per cent renewable market share for several hours that day. Germany faces its own travails over its chosen path.
- Germany is indeed avoiding blackouts-by opening new coal and gas fired plants. Renewable electricity is proving so unreliable and chaotic that it is starting to undermine the stability of the European grid and provoke international incidents.
- The spiraling cost of the renewables surge has sparked a backlash, including government proposals to slash subsidies and deployment rates.
- For all modes of power generation, capacity factor — CF (the amount of electricity, a generator produces in a year divided by the amount it will produce if it ran at full capacity for all 8,760 hrs a year) — is important. Typically during 2012, CFs (per cent) in Germany were, for solar: 11; wind: 17; fossil fuel: 80 and for nuclear: 94.
- Since India has in place an ambitious renewable energy programme, we must learn from the experiences of other

countries particularly Germany; Germany's tryst with renewable power is often taken as a model.

- India must promote all modes of power generation including solar and wind. Copious sunshine and abundant wind may lead to over production in the grid. Balancing the grid may be a challenge. Central Government must organise a systematic review of the challenges to arrive at India-centric solutions.

### Scientists develop water-based organic battery

- Scientists have developed a water-based organic battery that is long lasting and built from cheap, eco-friendly components. The new battery - which uses no metals or toxic materials - is intended for use in power plants, where it can make the energy grid more resilient and efficient by creating a large-scale means to store energy for use as needed.
- "The batteries last for about 5,000 recharge cycles, giving them an estimated 15 year lifespan," said Sri Narayan, professor of chemistry at the University of Southern California Dornsife College of Letters, Arts and Sciences and the corresponding author of the study. "Lithium ion batteries degrade after around 1,000 cycles, and cost 10 times more to manufacture," Narayan said.
- Narayan collaborated with Surya Prakash, professor of chemistry and director of the USC Loker Hydrocarbon Research Institute, as well as USC's Bo Yang, Lena Hooper—Burkhardt, and Fang Wang. "Such organic flow batteries will be game-changers for grid electrical energy storage in terms of simplicity, cost, reliability and sustainability," said Prakash.

- Solar panels and wind turbines are inherently unreliable which makes it difficult for power companies to rely on them to meet customer demand. With batteries to store surplus energy and then dole it out as needed, that sporadic unreliability could cease to be such an issue, researchers said.
- “Mega-scale energy storage is a critical problem in the future of the renewable energy, requiring inexpensive and eco-friendly solutions,” Narayan said. The new battery is based on a redox flow design — similar in design to a fuel cell, with two tanks of electroactive materials dissolved in water.
- The solutions are pumped into a cell containing a membrane between the two fluids with electrodes on either side, releasing energy. The design has the advantage of decoupling power from energy. The tanks of electroactive materials can be made as large as needed — increasing total amount of energy the system can store — or the central cell can be tweaked to release that energy faster or slower, altering the amount of power (energy released over time) that the system can generate.
- While previous battery designs have used metals or toxic chemicals, Narayan and Prakash wanted to find an organic compound that could be dissolved in water. Such a system would create a minimal impact on the environment, and would likely be cheap, they figured.
- They found that certain naturally occurring quinones — oxidised organic compounds — fit the bill. Quinones are found in plants, fungi, bacteria, and some animals, and are involved in photosynthesis and cellular respiration. The research was published in the Journal of the Electrochemical Society.

### **New algae species could provide valuable biofuel**

- The discovery of a new species of macro algae along the coast at south Goa could open up vast reserves of biofuel besides providing raw material for anti-cancer drugs. A variety of macro algae was last discovered some 45 years back in the coastal region of Chennai.
- Such macro algae can be a rich source of biomass,” said Felix Bast, principle investigator and scientist at the Centre for Biosciences, Central University of Punjab. “Macro algae or seaweed changes its morphology frequently and hence it is extremely tough to record or find out about various species.
- Algae larger than 100 micrometre in size is termed a macro algae, or seaweed, in layman’s language. The new species has been named *Cladophora goensis* Bast after the researcher who found it. Green marine algae is responsible for the phenomenon of the massive green tides occurring in Goa, due to the explosive growth of seaweeds.
- This is a rapidly growing algae which cultivates in marine areas only and in water with salinity greater than 30ppm,” said Bast. Apart from the possibility of this being used as a raw material for biofuel, it can be cultivated and used in the production of FDA-approved anti-cancer drugs.
- The team of researchers including Felix Bast and his students Aijaz Ahmad John and Satej Bhushan used DNA sequencing techniques to establish their findings. The researchers said this bloom forming algae needs some hard sub-strata or rock-like substance to grow on and was seen to be growing on mooring lines, buoys, hulls of wooden dinghies and intertidal

substrata, including natural rocks and concrete breakwaters. Its morphological characters distinguish it from its earlier species including the green pigment-chloroplast-containing organic cell.

### El Niño in 2014

- The El Niño weather phenomenon, which can cause global famines, floods and even wars, has a 90 per cent chance of striking this year, according to the latest forecast released.
- El Niño begins as a giant pool of warm water swelling in the eastern tropical Pacific that sets off a chain reaction of weather events around the world, some devastating and some beneficial.
- India is expected to be the first to suffer, with weaker monsoon rains, followed by further scorching droughts in Australia and collapsing fisheries off South America. But some regions could benefit, in particular the U.S., where El Niño is seen as the “great wet hope”, bringing rains that could break the searing drought in the west.
- The knock-on effects can impact even more widely, from cutting global gold prices to making England’s World Cup footballers sweat a little more.

### Earth size white dwarf star found in space

- A team of astronomers has identified possibly the coldest, faintest white dwarf star ever detected. This ancient stellar remnant is so cold that its carbon has crystallised, forming, in effect, an earth-sized diamond in space.
- It is likely its age is the same as of the Milky Way, approximately 11 billion years old. It is a really remarkable object,” said David Kaplan, professor at University of Wisconsin-Milwaukee in the US. These

things should be out there, but because they are so dim they are very hard to find.

- Kaplan and his colleagues found this stellar gem using the National Radio Astronomy Observatory’s (NRAO) Green Bank Telescope (GBT) and Very Long Baseline Array (VLBA), as well as other observatories. White dwarfs are extremely dense end-states of stars that have collapsed.
- The researchers calculated that the white dwarf would be no more than a comparatively cool 3,000 degrees Kelvin (2,700 degrees Celsius). Astronomers believe that such a cool, collapsed star would be largely crystallised carbon, not unlike a diamond. The findings were published in the *Astrophysical Journal*.

### ‘Super-adapted’ chikungunya virus a possibility

- The chikungunya virus circulating in parts of India as well as Sri Lanka and South-East Asia could gain the ability to spread more efficiently by combining mutations, becoming ‘super-adapted’ for transmission by the Asian tiger mosquito, *Aedes albopictus*, according to research published recently.
- The virus has been primarily transmitted by the *Aedes aegypti* mosquito. However, ten years back, a novel form of the virus emerged in coastal Kenya, which then spread to countries around the Indian Ocean, including India, causing huge outbreaks.
- Strains of this virus found in islands off Africa, states in India such as Kerala, Sri Lanka and in countries in South-East Asia had a mutation that allowed it to be passed on by the *A. albopictus* mosquito as well. The mutation changed the virus’ E1 protein.

- Subsequently, an additional mutation was discovered in a virus isolated in Kerala in 2009 and from Orissa a year later that altered the viral E2 protein. The mutation, known as 'E2-L210Q,' further enhanced the virus' ability to replicate in the *A. albopictus* mosquito and thereby increase its circulation among humans.
- A team of scientists led by Scott C. Weaver of the University of Texas Medical Branch at Galveston in the U.S. has identified more E2 mutations, each of which, along with the change in the E1 protein, made the virus more efficient in establishing itself in *A. albopictus*.
- One of these mutations, 'E2-K252Q,' first turned up in a virus isolated in Kerala in 2007 and later in viruses from South-East Asia. More ominously, their paper published recently in *Nature Communications* also provided experimental evidence that a 'super-adapted' form of the virus could potentially emerge by combining E2 mutations.
- A lab-created virus with both the E2-L210Q and E2-K252Q mutations was far more effective than either one of those mutations at colonising *A. albopictus*. The findings indicated that even more efficient chikungunya virus transmission by *A. albopictus* "will likely evolve when combinations of these second-step mutations occur in their current ranges of endemic circulation in India and Southeast Asia, followed by their likely global spread," the scientists noted in the paper.

