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Current Affairs 2014

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Topics

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Science & Technology

First telecommunication Satellite of Bolivia launched

Bolivia on 20 December 2013 launched the country's first telecommunication satellite Tupak Katari. The satellite has been named upon an indigenous national hero, who fought the 18th century Spanish colonial rule. The rocket carrying the satellite blast off from Xichang Satellite Launch Center in China. Bolivia is one of the last countries in South America to have its own satellite. Ivan Zambrana is the Director of the Bolivian Space Agency. He said that the satellite should be fully operational by March 2014 and help to bring down communication cost and improve television and Internet services for people living in rural areas.

Telecommunications satellite

Satellite telecommunication is the most mature of space applications. Starting 50 years ago with the launch of Telstar in 1962 and Syncom in 1963, satcom has continued to grow ever since. At first, satellite performance was very limited. The use of satellites was limited to long distance telephony and to the transport of television signals between studios.

Use of Telecommunication satellites

- While listening to the radio and watching T.V. the signals, we receive is distributed from the satellite
- Most news agencies use satellites to distribute text, audio and video to their affiliates
- Access to the Internet is possible only by satellite communication
- Satellites are being used for tele-education, telemedicine or videoconference systems
- Internet service providers often link their servers to the core of the Internet network by satellite
- With the emergence of very powerful broadband satellites, users – equipped with their own broadband interactive satellite terminals – get access to the Internet regardless of their distance from the nearest terrestrial node
- In most remote and some not-so-remote parts of the world, satellite communications continue to play a fundamental role in the infrastructure of telephone and other services

First human artificial heart implanted

The first human artificial heart implantation performed in Georges Pompidou Hospital, Paris on 18 December 2013 was successful. The artificial heart designed by the French biomedical firm Carmat and developed by the Dutch based European Aeronautic Defence and Space Company (EADS). The artificial heart can give patients up to five years of extra life, which replaces the real heart. The previous heart assistance devices are created mainly for temporary use. The artificial heart uses biomaterials including bovine tissue and an array of sensors to mimic the contractions of the heart. The patient has to wear a belt of lithium batteries to power the heart. Inside the heart, surfaces that come into contact with human blood are made partly from bovine tissue instead of synthetic materials which can cause blood clots. The artificial heart weighs as little as less than a kilogram (900grams), almost three times heavier than an average healthy human heart.

Malaria vaccine developed by Oxford Scientists

Oxford scientists recently developed a novel new Malaria Vaccine which can protect against the deadly mosquito-borne disease. The vaccine has shown promising results in the first clinical trial to test whether it can protect people against the disease. The trial was carried out by researchers led by Professor Adrian Hill of the *Jenner Institute at Oxford University*, along with researchers from the biotechnology company *Okairos*. It's the first time that a vaccine has been shown to have a protective effect through a sufficiently high immune response involving cells called CD8 T cells. It is CD8 immune cells that are seen to mount a protective response against malaria in similar studies in mice.

Every existing vaccine in use - bar one - generates antibodies. But there are two arms to the body's immune system for fighting infection: *antibodies and T cells*.This new vaccine aims to stimulate an immune response involving T cells. CD8 T cells are important because they are the primary killer cells in the immune system. They can attack nearly all types of infected cells in this case liver cells infected with the malaria parasite. But this first demonstration of a large CD8 response from a vaccine could be relevant for tackling other diseases too.

Science journal's top 10 breakthroughs of 2013

"Ultimately, we concluded, cancer immunotherapy passes the test. It does so because this year, clinical trials have cemented its potential in patients and swayed even the sceptics. The field of cancer immunotherapy hums with stories of lives extended — the woman with a grapefruit-size tumour in her lung from melanoma, alive and healthy 13 years later; the 6-year-old near death from leukaemia, now in third grade and in remission; the man with metastatic kidney cancer whose disease continued fading away even after treatment stopped," notes a paper published recently in the *journal that ranked the top*

10 Science Breakthroughs of 2013

The cancer research community experienced a sea change in 2013 as a strategy, decades in the making, finally cemented its potential. Promising results emerged from clinical trials of cancer immunotherapy, in which treatments target the body's immune system rather than tumours directly. The new treatments push T cells and other immune cells to combat cancer — and the editors of believe that such approaches are now displaying enough promise to top their list of the year's most important scientific breakthroughs. Though the ultimate impact on the disease is not known, results so far have been highlighting its success.

This annual list of groundbreaking scientific achievements, selected by and its international nonprofit publisher, AAAS, also includes major breakthroughs in solar cell technologies, genome-editing techniques and vaccine design strategies, to name a few. "This year there was no mistaking the immense promise of cancer immunotherapy," Tim Appenzeller, chief news editor of the journal said in a press release by the American Association for the Advancement of Science (AAAS). "So far, this strategy of harnessing the immune system to attack tumours works only for some cancers and a few patients, so it's important not to overstate the immediate benefits. But many cancer specialists are convinced that they are seeing the birth of an important new paradigm for cancer treatment."

Many of today's advances in cancer immunotherapy revolve around CTLA-4 (cytotoxic T-lymphocyte antigen 4) — a receptor on T cells that was discovered in 1987. "The early steps were taken by French cancer immunologist James Allison, now at the University of Texas, MD Anderson Cancer Center in Houston. CTLA-4 prevented the T cells from attacking invaders with their full force. In 1996, James Allison showed that blocking CTLA-4 in mice could unleash T cells against tumour cells in the animals that finally "erased tumours in mice." In the meantime, Japanese researchers identified another "brake" on T cells known as PD-1. Clinical trials involving this receptor began in 2006, and preliminary results in small groups of patients appear to be promising.

Another area of interest involves genetically modifying T cells to make them target tumours. In 2011, this strategy, which was known as chimeric antigen therapy, or CAR therapy, electrified the cancer research field, and it is now the subject of numerous clinical trials, particularly in blood cancers. Accordingly, many pharmaceutical companies that wanted nothing to do with immunotherapy several years ago are now investing heavily, the release noted. There is still plenty of uncertainty regarding how many patients will benefit from these therapies, most of which remain experimental — and for which forms of cancer they will work best, the release noted. Scientists are busy trying to identify biomarkers that might offer answers, and thinking of ways to make treatments more potent. But a new chapter in cancer research and treatment has begun. The journal's list of nine other groundbreaking scientific achievements from the past year follows.

CRISPR: Akin to the discovery of the microscope in the 1920 that "touched off a revolution in surgical procedures," the discovery of a bacterial protein — Cas9 — gives "researchers the equivalent of a molecular surgery kit for routinely disabling, activating, or changing genes," the paper notes.

Though CRISPR, the gene-editing technique was discovered in bacteria, researchers use it as a scalpel for surgery on individual genes. Its popularity soared this year — with over 50 publications in 10 months — as more than a dozen teams of researchers used it to manipulate the genomes of various plant, animal and human cells.

Cloning human embryos: After years of failure, researchers were able to derive stem cells from cloned human embryos this year. Scientists were able to clone sheep, mice, pigs, dogs and other animals, but human cells proved really tricky.

But in 2007, researchers at the Oregon National Primate Research Center in Beaverton succeeded in cloning monkey embryos and extract embryonic stem cells. In the process they realised that caffeine plays an important role in the process, stabilizing key molecules in delicate human egg cells.

CLARITY: This imaging technique, which renders brain tissue transparent by "by removing the fatty, light-scattering lipid molecules that form cellular membranes." The lipids are replaced with molecules of "clear gel" but all neurons (as well as other brain cells) are left intact and on full display. This has changed the way researchers look at this intricate organ in 2013.

According to the paper, researchers say the "advance could speed up by 100-fold tasks such as counting all the neurons in a given brain region and could make traditional methods of imaging post-mortem brain tissue irrelevant." Currently, the technique is limited to small amounts of tissue.

Mini-organs: Researchers made remarkable progress growing mini human-like "organoids" in vitro this year. These included liver buds, mini-kidneys and tiny brains. miniaturized human organs may prove to be much better models of human disease than animals. If it is a challenge to "coax stem cells to grow into specific tissues" prodding pluripotent stem cells to develop into organized structures has been nearly impossible. Not any more. Researchers in spectacular style were able to grow a variety of "organoids" in the lab — liver buds, mini-kidneys, and, most remarkably, rudimentary human brains.

Cosmic rays traced to supernova remnants: Although originally detected 100 years ago, scientists have not been sure where the high-energy particles from outer space known as cosmic rays come from. This year, they finally tied the rays to debris clouds left by supernovae, or exploding stars.