#### **Full capacity attained in Kudankulam reactor**

- The Kudankulam Nuclear Power Project crossed the much-awaited milestone as the first reactor of the upcoming nuclear

park attained its maximum capacity of 1,000 MW.

- The Nuclear Power Corporation of India Limited (NPCIL) engineers were operating 1,000 MWe reactors built with VVER technology, supplied by Atomstroyexport, Russia.
- When the reactor reached 90 per cent of its capacity on May 5 last, it was expected that the first unit would attain the maximum power generation capacity within a week or so.
- Though the NPCIL had originally planned to commission the first of the 2 X 1,000 MWe reactor within five years from the date of 'first pouring of concrete', the completely new technology for the NPCIL technocrats, a range of technical issues, delayed supply of components, incorporation of additional safety measures, anti-KKNPP struggle and other reasons delayed its completion. Finally, the reactor is now ready for commercial power generation 11 months after it attained criticality last year.

#### **PSLV C23 successfully put five foreign satellites**

- India's Polar Satellite Launch Vehicle C-23 successfully put five foreign satellites into orbit in the presence of Prime Minister Narendra Modi at the Indian Space Research Organisation's spaceport in Sriharikota.
- In a smooth 20-minute mission, the ISRO launched the 714-kg French earth observation satellite SPOT-7, the 14-kg German AISAT, the two 15-kg Canadian NLS7.1 (CAN-X4) and NLS7.2 (CAN-X5) and the 7-kg Singapore VELOX-1. Following a "perfect" lift-off at 9.52 a.m., the PSLV-C23's four stages came to life and fell off as programmed — the 4-storey heat shield which protected the satellites



from turbulence, split in two and fell into the Bay of Bengal. Soon, all five were in their slots at a height of more than 660 km.

- Observing that 40 of the 67 PSLV satellites were put into orbit from 19 foreign countries, Mr. Modi said it was “a global endorsement of India’s capabilities”.

#### ISRO must develop Saarc satellite- PM

- Prime Minister Narendra Modi asked India’s space community to take up “the challenge of developing a Saarc satellite” which can be dedicated to “our neighbourhood, as a gift from India”.
- He suggested that the Saarc satellite could provide a full range of applications and services to all neighbours of India. He also asked the Indian Space Research Organisation (ISRO) “to enlarge the footprint of our satellite-based navigation system to cover all of South India.”
- Mr. Modi, who addressed the ISRO employees from the Mission Control Centre (MCC) at Sriharikota after the Polar Satellite Launch Vehicle (PSLV-C23) successfully put five foreign satellites into orbit, wanted the ISRO to develop more advanced satellites with higher degree of computation, imaging and transmission. “We must expand our satellite footprint in terms of frequency and quality.”
- The Prime Minister praised India’s space scientists for helping the country become a self-reliant space power. India could be proud that its space programme was indigenous and the country developed it despite international hurdles.

#### Akash ready for induction into Army

- The DRDO-developed air defence missile system was successfully test-fired by the Army and hit an unmanned aerial vehicle. The Army on Wednesday fired a surface-to-air Akash missile, which

intercepted a fast-moving, small unmanned aerial vehicle called Banshee at an altitude of 30 metres above the sea level.

- The interception proved the missile’s capability against subsonic cruise missile, said officials from the Defence Research and Development Organisation (DRDO) which developed Akash. Wednesday’s launch was the last among the validation trials done by the Army on the missile’s production model.
- A modern radar, which forms part of the entire Akash system, continuously tracked the low-flying target. Special techniques developed by the DRDO for overcoming the reflections of the target vehicle Banshee coming from the sea worked perfectly in the mission. With this flight trial, the Army had accomplished all the validation trials on the missile’s production model and the Akash system was being delivered for induction into the Army.
- Bharat Dynamics Limited (BDL), Hyderabad, is producing the missile for the Army, the Bharat Electronics Limited (BEL) is the production agency for the Air Force. BEL and BDL were executing production orders for more than Rs.23,000 crore of the Akash missile system.

#### KLOTHO

- People who have a variant of a longevity gene have improved brain skills such as thinking, learning and memory. Researchers found that increasing levels of the gene, called KLOTHO, in mice made them smarter, possibly by increasing the strength of connections between nerve cells in the brain.
- The study was published in Cell Reports. Those who have one copy of a variant of

the KLOTHO gene, called KL-VS, tend to live longer and have lower chances of suffering a stroke whereas those who have two copies may live shorter lives and have a higher risk of stroke.

- The study also found that those with one copy performed better on cognitive tests regardless of age, sex or the presence of the apolipoprotein 4 gene, the main genetic risk factor for Alzheimer's disease.

#### **India's first cyber lab**

- The National Law School of India University (NLSIU) on May 6 will launch what is touted to be the country's first cyber lab in a legal academic institution.
- The lab, co-funded by the Department of Electronics and Information Technology (DEITY), Ministry of Communication and Information Technology, will be inaugurated by Shyamal Ghosh, the former Telecom Secretary, Government of India; Gulshan Rai, Director-General, Indian Computer Emergency Response Team (CERT-In) and R. Venkata Rao, Vice-Chancellor, NLSIU.
- A release from NLSIU's Advanced Centre for Cyber Law and Cyber Forensics, said the centre also offers training programmes for bank officials and other professionals who want to gain knowledge of cyber technology and forensics crucial for detection and investigation of cyber crimes.
- The centre launched its Postgraduate Diploma in Cyber Law and Cyber Forensics in June 2013, which senior police officers, IT security officers and lawyers have enrolled for.

#### **Implantable Device to Control BP**

- Not being able to control blood pressure even after gulping pills would no longer be a problem. Soon, an implantable device

will reduce blood pressure by sending electrical signals to the brain.

- In a first, German researchers have successfully reduced the blood pressure in rats by 40 percent with this device without any major side effects.
- This could offer hope for a significant proportion of patients worldwide who do not respond to existing medical treatment for the condition.
- The implantable device uses an intelligent circuit to record the activity of the patient, for instance when they are exercising, and adjust the blood pressure accordingly.
- The device consists of 24 individual electrodes that are integrated into a micro-machined cuff. It is designed to wrap around the vagus nerve, which extends from the brainstem to the thorax and abdomen - supplying and stimulating various major organs including the heart and major blood vessels.

#### **Supermassive black holes**

- Luck for the average pedestrian is happening upon a crisp dollar bill tumbling down the sidewalk. For European astronomers, it's happening to be looking at the right portion of sky at the exact moment a star is ripped apart by a giant black hole.
- The auspicious discovery was made by the European Space Agency's orbiting X-ray observatory XMM-Newton. The cosmological providence revealed not one black hole, but two — the first pair of supermassive black holes observed in a normal galaxy. Normal galaxies, or quiescent galaxies -- as opposed to active galaxies -- are no longer actively producing stars. Black holes are much easier to locate in newer active galaxies. While black holes in active galaxies are constantly eating up

gas clouds and star matter, giving off detectable X-rays as a result, similar activity is less frequent and more sporadic in normal galaxies.

- Currently, the only way to find a normal black hole is by happening upon a "tidal disruption event," like the star consumption witnessed by ESA's XMM-Newton.
- What makes the latest discovery even more unusual is that the two black holes were found together, orbiting each other -- the product of two galaxies having merged.

### **Helix's twisted cousin**

- The helix is a complex shape found in many natural settings. It is commonly illustrated by the shape of DNA molecules. The roots of some plants also burrow as helices, like corkscrews winding downward in search of richer soil. But during an experiment at Harvard University, mechanical engineers were surprised when a pair of rubber ribbons expected to form a helix did not, buckling into a shape rarely observed in nature.
- Every helix winds in a left or right direction. The engineers observed what they called a hemihelix: a helix that changes its direction midway. The region along which it changes its direction is called a perversion. Charles Darwin observed plant tendrils forming hemihelices in 1888.
- Starting with two strips of an elastic polymer of different lengths, the engineers stretched the shorter one to be the same length as the other. Then, while maintaining the stretching force, they joined the strips side-by-side. As the force was dwindled, the bi-strip twisted and bent to create either a helix or a hemihelix.
- As energy due to stretching flows through

the strip, the strip twists to reduce the load it bears. However, imperfections in the material could cause the strip to buckle at certain places, where perversions form and the chirality reverses.

### **From thin air to drinking water**

- An Israeli company has developed a new and inexpensive technology that produces drinking water from thin air, an advancement that can address the problem of water scarcity in developing countries such as India.
- Using the technology, a litre of water can be produced for a mere Rs. 1.5, as compared to Rs. 15 for a litre of bottled water, the company claims. The Atmospheric Water-Generation Units created by Water-Gen use a "GENius" heat exchanger to chill air and condense water vapour.
- The clean air is passed through the heat exchanger system where it gets dehumidified. The water is then removed from the air and collected in a tank inside the unit.
- The company claims its water generator is more energy efficient than other such companies as it uses the cooled air created by the unit to chill incoming air. The system can produce 250-800 litres of potable water a day depending on temperature and humidity conditions.

### **Orbit of the International Space Station (ISS)**

- The orbit of the International Space Station (ISS) will be corrected by raising it by 2.15 kilometres.
- The manoeuvre were carried out using the thrusters of the Progress M-21M cargo spacecraft.
- The station was raised to the altitude of 415.2 kilometres and the adjustment is



made to ensure better docking conditions of the Soyuz TMA-13M spacecraft, which is scheduled to blast off from the Baikonur space centre in Kazakhstan on May 28 to bring a new crew to the ISS.

- The Progress M-21M docked with the orbital station on November 30. The docking operation was being carried out by means of the new approach system in an automatic mode.

### Microbes could Colonize Mars

- In the race to colonise Mars, microbes may end up beating humans!
- Hardy little micro-organisms from Earth could hitch a ride on a spacecraft and colonise the surface of Mars and trick scientists into thinking they are aliens, a new study by NASA scientists, including one of Indian-origin, has found.
- These bacteria could contaminate celestial bodies such as Mars, making it difficult for researchers to determine if a life form actually originated on the site, researchers said.
- Currently, spacecraft landing on Mars or other planets where life might exist must meet requirements for a maximum allowable level of microbial life, or bioburden.
- These acceptable levels were based on studies of how various life forms survive exposure to the rigours associated with space travel, researchers said.
- Spore-forming bacteria are of particular concern because spores can withstand certain sterilisation procedures and may best be able to survive the harsh environments of outer space or planetary surfaces.
- Spores of *Bacillus pumilus* SAFR-032 have shown especially high resistance to techniques used to clean spacecraft, such as ultraviolet (UV) radiation and peroxide

treatment.

- When researchers exposed this hardy organism to a simulated Mars environment that kills standard spores in 30 seconds, it survived 30 minutes.

### The link between Tobacco and Cancer in India

- Every year nearly one million new cancer cases are diagnosed in India, the prevalence being 2.5 million. With mortalities of 6,00,000-7,00,000 a year, cancer causes six per cent of all adult deaths in the country.
- The number of deaths per year is projected to shoot up to 1.2 million by 2035, according to a series of papers published in the Lancet Oncology journal.
- Currently, people in the 30-69 age group account for over two-thirds of cancer deaths in India, with less than a third of the patients surviving more than five years after diagnosis.
- The most common, nearly half of all, are cancers of the lung and oral cavity in men, and of the breast and cervix in women.
- Tobacco use alone accounts for about 40 per cent of all cancers in India.
- The geographical distribution of cancers is quite varied across the country. Based on the data from Chennai, cervical cancer was more prevalent (22.7 per 100,000) than breast cancer in Tamil Nadu, while oral cancer accounted for 243 per 100,000 men in Kerala.
- With a rate of 215 per 100,000 women, Delhi had the highest incidence of gall bladder cancer in women in the world.

### Plant Growth Chamber for Space

- Astronauts will now turn into cosmic gardeners and grow lettuce in space as United States space agency National Aeronautics and Space Administration

(NASA) is all set to send the largest ever plant growth chamber to the International Space Station (ISS).

- It will launch the Vegetable Production System aboard SpaceX's Dragon capsule.
- The plant growth chamber will grow lettuce inside prototype flight pillows that will help the plants withstand zero gravity, The Verge reported. Red, blue, and green light emitting diodes (LEDs) will help sustain the vegetables, and the plant chamber itself can grow to 11.5 inches wide and 14.5 inches deep.
- This will be "the largest plant growth chamber for space to date.
- The chamber may even be used for more ambitious projects, like providing food for the average person back on Earth. After extensive testing on weightless horticulture, NASA is confident the lack of gravity will not impede growth.
- However, space-borne micro-bes that may develop during growth are a cause of concern. Therefore, the lettuce will undergo extensive testing before astronauts chow down.

### **High Manganese level Detected in the Selaulim Reservoir**

- High manganese level has been detected in the Selaulim reservoir in Goa, which supplies drinking water to more than half of the coastal State. The government engineers have however said that there was "no reason" to worry.
- The State Public Works Department has started monitoring the water content at the South Goa reservoir.
- The manganese level in the water from the reservoir has risen up from 0.1 to 0.8 mg per litre.
- The reservoir has an earth dam with concrete spillway and is on the Selaulim

tributary of Zuari river.

- The reservoir has production capacity of 214 MLD of water, which is supplied to entire South Goa and some parts of north district.

### **LADEE**

- NASA's robotic moon explorer, LADEE, is no more.
- Researchers believe LADEE likely vaporized when it hit because of its extreme orbiting speed of 3,600 mph (5,800 kph), possibly smacking into a mountain or side of a crater. No debris would have been left behind.
- LADEE - short for Lunar Atmosphere and Dust Environment Explorer - was launched in September from Virginia. From the outset, NASA planned to crash the spacecraft into the back side of the moon, far from the Apollo artifacts left behind during the moonwalking days of 1969 to 1972.

### **Earth-like Planet Spotted**

- Astronomers have discovered what they say is the most Earth-like planet yet detected a distant, rocky world that's similar in size to our planet and exists in the Goldilocks zone where it's not too hot and not too cold for life.
- The planet was detected by NASA's orbiting Kepler telescope, which examines the heavens for subtle changes in brightness that indicate an orbiting planet is crossing in front of a star. From those changes, scientists can calculate a planet's size and make certain inferences about its makeup.
- The newfound object, dubbed Kepler-186f, circles a red dwarf star 500 light years from Earth in the constellation Cygnus. A light year is about 9.5 trillion km.

- The planet is about 10 per cent larger than Earth and may very well have liquid water a key ingredient for life on its surface. That is because it resides at the outer edge of the habitable temperature zone around its star the sweet spot where lakes, rivers or oceans may exist without freezing solid or boiling away.

#### **World's Smallest, Fastest Nanomotor**

- Researchers have built the smallest, fastest and longest-running tiny synthetic motor to date.
- The team's nanomotor is an important step toward developing miniature machines that could one day move through the body to administer insulin for diabetics when needed, or target and treat cancer cells without harming good cells.
- With the goal of powering these yet-to-be invented devices, UT Austin engineers focused on building a reliable, ultra-high-speed nanomotor that can convert electrical energy into mechanical motion on a scale 500 times smaller than a grain of salt.
- The team's three-part nano-motor can rapidly mix and pump biochemicals and move through liquids, which is important for future applications.
- With all its dimensions under 1 micrometer in size, the nanomotor could fit inside a human cell and is capable of rotating for 15 continuous hours at a speed of 18,000 RPMs, the speed of a motor in a jet airplane engine. Comparable nanomotors run significantly more slowly, from 14 RPMs to 500 RPMs, and have only rotated for a few seconds up to a few minutes.

#### **Indian Cities with Minimum air Pollution**

- Hassan city is among three Indian cities

with minimum air pollution, according to the latest World Health Organisation (WHO) study on ambient air quality. The study spanned over 1,600 cities in 91 countries.