Perovskite solar cells: A new generation of solar-cell materials, cheaper and easier to produce than those in traditional silicon cells, garnered plenty of attention this past year. Perovskite cells are not as efficient as commercial solar cells yet, but they are improving very quickly.

Structural biology guides vaccine design: This year, researchers used the structure of an antibody to design an immunogen — the main ingredient of a vaccine — for a childhood virus that hospitalizes millions each year. It was the first time that structural biology led to such a powerful tool for fighting disease.

Our microbes, our health: Research on the trillions of bacterial cells that call the human body home made it clear how much these microbes do for us. "Personalized" medicine will need to take these microbial tenants into account in order to be effective.

Why we sleep: Studies with mice showed that the brain cleans itself — by expanding channels between neurons and allowing more cerebrospinal fluid to flow through — much more efficiently during sleep. The finding suggests that restoration and repair are among the primary purposes of catching Z's.

Why do we dream when we sleep?

There are various theories — medical as well as metaphysical — as to why we get dreams. Sleep has two parts, non REM sleep and REM (rapid eye movement) sleep. Dreams occur in the latter stage of sleep, that is, REM sleep also known as paradoxical sleep. It is paradoxical in the sense that although we are sleeping, still the metabolic activity of our brain is comparable to that of the awake state and our eyes are moving as if following a scene. This scene is actually a dream. So that we do not enact our dreams, our skeletal muscles are paralyzed during dreaming. Dreams serve an important purpose. They allow us to confront situations that may/may not occur in our daily lives and we do not have to experience them in reality to learn them. Dreaming is actually a learning behaviour where we exercise our brain. That is why dreams constitute the most bizarre chronologies ever. That is why a new born spends more proportion of his sleep dreaming than an elderly person. Also dreams consist of visual perceptions mostly.

We usually don't hear people talking or smell things during dreams. This is principally because the blood supply to the visual centre of our brain is greatly increased during dreaming. Some people also believe that dreaming is an essential part of developing a reflex action. It is also theorised that we dream about things that we are thinking about just before going to sleep. So it is kind of building upon that thought process and exploring various possibilities to it while in the dream state. This dream can allow us to reach the most bizarre consequences of our thought process and help us take better decisions. In a disorder called REM sleep behaviour disorder, people start enacting their dreams which become dangerous for the patient as well as the bed partner. In the end it suffices to say that dreams serve an important purpose in the development of human behaviour and those who do not dream have behaviour abnormalities.

Phosphorus found in supernova Cassiopeia A

Scientists discovered Phosphorus for the first time in the cosmic leftovers from the supernova - Cassiopeia A – explosion. The study was published in a science journal on 13 December 2013. The discovery of Phosphorus confirmed that massive exploding stars are crucibles in which the element is created. Phosphorus is 100 times more abundant in the remains of a supernova than elsewhere in the galaxy. Abundance of carbon, nitrogen, oxygen and sulphur has been measured in supernova remnants before. Now supernova remnant Cassiopeia A revealed the first measurement of the relatively scarce phosphorus. These five elements are essential to life and can only be created in massive stars. They are scattered throughout our galaxy when the star explodes and become part of other stars, planets and humans. The observations of the object were made with a spectrograph mounted on a telescope at Palomar Observatory at the California Institute of Technology. Scientist said that Cassiopeia A exploded 300 years ago.

About Phosphorus:

- Phosphorus is an essential component of living systems and it is found in nervous tissue, bones and cell protoplasm.
- Phosphorus used in the manufacture of safety matches, pyrotechnics, incendiary shells, smoke bombs.
- Phosphorus used in pesticides and also in the production of special glasses.
- Na3PO4 is important as a cleaning agent, water softener and for preventing boiler scale and corrosion of pipes and boiler tubes
- Phosphorus found in food items are pumpkin, soya foods, cheese, nuts like badam and fish.

Gaia satellite launched by Europe

Europe on 19 December 2013 launched the Gaia satellite – one of the most ambitious space missions in the history. Gaia lifted on a Soyuz rocket from Europe's Spaceport from the Kourou in French Guiana at 6:12 local time. It will map the precise positions and distances to more than a billion stars. This will give the first realistic picture of how the Milky Galaxy has been constructed and will also detect thousands of unseen objects like asteroids and new planets. The satellite is carrying two telescopes that will throw light on to a huge, one billion-pixel camera detector connected to a trio of instruments. It has been developed to sample the ultra-stable and supersensitive optical equipment to pinpoint. Gaia's journey will take about a month as it will travel about one and half kilometers to the observatory station from the earth.