Of the 123 Indian cities that were covered by the study, Hassan ranked third in terms of least concentration of dust particles in air. The other two cities are Kollam and Pathanamthitta in Kerala.

- The WHO conducted the study and prepared a database of ambient air quality, considering the concentration of particulate matter in air. Particulate matter with a diameter of 10 micron (PM10) and 2.5 micron (PM2.5) were considered for the study. The collected daily measurements or data were aggregated into annual mean for the database.
- As per the database, in Hassan, the annual mean of PM10 was recorded at 44  $\mu\text{g}/\text{m}^3$  (micrograms per cubic metre of air) and PM2.5 at 19  $\mu\text{g}/\text{m}^3$ .
- In Kollam, it was 39  $\mu\text{g}/\text{m}^3$  and 17  $\mu\text{g}/\text{m}^3$  respectively and in Pathanamthitta, it was 23  $\mu\text{g}/\text{m}^3$  and 10  $\mu\text{g}/\text{m}^3$  respectively.
- The concentration of particulate matter recorded in Pathanamthitta is closer to the recommended level.

#### **New Species of Dancing Frogs**

- Scientists have discovered 14 new species of so-called dancing frogs in the Western Ghats, just in time, they fear, to watch them fade away.
- Indian biologists say they found the tiny acrobatic amphibians, which earned their name with the unusual kicks they use to attract mates, declining dramatically in number during the 12 years in which they chronicled the species through morphological descriptions and molecular DNA markers. They breed after

the yearly monsoon in fast-rushing streams, but their habitat appears to be becoming increasingly dry.

- The study listing the new species published in the Ceylon Journal of Science brings the number of known Indian dancing frog species to 24.
- Only the males dance: it's actually a unique breeding behavior called foot-flagging. They stretch, extend and whip their legs out to the side to draw the attention of females who might have trouble hearing mating croaks over the sound of water flowing through perennial hill streams.
- They bigger the frog, the more they dance. These are tiny, delicate frogs no bigger than a walnut and can easily be swept away in a gushing mountain stream. So breeding happens only once the level of a stream drops to the point where the water babbles over stones.

### WHO Report on Pollution

- The 2014 version of the Ambient Air Pollution (AAP) database contains results of monitoring of outdoor air pollution from 1600 cities in 91 countries and it found that Delhi has the highest concentration of PM2.5 - particulate matters less than 2.5 microns - form of air pollution.
- According to WHO, this type of concentration is dangerous because it consists of tiny particles that increase the risk of respiratory diseases and other health problems.
- The Delhi air has PM2.5 concentrations of 153 micrograms and PM10 concentrations of 286 micrograms, which is much more than the permissible limits.
- Beijing, which was once regarded by many as the most polluted cities in the world, has PM2.5 concentration of 56

micrograms and PM10 concentration of 121 micro grammes.

- The WHO study covers the database from 2008 to 2013, with the majority of values for the years 2011 and 2012.

### Change in U.S. Climate

- The effects of human-induced climate change are being felt in every corner of the United States, with water growing scarcer in dry regions, torrential rains increasing in wet regions, heat waves becoming more common and more severe, wildfires growing worse, and forests dying under assault from heat-loving insects.
- Such sweeping changes have been caused by an average warming of less than 2 degrees Fahrenheit over most land areas of the country in the past century, the scientists found. If greenhouse gases like carbon dioxide and methane continue to escalate at a rapid pace, they said, the warming could conceivably exceed 10 degrees by the end of this century.
- Climate change, once considered an issue for a distant future, has moved firmly into the present.
- The report is the latest in a series of dire warnings about how the effects of global warming that had been long foreseen by climate scientists are already affecting the planet. Its region-by-region documentation of changes occurring in the United States, and of future risks, makes clear that few places will be unscathed - and some, like northerly areas, are feeling the effects at a swifter pace than had been expected.
- Alaska in particular is hard hit. Glaciers and frozen ground in that state are melting, storms are eating away at fragile coastlines no longer protected by winter sea ice, and entire communities are having

to flee inland - a precursor of the large-scale changes the report foresees for the rest of the United States.

### "Save Our Snow Leopards"

- The strikingly beautiful snow leopards are in "real danger" and there was need to observe, study and develop ways to conserve this rare and endangered species as only 400-700 of the world's best mountain climbers remain in India, according to a leading conservation organisation.
- Launching a campaign "Save Our Snow Leopards", WWF-India said that poaching is the major challenge for the protection of this so magnificent species found high altitude Himalayan region.
- Snow leopards are poached for their pelts while their bones and other body parts are also in demand for use in traditional Asian medicines.
- Snow leopards also face habitat and prey loss with the increase of human settlements and developmental activities in their territories.
- The snow leopard is found across almost 1,29,000 sq kms in India, in the states of Jammu and Kashmir, Uttarakhand, Himachal Pradesh, Sikkim and Arunachal Pradesh.
- The WWF-India said that the snow leopard is at the apex of the mountain ecosystem and is also an indicator species for the high altitude mountain ecosystem.

### Happy Earth Day doodle

- Google is celebrating Earth Day" (April 22), which is marked to raise awareness for our planet's environment, through animated doodles featuring six creatures from the animal planet.
- Earth Day was first held in 1970 and is now observed in over 192 countries each

year, with activities being coordinated by the nonprofit Earth Day Network which is chaired by the first Earth Day coordinator Denis Hayes.

### These are a few facts about these animals:

- The Rufous Hummingbird, which is the first to appear, is beautifully incorporated in the doodle. A couple of blooming flowers become the Os of Google as the Rufous hummingbird, which is known to attack flowers relentlessly, flaps its wings at the speed of light while devouring the nectar.
- The Rufous Hummingbird makes one of the longest migratory journeys of any bird in the world, as measured by body size.
- Next is a pair of sleeping Japanese Macaques sticking to each other for warmth in the falling snow as they make the Os of Google. They are also known as "snow monkeys" and inhabit three out of four main islands of Japan.
- Then there is the bloated, rotating puffer fish which is known for its ability to transform and enlarge its body in a split of a second. It also makes one of the Os of Google.
- The puffer fish is one of the most poisonous creatures on Earth and is considered a major delicacy in Japan. When prepared correctly, the flesh of the fish gives a tingling sensation on the tongue because of a non-lethal dose of tetrodotoxin which is a potent neurotoxin and has no antidote.
- However, anyone eating a badly made dish of puffer fish could completely be paralysed and die.

### River policing

- Batting to end all encroachments and to enforce a ban on developmental activities



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on the floodplains of River Yamuna, the Union ministry of Environment and Forests (MoEF) said that a dedicated 'river policing' unit should be set up to stop unauthorised construction and maintain the ecological integrity of the river.

- It also said the entire 52-km stretch of the Yamuna in Delhi and UP should be declared a 'conservation zone' in order to frame proper rules for permitting/prohibiting human activities.
- The MoEF recommendations came in the form of a report to the National Green Tribunal (NGT) for saving Yamuna.
- Acting on a complaint by environmentalist Manoj Mishra regarding "serious degradation" of the river, NGT last year asked MoEF to submit a comprehensive report for restoration, preservation and beautification of the river, as well as identify people who should carry out the work.
- It has also sought immediate action for identifying "additional landfill sites, catering to the next 25 years of requirement" as there is shortage of landfill sites in Delhi.
- The MoEF has recommended a slew of measures like controlled dredging, construction of culverts, development of wetlands and floodplain vegetation having native biodiversity, development of green belt on both sides of the embankments, controlling of sewage pollution, etc for saving the Yamuna. It also said agricultural activity on floodplains should be regulated to totally prohibit the use of pesticides and fertilisers.
- The ministry has also called for a separate programme for promoting public awareness on river conservation and

community participation in restoration, management and monitoring of the river.