Mars Orbiter Spacecraft successfully placed

India's Mars Orbiter Spacecraft successfully placed in Mars transfer trajectory on 1 December 2013 by ISRO scientists. Now, the Mars spacecraft will travel 780 million kilometers (485 million miles) over 300 days (ten months) to reach an orbit around Mars planet in September 2014. With this achievement the journey towards Mars, Mangalyaan has reached the next phase of its journey. The team of scientists at ISRO telemetry, Tracking and Command network Bangalore will monitor every minute detail of the movement of the orbiter. It was raised in six stages until it reached 1.92 lakh kilometres as it circled earth several times. PSLV C25 carrying the orbiter was placed in the earth's orbit on the 5th November 2013 and is expected to reach the Mars orbit in September 2014. This landmark technological mission of ISRO will fulfill the objective of deep space communication, navigation, mission planning and management. The flight path of the vehicle will be monitored by ground stations at Canberra in Australia,Goldstone in the US and Madrid in Spain. The Indian Space Science data centre will receive and disseminate the payload datas of the Mangalyaan. One of the payloads in the spacecraft the Mars Colour Camera is already in operation. The other payloads are lyman alpha photometer, Methane sensor for mars, mars exospheric neutral composition analyser and Thermal infrared imaging spectrometer to understand the soil features and minerals available in the red planet- the Mars.

If liver has the capacity to regenerate then why does one need to have liver transplantation?

Liver regeneration is a misnomer because the removed liver will not grow back, not the same sort of regeneration as we see in echinoderms such as the Sea Star where the cut off arm grows into a new arm and also the regeneration of limbs in amphibian models. Liver regeneration is a complex, evolutionarily conserved process. In case of humans, the liver actually hypertrophies by increasing the number of liver cells thereby increasing the size of the liver. It is the division of mature functioning cells of the remnant liver through hyperplastic response instead of recruitment of liver stem cells or progenitor cells. During this process, the proliferation stops once the liver has attained its original size which is highly regulated and determined by the demands of the organism. Our body knows the size of the liver that it needs to carry out the normal metabolism. Though liver has the capacity to regenerate, in certain cases liver transplantation is the only way to prolong one's life. Biliary atresia in children and cirrhosis in adults require a liver transplantation for survival. Cirrhosis is the final phase of chronic liver disease with scarring of the liver and poor liver function.

The most common causes of cirrhosis are hepatitis B or C infection and alcohol abuse along with a few less common causes. Biliary atresia is a blockage in the ducts that carry bile from the liver to the gallbladder. Biliary atresia leads to liver damage which is deadly if not treated. Living donor liver transplant and cadaverous liver transplant are the liver transplant methods. In living donor liver transplantation, a piece of liver is removed from a living donor and transplanted into a recipient whereas in cadaverous liver transplantation, the liver from brain-dead patients are transplanted into the recipients. Both the donor and the recipient body send signals to the liver to remodel and grow

to its normal size. These events occur so quickly within a week or so and continue to do so over six months to a year. For quicker and successful regeneration both have to be supplied with a lot of extra nutrients after the surgery. Regeneration is required even in cadaverous liver transplantation due to the loss of liver cells from ischaemic injury to the graft.

Novel evolution of Mexican tetra fish

The Mexican tetra, *Astyanax mexicanus,* is a type of fish found in northeastern Mexico. It is also found in a blind form and is known as blind cavefish. Many thousands of years ago some of these fish found their way into caves that were nearly completely dark. Over the years, they adapted to this environment by totally losing their eyes and colouring. There are however eyed forms of this fish which did not get into caves, and these can interbreed, making them members of the same species. Studying this, Nicolas Rohner et al, state in *Science* an explanation of how this major evolutionary change happened in, relatively, such a short time-span. Tying up with an idea by Susan Lindquist, they propose that the heat shock protein 90 (HSP90), found in the cells, plays a major role in this quick evolution to eyeless and depigmented forms. When HSP90 is present, any mutation happening at the level of the genes is masked and prevented from manifesting as traits. If for some reason, HSP90 is depleted from the cell, the mutation shows up as physical changes. In the case of the cavefish, they say that the environmental change acts as a stress that causes depletion of HSP90 in the cells of the cavefish.