### 15 Endangered Indian Birds

- Fifteen Indian bird species are part of a list of avians which are evolutionarily distinct and globally endangered. The Zoo-logical Society of London (ZSL) and Yale University has come out with a study of 100 Evolutionarily Distinct and Globally Endangered (EDGE) species worldwide.
- The study says Bengal Florican, Lesser Florican, Great Indian Bustard, Sociable Lapwing and Jerdon's Courser are birds that are under threat due to the destruction of their habitat of grasslands and scrub forests. The survival of Spoon-billed Sandpiper, Siberian Crane and White-bellied Heron greatly depend on the existence of their wetland habitat.
- Forest Owlet's survival is impossible if its habitat of deciduous forests in central India is destroyed, the study said. Officials of the Bombay Natural History Society (BNHS), which works on the conservation of 12 of these threatened birds, said these species were threatened by human factors such as uncontrolled urbanisation, unsustainable industrialisation and rampant use of chemicals in agriculture.

### Indian projects shortlisted for Green Oscars

- IT giant Infosys leads five Indian clean energy projects that have been shortlisted for the annual Ashden Awards, referred to as the Green Oscars.
- The awards recognise world-wide contributions towards green energy initiatives and a move away from fossil fuels.
- Infosys has been nominated in the

'Ashden Award for Sustain-able Buildings' category for the Bangalore-based company's cutting edge design of new buildings which helps keep offices cooler and maximises natural light.

- The other finalists include two projects from Maharashtra - Sakhi Unique Rural Enterprise (SURE) and Greenway Grameen - which have been nominated in the 'Ashden Clean Energy for Women and Girls Award' category.
- SURE is a not-for-profit social enterprise in central Maharashtra that has selected, trained and supported more than 600 women micro-entrepreneurs to sell clean energy products like solar lanterns and cleaner cook-stoves to other women.
- Mumbai based Greenway Grameen's mission is to provide an affordable, desirable cookstove to improve quality of life for Indian women.

#### The link between tobacco and cancer in India

- ◆ Every year nearly one million new cancer cases are diagnosed in India, the prevalence being 2.5 million. With mortalities of 6,00,000-7,00,000 a year, cancer causes six per cent of all adult deaths in the country.
- ◆ The number of deaths per year is projected to shoot up to 1.2 million by 2035, according to a series of papers published in the Lancet Oncology journal.
- ◆ Currently, people in the 30-69 age group account for over two-thirds of cancer deaths in India, with less than a third of the patients surviving more than five years after diagnosis.
- ◆ The most common, nearly half of all, are cancers of the lung and oral cavity in men, and of the breast and cervix in women.
- ◆ Tobacco use alone accounts for about 40

per cent of all cancers in India.

- ◆ The geographical distribution of cancers is quite varied across the country. Based on the data from Chennai, cervical cancer was more prevalent (22.7 per 100,000) than breast cancer in Tamil Nadu, while oral cancer accounted for 243 per 100,000 men in Kerala.
- ◆ With a rate of 215 per 100,000 women, Delhi had the highest incidence of gall bladder cancer in women in the world.

#### Plant growth chamber for space

- ◆ Astronauts will now turn into cosmic gardeners and grow lettuce in space as United States space agency National Aeronautics and Space Administration (NASA) is all set to send the largest ever plant growth chamber to the International Space Station (ISS).
- ◆ It will launch the Vegetable Production System aboard SpaceX's Dragon capsule.
- ◆ The plant growth chamber will grow lettuce inside prototype flight pillows that will help the plants withstand zero gravity, The Verge reported. Red, blue, and green light emitting diodes (LEDs) will help sustain the vegetables, and the plant chamber itself can grow to 11.5 inches wide and 14.5 inches deep.
- ◆ This will be "the largest plant growth chamber for space to date.
- ◆ The chamber may even be used for more ambitious projects, like providing food for the average person back on Earth. After extensive testing on weightless horticulture, NASA is confident the lack of gravity will not impede growth.
- ◆ However, space-borne microbes that may develop during growth are a cause of concern. Therefore, the lettuce will undergo extensive testing before astronauts chow down.

### High manganese level in Selaulim reservoir

- ◆ High manganese level has been detected in the Selaulim reservoir in Goa, which supplies drinking water to more than half of the coastal State. The government engineers have however said that there was “no reason” to worry.
- ◆ The State Public Works Department has started monitoring the water content at the South Goa reservoir.
- ◆ The manganese level in the water from the reservoir has risen up from 0.1 to 0.8 mg per litre.
- ◆ The reservoir has an earth dam with concrete spillway and is on the Selaulim tributary of Zuari river.
- ◆ The reservoir has production capacity of 214 MLD of water, which is supplied to entire South Goa and some parts of north district.

### LADEE

- ◆ NASA’s robotic moon explorer, LADEE, is no more.
- ◆ Researchers believe LADEE likely vaporized when it hit because of its extreme orbiting speed of 3,600 mph (5,800 kph), possibly smacking into a mountain or side of a crater. No debris would have been left behind.
- ◆ LADEE - short for Lunar Atmosphere and Dust Environment Explorer - was launched in September from Virginia. From the outset, NASA planned to crash the spacecraft into the back side of the moon, far from the Apollo artifacts left behind during the moonwalking days of 1969 to 1972.

### Earth-like planet spotted

- ◆ Astronomers have discovered what they say is the most Earth-like planet yet

detected a distant, rocky world that’s similar in size to our planet and exists in the Goldilocks zone where it’s not too hot and not too cold for life.

- ◆ The planet was detected by NASA’s orbiting Kepler telescope, which examines the heavens for subtle changes in brightness that indicate an orbiting planet is crossing in front of a star. From those changes, scientists can calculate a planet’s size and make certain inferences about its makeup.
- ◆ The newfound object, dubbed Kepler-186f, circles a red dwarf star 500 light years from Earth in the constellation Cygnus. A light year is about 9.5 trillion km.
- ◆ The planet is about 10 per cent larger than Earth and may very well have liquid water a key ingredient for life on its surface. That is because it resides at the outer edge of the habitable temperature zone around its star the sweet spot where lakes, rivers or oceans may exist without freezing solid or boiling away.

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### Climate Panel on Rising Emissions

- ◆ The U.N.'s expert panel on climate change has highlighted the disconnect between international goals to fight global warming and what is being done to attain them.
- ◆ Emissions of carbon dioxide and other greenhouse gases must drop by 40—70 per cent by 2050 to keep the global temperature rise below the 2—degree C (3.6—degree F) cap set in U.N. climate talks, the Intergovernmental Panel on Climate Change said.
- ◆ The opposite is happening now. On average global emissions rose by 2.2 percent or 1 gigaton a year between 2000 and 2010, outpacing growth in previous decades to reach "unprecedented levels" despite some efforts to contain them, the IPCC said.
- ◆ The graphics divided the world into four categories low, lower—middle, upper—middle and high income countries. Participants in the closed—door session said many developing countries objected to using such income categories.
- ◆ Counting all emissions since the industrialized revolution in the 18th century, the U.S. is the top carbon polluter. China's current emissions are greater than those of the U.S. and rising quickly. China's historical emissions are expected to overtake those of the U.S. in the next decade.
- ◆ Global temperatures have already risen about 0.8 C since record—keeping started in the 19th century. The IPCC said the goal of keeping the warming below 2 C by 2100 would require a significant shift in the energy system, away from oil and coal, which generate the highest emissions. That would mean a near—



quadrupling of energy from zero— or low—carbon sources such as solar and wind power.

#### **New spy satellite by Israel**

- ◆ Israel has successfully launched a new observation satellite into orbit, one which is expected to be used to observe Iran and hostile militant groups in the Middle East.
- ◆ The Israeli-made “Ofek 10” satellite was launched in cooperation with state-owned Israel Aerospace Industries. The satellite has already begun transmitting data and visual material. It is expected to be operational within months.
- ◆ Israel is expected to use the satellite to keep tabs on Iran and the region. It believes Iran is trying to develop a nuclear weapon a charge Iran denies and accuses it of arming militants across the region.
- ◆ Unlike other countries that launch satellites eastward in the direction of the earth’s orbit, Israel launched the satellite westward, opposite the direction of the earth’s orbit, to prevent debris following the launch to land in enemy countries east of Israel. The satellite completes a full orbit around the earth every 90 minutes.