The authors tested this theory by an experiment involving surface and cavefish. When surface fish (the form with eyes) were raised in the presence of a drug that blocks HSP90 activity, they developed smaller eyes over a few generations. Cavefish, on the other hand, under the same conditions did not show increase in the eye-orbits. (Though they do not have eyes, they have eye-orbits in their skulls.) The next step was to effect the depletion of HSP90 through external, environmental stress. They identified that the caves in which the fish were reared had water with low conductivity. They repeated the experiments with a low-conductivity environment, and found compatible results.

Malarial drug resistance marker identified

Scientists have uncovered mutations of a gene that make the most dangerous malarial parasite resistant to front line drug therapy. More than half a million children die each year from malaria caused by *Plasmodium falciparum* . Drugs with artemisinin have led the fight against this single-celled parasite's depredations and contributed to a decline in the world's burden of malaria.

However, strains of *P. falciparum* that are resistant to artemisinin have been detected in Cambodia, Thailand, Myanmar and Vietnam, raising fears that these drug-resistant forms could spread to other parts of the world and put at risk the advances that have been made in combating malaria. An international team of scientists have identified a parasite gene whose mutations are associated with artemisinin resistance. Such mutations could be "a useful molecular marker for tracking the emergence and spread" of resistance, noted Frédéric Ariey of the Institut Pasteur in France and his colleagues in a paper published last week in *Nature* .

Australia opened world's first standing classroom

In an effort to know the effects of long sitting , scientists had started a new initiative in Australia. Mont Albert Primary School had launched the world's first standing classroom as part of the Experiment by Baker IDI Heart and Diabetes Institute Researchers. Since the desks were introduced more than two months ago, most students have taken the opportunity to stand. A grade six class at Primary School was fitted with height-adjustable desks to allow the pupils to sit or stand, as part of an experiment. Previous studies have shown students spent two-thirds of a school day sitting, and prolonged childhood sitting can contribute to the onset of such diseases such as Type 2 diabetes, cardiovascular disease and obesity.

Oldest known human DNA decoded

The scientists on 4 December 2013 decoded the oldest DNA from ever found 400000 year old thigh bone of human family. This research has expanded the knowledge of the human genetics by 300000 years and also suggests the journey of man evolution. The thigh bone was found at a burial site Sima de los Huesos (Bone Pit) that was preserved in Spain's northern Sierra de Atapuerca highlands.

The researchers have found that the mitochondrial genome of Denisovans belongs to the extinct relatives of Neanderthals in Asia. The researchers at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, have determined an almost complete mitochondrial genome sequence of a 400000 year old representative of the genus Homo. The researchers sampled two grams of bone powder extracted from a femur and sequenced the genome of mitochondrial DNA (mtDNA), which is passed down along the maternal line. Further, they compared the code with the modern humans, apes, Neanderthals and their sister group, Denisovans. In the result they found that the Spanish hominins were more closely related to the geographically more distant Denisovans than to Neanderthals. The bone pit (Sima de los Huesos) is a cave site in Northern Spain that has given the largest assembly of Middle Pleistocene hominin fossils of the world, which consist of 28 skeletons.

Potential malaria vaccine discovered

Researchers have discovered a key process during the invasion of the blood cell by the Malaria parasite, and have found a way to block this invasion. With this new knowledge, the scientists from Singapore's Nanyang Technological University (NTU) are looking to collaborate with the industry on a vaccine against malaria which can be developed within the next five years if accelerated by vaccine development companies. Lead scientist Professor Peter Preiser said his team's scientific breakthrough will be instrumental in paving the way towards eradicating Malaria in the long run. The parasitic diseases expert said that they have identified a region of the malaria parasite which it uses to attach to a healthy blood cell then pushes itself into the cell. "To prevent this invasion, we developed antibodies which can interfere with this invasion process. So imagine the parasite has the key to unlock a door to the red blood cell, but we muck the key up, so no matter how hard the parasite tries, the door just refuses to open," the researcher said. The patented discovery also opens the doors to new drug targets, which will allow scientists to develop more methods to interfere and disrupt the parasite's act of invasion. This research outcome was made possible with the development of a new screening assay that allows the rapid characterization of parasite signalling, which is significantly faster than conventional methods. The study is published in the scientific journal *Nature Communications* .

Unique cancer called histiocytosis

Team of Doctors at Chennai performed a surgery on unique cancer called Histiocytosis found in the patient's food pipe and stomach and removed it on the third week of December 2013. The Histiocytosis is generally believed to affect the blood cells and is found in the nasal region of the person. The cancer escaped several endoscopic and laparoscopic biopsies and finally team of doctors from the surgical gastroenterology department at the Government General Hospital, Chennai operated the patient and put the tissues under the microscope, it showed up as Histiocytosis of the esophagus and stomach.

First indigenous Thalassaemia testing kit

The Indian Council of Medical Research (ICMR) on 17 December 2013 unveiled the first indigenously developed thalassaemia and sickle cell anaemia testing kit. The testing kit was developed by the National Institute of Immuno Haematology (NIIH) in Mumbai. The testing kit is a polymerase chain reaction (PCR) based test that screens for eight genetic mutations, six of which can cause thalassaemia and two sickle cell anaemia. The kit would bring down the cost of screening for both the genetic diseases to a tenth

of the 15000 rupees to 20000 rupees in the private sector. The test costs 4000 rupees in All India Institute of Medical Sciences (AIIMS).The testing kit would be of immense help for premarital and post-pregnancy counselling. This is because two carriers of a defective gene have a 25 per cent chance of having a baby born with thalassaemia. There are 3-4% (30-40 million) beta thalassaemia carriers in India and 10000-12000 thalassaemic babies are born every year and 5000 with sickle cell anaemia. The prevalence is between 5 and 15 per cent among Sindhis, Kutchis, Punjabis, Bhanushalis, Jains and Muslims. Scientists who developed the kit, meanwhile, rued the fact that a PCR machine — which costs about Rs 1 lakh — was available in only 10 per cent of medical colleges.

About Thalassaemia

Thalassaemia is a group of inherited blood disorders that affect the body's ability to create red blood cells. In case of thalassaemia bone marrow does not produce the haemoglobin causing anaemia and reducing the oxygen carrying capacity. There are two types of thalassaemia that is alpha thalassaemia and beta thalassaemia.

Indian Scientists developed Insulin Pill for diabetics

The Indian Scientists, National Institute of Pharmaceutical Education and Research (NIPER) developed insulin pill for diabetics in third week of December 2013. The Scientists developed a long-sought insulin pill that could spare millions of diabetics and soughed a way the delivery of insulin therapy from a jab to a pill.

The experiments with rats, the pill lowered blood glucose levels almost as much as injected insulin and the effects of the pill lasted longer than injected insulin. The body's digestive enzymes in the body are so good at breaking down food also break down insulin before it can get to work. In addition, insulin does not get easily absorbed through the gut into bloodstream. To solve these problem researchers from National Institute of Pharmaceutical Education and Research (NIPER) in Punjab combined two approaches to shield insulin from the digestive enzymes and then get it into the blood.

The team of researchers Ashish Kumar Agrawal, Harshad Harde, Kaushik Thanki and Sanyog Jain, packaged insulin in tiny sacs made of lipids or fats called liposome.Then wrapped the liposomes in layers of protective molecules called polyelectrolytes. To get absorbed and to transport the layersome across the intestinal wall into the blood stream they attached folic acid and a kind of vitamin B. This was published in American Chemical Society journal biomacromolecules, Washington.

First Trajectory Correction Manoeuvre of Mangalyaan performed

The first Trajectory Correction Manoeuvre (TCM) of Spacecraft of India's maiden interplanetary mission to Mars was carried out successfully at 06:30 hrs (IST) on 11 December 2013. The TCM was fired by the 22 Newton Thrusters for duration of 40.5 seconds. The spacecraft at present is travelling at a distance of about 29 lakh (2.9 million) km away from Earth. The correction has been done to fine tune the trajectory path of the spacecraft to keep it travelling in the intended track towards Mars (red planet). To place the spacecraft on a right path the Indian Space Research Organisation (ISRO) has planned four Trajectory Correction Manoeuvres for Manglayan for its journey to Mars.

They oeuvres are needed to keep the space-craft on the required path. It is also essential for maintaining the required velocity. Mangalyaan is on a 680 million km voyage to Mars. The Spacecraft moved out from the orbit of Earth on 1 December 2013. The 1350 kilogram Mars Craft was successfully injected into the orbit around earth from the national space agency's PSLV C 25 from the Satish Dhawan Space Centre at Sriharikota. It was launched on the 5 November 2013 and it is expected that the spacecraft will reach to the Martian orbit by 24 September 2014.