#### **The Rising Red Planet**

- ◆ This month, the Red Planet (Mars) looks bigger and brighter than it has for the past six years.
- ◆ That may sound like the Great Mars Hoax — the occasional (and totally false) claim that Mars will loom as big as the moon in the night sky. But in this case, the claim is totally true. This month, Mars will have its closest encounter with Earth since December 2007.
- ◆ The reason has to do with orbital mechanics. As Earth and Mars trace their elliptical orbits around the sun, the distance between the two planets varies

dramatically. There are times when the separation amounts to almost 250 million miles (400 million kilometers). On April 14, that separation narrows to a mere 57 million miles (92 million kilometers).

#### **Tectonic plates of Earth**

- ◆ The tectonic plates of earth took around one billion years to form. The outermost layer of earth, or lithosphere, was weakened by movement in viscous layers below it. Around four billion years ago, cooler parts of crust of earth were pulled downwards into the warmer upper mantle and it damaged the surrounding crust. It continued until the weak areas formed plate boundaries.
- ◆ To investigate how the plates formed, Bercovici and Yanick Ricard of University of Lyon in France developed a computer model of earth’s crust as it may have existed billions of years ago.
- ◆ The model included a low-pressure zone at the base of the crust which caused a piece of the crust to sink into the upper mantle - mimicking conditions thought to have occurred early in the earth’s history.
- ◆ As the process repeated over time, it created a large tectonic plate with an active subduction zone.
- ◆ Prior studies suggested the age of the plates based on evidence of subduction gathered from minerals preserved in ancient rocks.
- ◆ In geology, subduction is the process that takes place at convergent boundaries by which one tectonic plate moves under another tectonic plate and sinks into the mantle as the plates converge.
- ◆ The oldest such specimens are four-billion-year-old zircons found in the Jack Hills of Australia that appear to have formed at temperatures and pressures that are indicative of subduction.

### Varicose veins

- ◆ Varicose veins are a widely prevalent condition where veins, typically in the leg, swell and become twisted.
- ◆ The development of varicose veins is not well understood. Women can get varicose veins during pregnancy and it is often seen in those who need to stand for long periods of time, such as policemen and shop assistants.
- ◆ There is also a strong genetic component to it. When both parents suffered from the condition, their progeny had 90 per cent risk of developing it too, compared to a 25 per cent to 62 per cent risk when only parent had it and 20 per cent risk when neither parent had been affected.
- ◆ The researchers decided to look at whether a gene known as 'human forkhead box C2' (FoxC2) could be involved. This gene is known to be important for blood vessel development.

### Gilead hepatitis C drug patent

- ◆ Natco Pharmaceuticals, the Hyderabad-based generic pharmaceutical company, has filed a 'pre-grant opposition' with the Indian Controller General of Patents, Designs & Trademarks to prevent the granting of a patent to U.S. pharmaceutical major Gilead Sciences for its breakthrough drug for treatment of Hepatitis C, Sovaldi.
- ◆ Under India's patent laws, a third party can dispute the validity of a pending patent application.
- ◆ The grant of a patent can be opposed under 11 grounds that include lack of novelty and inventive step.
- ◆ Indian Pharmaceutical Alliance (IPA) and Initiative for Medicine and Access to Knowledge (I-MAK) have also filed pre-grant opposition on similar grounds

earlier.

- ◆ Sofosbuvir is considered a breakthrough as it is a once-daily regimen expected to replace the injection-based therapy. It is a direct-acting anti-viral (DAA), and reduces treatment time to 12 weeks from 24-48 weeks. The existing treatment has several side-effects while sofosbuvir has none.

### Heartbleed :

#### The Internet Bug

- ◆ Heartbleed is an Internet bug that has been widely employed in software that secures users' personal information on the web.
- ◆ In an advisory to users in the country, the Computer Emergency Response Team of India, a nodal agency, has categorised the problem's severity as "high".
- ◆ Ominously named Heartbleed, this bug interferes with the regular function of software called OpenSSL by causing it to spill the secrets, it's tasked with protecting, to malicious attackers.
- ◆ When users key in their personal information on a website and hit 'Enter,' the data is on the Internet travelling between your computer and the site's server. To safeguard it, the site uses OpenSSL (SSL refers to Secure Sockets Layer) to encrypt it — turning it into an incoherent jumble of characters — using an encryption key.
- ◆ With Heartbleed in the picture, OpenSSL allows malicious messages sent to the server implementing it to potentially hand over the encryption key to the attacker.
- ◆ Companies like Amazon and Google have issued advisories to their customers stating that they have updated their systems and eliminated the threat.

Kaspersky, a security firm, advised caution because a Heartbleed attack leaves no traces nor does it give users a chance to protect themselves.

### **Tiangong 2**

- ◆ In 2015, China is expected to launch its next space laboratory.
- ◆ Tiangong 2 will follow on from the Tiangong 1 module, which was launched in 2011 and is still in orbit at the time of writing.
- ◆ Tiangong 1 received two crews of astronauts and carried out China's first space dockings.
- ◆ It is a small, roughly cylindrical module with a crew cabin and a service module featuring solar panels. Although Tiangong 1 is officially designated as a "space laboratory", it is really a small space station.
- ◆ The launch of Tiangong 2 has been expected for a long time, but space analysts are puzzled by the nature of this spacecraft.
- ◆ Originally, China planned to launch three Tiangong modules, and Tiangong 2 was expected to be a marginally improved version of the Tiangong 1 spacecraft.
- ◆ Later, China seemed to drop plans for three Tiangongs and launch just two.

### **New guidelines for treating rape victims**

- ◆ The Union Health Ministry, which has drawn new guidelines for treating rape victims, has asked all hospitals to set up a designated room for forensic and medical examination of victims besides outlawing the two-finger test performed on them, dubbing it as unscientific.
- ◆ The Department of Health Research (DHR) along with Indian Council of Medical Research (ICMR) with the help of experts formulated this set of national

guidelines for dealing with criminal assault cases, which will hopefully put an end to the "horrendous" medical process, which the victims are subjected to after the sexual abuse.

- ◆ The DHR has also drafted a new manual to address the psycho-social impact of sexual violence including counselling that the victims should receive to alleviate her woes.
- ◆ These guidelines have been made available to health care providers who work with victims of sexual violence.

### **Indoor maps launched by Google**

- ◆ Technology giant Google has launched indoor maps in India that will help users browse through and locate specific locations inside venues like malls and museums.
- ◆ The service, available as part of Google Maps, is already available in countries like the U.S., Japan, Singapore, Hong Kong and the Netherlands.
- ◆ The service will be available free to Android and iOS users.
- ◆ Apart from the metros, indoor maps will cover locations in cities like Bhopal, Coimbatore, Chandigarh, Dehradun, Jaipur, Kochi, Lucknow, Ludhiana and Moradabad.
- ◆ Apart from malls, indoor maps would be available for National Gallery of Modern Art in Delhi, Salarjung museum in Hyderabad and Hyderabad International Convention Centre.

### **World's first 3D fingerprint**

- ◆ A team of Michigan State University computer scientists led by Indian Institute of Technology(IIT) Kanpur alum Anil Jain have built the first three-dimensional model of a human fingerprint.

- ◆ Jain, a University Distinguished Professor of computer science and engineering, and his team did was develop a method that takes a two-dimensional image of a fingerprint and maps it to a 3-D finger surface.
- ◆ The 3-D finger surface, complete with all the ridges and valleys that make up the human fingerprint, is made using a 3-D printer. It creates what Jain's team called a fingerprint "phantom."
- ◆ While the 3-D model doesn't yet have the exact texture or feel of a real finger, it could advance fingerprint sensing and matching technology.

#### **Commitment of Google to involve more women into technology sector**

- ◆ The Reserve Bank said that India is fully committed to bring in reforms in the over-the-counter (OTC) derivatives markets, but its pace and nature will depend on the domestic market conditions.
- ◆ However, the pace and scope of reform implementation depend on the domestic market conditions and characteristics," it said in a report on 'OTC Derivatives Market Reforms'
- ◆ In response to the financial crisis that began in 2008, G-20 had initiated a series of reforms designed to strengthen regulation and oversight of the financial system and tasked the Financial Stability Board (FSB) with coordinating the reforms and assessing their implementation.
- ◆ In India, the OTC derivative products were introduced by RBI in a phased manner, keeping in view the hedging needs of the real sector.