Mars rover got Software Upgrade

NASA engineers have upgraded the Software of the NASA's Mars rover Curiosity 20 December

2013. The NASA team is now planning to check the wear and tear on the wheels of the rover.

As per Jim Erickson of NASA's jet Propulsion Laboratory project manager for the NASA Mars Science Laboratory Project, Curiosity is now operating on version 11 of its flight software. Since 16 month of landing of Curiosity on Mars, this is the third upgrade version. Completing the switch from Version 10 took about a week NASA said. An earlier switch to version 11 prompted an unintended reboot on 7 November and a return to version 10, but the latest transition went smoothly. The upgrades in Curiosity have allowed advances in its capabilities like version 11 has expanded the capabilities of robotic arm of Curiosity at the time, when it is at slope. It has also improved its flexibility to store the information overnight to use in resuming autonomous driving on a second day. An upcoming activity would be driven to a relatively smooth patch of ground to take a set of images of Curiosity's aluminum wheels, by the use of Mars Hand Lens Imager (MAHLI) camera at the end of the rover's arm. NASA's Mars Science Laboratory Project is using Curiosity inside Gale Crater to assess ancient habitable environments and major changes in Martian environmental conditions. JPL, a division of the California Institute of Technology in Pasadena, built the rover and manages the project for NASA's Science Mission Directorate in Washington.

Why are we advised not to breathe through our mouth?

Two important functions of the nose are, as a respiratory passage and organ of smell. Receptors for smell are placed in the upper one-third of nasal cavity and this part is lined by olfactory (related to smell) mucosa. Rest of the nasal cavity is lined by respiratory mucosa. Filtering or cleaning functions of the nose are carried out by hair in the nostrils, mucous blanket covering the nasal cavity and the cilia present in the nasal epithelial covering. Hairs in the nostrils strain out many foreign particles greater than100 micrometres. Most of the remaining particles of this size are settled on the mucous membrane of the nose and the throat. 'Mucous blanket' is a sheet of secretion of mucous secreting glands of the nose. This blanket traps the foreign particles which are removed. Particles of size 2-10 micrometres entering the lower airway are also removed away from the lungs by the 'ciliary escalator' which is present from nose up to the lower airways. When ciliary motility is defective, mucous transport is virtually absent and this leads to chronic sinusitis and recurrent lung infections. Nasal mucosa can cool or warm the inspired air so that very hot or very cold air is at or near the body temperature by the time it reaches the lungs. Relative humidity of the atmospheric air depends on various climatic conditions.

Air is dry in winter and saturated with moisture in summer. Nasal mucosa adjust the relative humidity of the inspired air to 75 per cent or more. Water to saturate the air is provide by the serous and mucous secretions. Curved bony projections from the inner side of nose called as nasal conchae or turbinates play a significant role in the above said functions of the nose by providing a larger surface area. Nasal breathing also has a vital role in preserving the oro-facial structural and functional harmony. Mouth breathers breath orally even in relaxed and restful situations.

To begin with, new born child is an obligatory nasal breather. Mouth breathing is an acquired habit which is learnt either as a mere habit or due to various anatomic reasons like obstructing nasal airway or short upper lip. Oral breathing causes drying of gums (gingiva) of the upper front teeth and this predisposes to redness, swelling and easily bleeding tendency of gums called as gingivitis. Saliva is evaporated due to continuous airflow through the mouth which will lead to dryness and promotes dental decay(dental caries).

China's first lunar rover landed on Moon

The first lunar rover of China, which was carried by an unmanned remotely piloted spacecraft Chang'e-3 was deployed successfully on moon on 14 December 2013. The lunar rover has been named Jade Rabbit (called Yutu in Chinese). Chang'e-3 was blasted off on a Long March-3B carrier rocket. The Chinese moon exploration has made it one of the only three nations that have soft

landed on the surface of moon after United States and the Soviet Union. In past three decades, China is the first country to do so. Earlier, Luna 24 Probe of Soviet Union was the last space mission to land on moon in August 1976. It landed after four years after the launch of the manned Apollo 17 mission by United States.