#### **Smaller particles than Higgs Boson**

- ◆ Until 2012, nobody was certain it existed

till the European Organisation for Nuclear Research (CERN) announced they had found the God Particle.

- ◆ Scientists now say that it is more likely than ever now that there must be particles smaller than Higgs particle
- ◆ According to the Standard Model, everything, from flowers and people to stars and planets, consists of just a few building blocks: matter particles. These particles are governed by forces mediated by force particles that make sure everything works as it should.
- ◆ The entire Standard Model also rests on the existence of a special kind of particle: the Higgs particle.
- ◆ CERN's particle collider, LHC (Large Hadron Collider), is probably the largest and the most complex machine ever constructed by humans.
- ◆ Last year, the Royal Swedish Academy of Sciences announced that the 2013 Nobel Prize for Physics to Peter Higgs after whom the particle is named.
- ◆ If techni-quarks exist they will form a natural extension of the Standard Model which includes three generations of quarks and leptons.
- ◆ These particles together with the fundamental forces form the basis of the observed matter in the universe.

#### **Setting up a chain of 25 cancer detection**

- ◆ Medical diagnostics and imaging equipment company GE Healthcare,said it was jointly investing Rs.720 crore with U.S.-based Cancer Treatment Services International (CTSI) to set up a chain of 25 cancer detection and treatment centres across the country.
- ◆ GE Healthcare would put a minor portion into the \$120-million programme planned over the next five years.

- ◆ With the new tie-up format, the diagnostics-focussed company had made its closest approach towards treating a disease anywhere in the world.
- ◆ GE was also developing low-cost diagnostic technologies 'in India and for India' for various diseases, 100 of them targeting cancer alone. It recently launched a low-cost version of PET-CT that is widely used to find cancerous tumours.
- ◆ GE would provide equipment while CTSI, which set up the 250-bed American Oncology Institute in Hyderabad in 2012, would take care of treatment, doctors, medical personnel and related services.

#### **Creation of X-Rays brighter than a million suns**

- ◆ Scientists have for the first time ever created the brightest light ever imagined in the entire Universe.
- ◆ X-rays brighter than a million suns were created which exposed the biochemical structure of a 50 million-year-old fossil plant to stunning visual effect when they were bombarded on it.
- ◆ The team of palaeontologists, geochemists and physicists investigated the chemistry of exceptionally preserved fossil leaves from the Eocene-aged "Green River Formation" of the western United States by bombarding the fossils with X-rays produced by synchrotron particle accelerators.
- ◆ The work shows that the distribution of copper, zinc and nickel in the fossil leaves was almost identical to that in modern leaves. Each element was concentrated in distinct biological structures such as the veins and the edges of the leaves and the way these trace elements and sulphur were attached to other elements was very

similar to that seen in modern leaves and plant matter in soils.

- ◆ The data has led the team to conclude that the chemistry of the fossil leaves is not wholly sourced from the surrounding environment as has previously been suggested but represents that of the living leaves.

#### **Rehearsal for PSLV-C24 Launch**

- ◆ The campaign for the lift-off of the Polar Satellite Launch Vehicle (PSLV-C24) is gathering momentum. The rocket will blast off at 5.14 p.m. on April 4 from Sriharikota and put into orbit a 1,432-kg navigation satellite, called the Indian Regional Navigation Satellite System (IRNSS-1B).
- ◆ Engineers of the Indian Space Research Organisation (ISRO) have stacked up the vehicle's four stages in the first launch pad. The satellite, sheathed in the heat-shield, has been mated with the vehicle. The launch rehearsal was completed without hitch.
- ◆ The IRNSS-1B is the second in a series of seven satellites. The IRNSS-1A was put into orbit on July 1, 2013. The PSLV will launch two more such satellites before the end of 2014.
- ◆ The IRNSS-1B will be useful in terrestrial, aerial and sea navigation. It will beam back accurate information on the position of trucks, cars, battle tanks, aircraft, missiles, ships and submarines with precise timing reference. Truck and car drivers, pilots of civilian or combat aircraft and ship captains can properly plan their route using the IRNSS satellites which will guide them towards their destination with the help of a receiver. The satellites will way-point the missiles to their targets.



### Chinese environment policy

- ◆ Iron ore exporters from Goa may face daunting task ahead for shipment of the newly purchased steelmaking raw material through online auctions due to restrictions imposed by Chinese recently passed environment law. The strict Chinese environment law may also affect iron ore sales through online auctions in Goa.
- ◆ The state government of Goa conducted two auctions in the last one month to dispose off little over two million tonnes of iron ore of the total unsold inventory of around 11.5 million tonnes. While steel mills stayed away, traders and exporters dominated participation. Auctions for the remaining quantity are scheduled for shortly.
- ◆ Indian iron ore exporters face high export duty of 30%, which make them uncompetitive in overseas markets. Apart from that, the government of China has put strict environmental regulation in place which restricts steel mills to purchase low grade iron ore from anywhere in the world including India.
- ◆ Iron ore deposits in Goa are mainly of low grade with between 45-60% of iron (Fe) content, which requires beneficiation to convert into high grade pellets for direct use in furnace.

### National Environment Regulator

- ◆ The Congress has tried to make a virtue of the inevitable by packaging the Supreme Court's orders for setting up a national environment regulator as a commitment in its Lok Sabha election manifesto .
- ◆ The party promises to bring in "a Bill to set up a National Environmental Appraisal and Monitoring Authority to

conduct rigorous and time-bound environmental appraisals and recommend environment clearances ... in a time-bound and transparent manner."

- ◆ In tune with its recent inclinations, the party promises to set up a regulatory reform task force to review all regulatory processes to streamline them and improve the "ease of doing business in India."
- ◆ While the UPA toyed with the idea of setting up an environment regulator in its second term, the move got a fillip when the Supreme Court endorsed such a body in the Lafarge judgement of February 2012. It set a deadline for the government to set it up by the end of March 2014.
- ◆ While the UPA has consistently been in trouble with the National Ganga River Basin Authority, it has promised more such bodies for other key rivers, and to start a national mission on wind energy.

### Birth of Mount Everest

- ◆ Mount Everest - the world's highest mountain - may have been born as Asia was squeezed like a tube of toothpaste after India smashed into the rest of the continent, scientists say.
- ◆ The unexpectedly prolonged collision led to the formation of the Himalayas and then caused them to grow ever taller.
- ◆ These mountains are home to the world's 100 highest mountain peaks, including the Everest.
- ◆ Moresi and colleagues have developed a computer model that explains what happens when continents collide.
- ◆ The model shows that when one continent bears thick or buoyant crust that blocks subduction, the other continent gets squeezed like a tube of toothpaste and folds around the blockage, creating a complex array of geophysical features.

- ◆ It suggests that as India shoves into Eurasia, China and South-East Asia initially resist being pushed underneath, and then get pushed aside instead.
- ◆ The process unclogs the subduction zone and allows India to keep pushing into Eurasia, raising up Mount Everest and its towering siblings.

#### **The biggest environmental health risk**

- ◆ Air pollution killed an estimated 7 million people around the world in 2012, making it the biggest environmental health risk, according to the World Health Organization (WHO).
- ◆ The situation was worst in developing and emerging countries in Southern Asia, South-East Asia and East Asia, where a total of 3.3 million deaths were linked to indoor air pollution and 2.6 million to outdoor pollution.
- ◆ Use of wood, coal or dung for cooking is the biggest indoor polluter.
- ◆ In Europe's industrialised countries, 279,000 deaths could be traced to air pollution.
- ◆ The WHO said bad air quality outside was a result of unsustainable policies in the transport, energy and waste sectors, as well as in industry.
- ◆ 'Cleaning up the air would reduce risks, especially for vulnerable children and the elderly', said the UN health body.

#### **Nuclear fuel Complex**

- ◆ Following the approval of the Cabinet Committee on Security, the country's second nuclear fuel complex will come up at Kota in Rajasthan. The Rs. 2,400-crore complex, next to the Rawatbhata nuclear plant, will have the facility to reprocess atomic fuel.
- ◆ The Department of Atomic Energy has made the new arrangement, keeping in

mind the growing demand for fuel required for nuclear plants. The complex will serve atomic plants which are proposed to be developed in Gorakhpur, Uttar Pradesh; Haryana; Jaitapur in Maharashtra and Mithi Virdhi in Gujarat.

- ◆ India's first nuclear fuel complex, developed at Hyderabad, does not have the capacity to meet the growing demands from reactors which will come up by the next decade. Also, under the 12th Plan, India aims to increase its nuclear energy generation capacity to over 17,300 MWe, from over 5,500 MWe now.

#### **Ice loss in Greenland**

- ◆ According to a study, sea levels will probably rise more now than the last remaining stable portion of Greenland's ice sheet — the world's second-largest — is unstable.
- ◆ Scientists have known Greenland's ice sheet has been thinning for decades, but for the first time, they've found that's even occurring in its northeast region that had been stable for 25 years. Since 2003, the northeast's ice loss has nearly tripled.
- ◆ The decline of Greenland's ice sheet, which is second in size only to Antarctica's and covers 80% of Greenland's surface, has been a major contributor to global sea level rise over the past 20 years.

#### **Nuclear reactor to yield plutonium**

- ◆ Iran and world powers locked horns over the future of a planned Iranian nuclear reactor that could yield plutonium for bombs as the United States warned "hard work" will be needed to overcome differences when the sides reconvene in April.
- ◆ Tehran's foreign minister voiced

optimism that a July 20 deadline for settling a long-running dispute about the scope of Iran's nuclear programme was within reach.

- ◆ The meeting in Vienna was the second in a series that the six nations - the United States, China, Russia, Germany, France, Britain - hope will produce a verifiable settlement, ensuring Iran's nuclear programme is oriented to peaceful ends only, and put to rest the risk of a new Middle East war.
- ◆ Western nations want to ensure that the Arak reactor is modified sufficiently to ensure it poses no bomb proliferation threat. Iran insists that the desert complex be free to operate under any accord as it would be designed solely to produce radio-isotopes for medical treatments.

#### Sea Anemones

- ◆ Sea anemones are classified as animals, but a surprising new research has found that these water-dwelling predatory creatures are technically half plant and half animal.
- ◆ It was discovered that sea anemones display a genomic landscape with a complexity of regulatory elements similar to that of fruit flies or other animal model systems.
- ◆ This suggests, that this principle of gene regulation is already 600 million years old and dates back to the common ancestor of human, fly and sea anemone.
- ◆ On the other hand, sea anemones are more similar to plants rather to vertebrates or insects in their regulation of gene expression by short regulatory RNAs called microRNAs.

#### Zebra pattern in Earth's inner radiation belt.

- ◆ Scientists, using data from the twin NASA

Van Allen Probes, have discovered a new, persistent pattern in Earth's inner radiation belt.

- ◆ The probes, which launched on August 30, 2012 as the Radiation Belt Storm Probes, were re-named in honour of physicist James Van Allen who, in 1958, discovered the radiation belts encircling our planet.
- ◆ The Van Allen Probes mission goal is to shed light on how and why radiation levels in the belts change with time.
- ◆ The radiation belts are dynamic, doughnut-shaped regions around our planet, extending high above the atmosphere, made up of high-energy particles trapped by Earth's magnetic field.
- ◆ Radiation levels across the belts are affected by solar activity, such as solar storms, and can ebb and flow.
- ◆ During active conditions, radiation levels can dramatically increase, which can create hazardous space weather conditions that harm orbiting spacecraft and endanger humans in space.

#### Limb bone marrow's earliest evidence

- ◆ Scientists have found the earliest fossil evidence for the presence of bone marrow in the fin of a 370 million-year-old fish.
- ◆ Long bones, which are found in the limb of tetrapods, are not only important for locomotion and supporting the weight of the body, but also host the bone marrow.
- ◆ The latter plays a major role in haematopoiesis, the formation of blood cells. In a healthy adult human, about a hundred billion to one trillion new blood cells are produced every day to maintain the stable blood circulation.
- ◆ It was discovered that Eusthenopteron, a Devonian (370-million-year-old) lobe-finned fish from Miguasha in Canada that

is closely related to the first tetrapods, exhibited typical marrow processes inside its humerus (upper arm bone).

- ◆ These processes are longitudinal, larger than blood vessel canals, and connect to the shoulder and elbow joint surfaces of the humerus.

### Green mobile in Ghana

- ◆ Indian telecom equipment-maker Vihaan Networks Ltd (VNL) is powering a communications revolution in Africa, particularly in villages and remote locations, through its innovative, green mobile tower solutions.
- ◆ The latest to join its client list is Ghana, which has chosen VNL's solar-powered 'WorldGSM' mobile tower architecture — an environment-friendly and cost-effective mobile system — to deliver affordable services in villages.
- ◆ VNL is already present in Nigeria, Uganda and Benin, while it is in talks with other African nations to deploy its cheap and green telecom solutions. In Latin America, VNL has deployed its network in Bolivia and Peru. In Bolivia, it has partnered with Entel S.A., state-run telecom operator, for deployment of GSM mobile tower sites in remote locations under the 'Cobertura Movil Rural' (rural mobile coverage) project.

### Kollam's Bird survey

- ◆ A brood of the highly elusive nocturnal forest bird, the Great Eared Nightjar, had been spotted in Kerala.
- ◆ A team of the nature lovers' forum Warblers and Waders, on its annual bird survey at the Shendurney Wildlife Sanctuary in Kollam during February, was able to record a Great Eared Nightjar sitting on brood in the forest. The Warblers and Waders team claim "it is the first record from the State".

- ◆ An earlier sighting had been recorded from the Siruvani foothills in Tamil Nadu in May 1995. The Great Eared Nightjar (*Eurostopodus macrotis bourdilloni*) belongs to the nightjar family. It gets its name from the two erect earlike tufts of feathers on its head, behind the eyes.
- ◆ The Shendurney Wildlife Sanctuary is rich in biodiversity and the Warblers and Waders has been conducting bird surveys there in association with the Kerala Forest Department since 1995.
- ◆ Significant bird species recorded were the Painted Bush Quail, Sri Lankan Frogmouth, White-Bellied Black Woodpecker, Great Indian Pied Hornbill, Black Baza, Blue-Bearded Bee-eater, Red-Winged Crested Cuckoo, Great-eared Nightjar, Lesser Fishing Eagle, Mountain Hawk Eagle, Booted Warbler, Blue Rock Thrush, Malay Bittern, Brown Fish Owl, Black-capped Kingfisher, Thick-billed Warbler, Speckled Piculet, Wayanad Laughing Thrush, and the Nilgiri Wood Pigeon.

### Initiative by France to ease air pollution

- ◆ Recently, France has proposed free transport over the weekend after poor air quality and pollution hit a record level in the country's northern region, particularly in Paris and its suburbs.
- ◆ The increase in pollution level was caused by above average temperatures heating up traffic and industrial pollutants and the hot air re-circulating slowly across densely populated north France and the capital.
- ◆ In Paris, officials encourage residents and visitors to use Velib and Autolib, public sharing services of bicycle and electric cars.
- ◆ Furthermore, the government

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recommended to reduce driving speeds, avoid intense physical activity and outdoor walks with children under 6 years of age, and a prohibition against lighting fires outside.

#### **World's first solar-powered toilet**

- ◆ A revolutionary waterless toilet powered by the sun, developed to help some of the 2.5 billion people lacking safe and sustainable sanitation around the world, will be unveiled in India this month.
- ◆ Designed and built using a \$7,77,000 grant from the Bill & Melinda Gates Foundation, the self-contained, waterless toilet with its innovative technology converts human waste to biochar, a highly porous charcoal.
- ◆ It aims to provide an eco-friendly solution to help some of the 2.5 billion people around the world lacking safe and sustainable sanitation.

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