About the lunar rover - Jade Rabbit

- It is a six-wheeled lunar rover
- It is equipped with four cameras and two mechanical legs, which can dig the soil samples, up to a depth of 30 meters
- For at least for next three months, the solar-powered rover will patrol the moon's surface to study the structure of lunar crust, soil and rocks
- It weighs 140 kilograms and carries an optical telescope for astronomical observations
- It also have a powerful ultravio l e t camera to monitor the effects of solar activity on various layers of Earth's atmosphere namely troposphere, stratosphere and ionosphere
- Radioisotope heater units of the rover will help it to be functional during cold lunar nights, the time when the temperature of moon goes down up to -180°C
- As per the Shanghai Aerospace Systems Engineering Research Institute, the rover can climb the slopes up to 30 degrees and it can travel at 200 meters per hour

China has been increasingly ambitious in developing its space programmes, for military, commercial and scientific purposes.

ISRO's SDSC to be shifted

Satish Dhawan Space Centre(SDSC) , Sriharikota , the satellite launching centre of ISRO would be shift its northern boundary to make a way for the oil exploration. The consortium of Cairn India , Tata , ONGC (Oil & Natural Gas Corp) had to explore oil and Gas in Bay of Bengal. ISRO would shift the boundary of the prohibited zone seven kilometers south to permit exploration drilling by operator Cairn. The consortium had put in $31 million in exploring block PR-0SN-2004/1 in Palar basin. As the consortium claims that a site in the zone has best chance of establishing petroleum system. It was held for huge potential to attract investors in the future. ISRO had stopped effective exploration in last two years as DoS(Department Of Space) refused to give drilling permission as the site was within 10-km radius of Satish Dhawan Space Centre — a strategic zone in terms of national security. The DoS had maintained for years that there was a vulnerability of radio frequency interference as well as the risk of space debris falling on any installations that come up for exploration.

Satish Dhawan Space Centre

The Satish Dhawan Space Centre is the launch centre for the Indian Space Research Organisation (ISRO). It is located in Sriharikota, Andhra Pradesh, 80 km north of Chennai. Originally called Sriharikota High Altitude Range (SHAR) and then Sriharikota Launching Range, the centre was renamed in 2002 after the death of ISRO's former chairman Satish Dhawan.

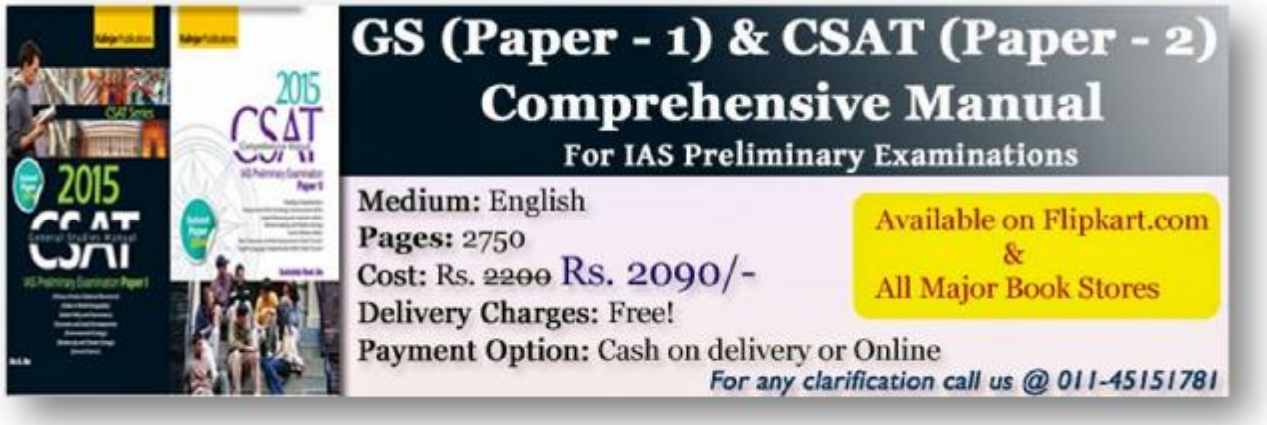
Sperm-based 'biobots' created in Germany

Scientists led by Oliver Schmidt created the biological robots or biobots powered by sperm in the Institute for Integrative Nanosciences in Dresden, Germany on December 2013. It is also called as biohybrid micro-robot. The researchers created magnetic nanotubes that were 50 microns long by 5 to 8 microns in diameter and dropped these into a fluid containing bull sperm. The tubes were narrower at one end to stop the sperm from escaping and can be rotated by using magnetic fields. The tail-like flagellum of the sperm cell sticks outside the end of the tube and power the bibot like a propeller.

Benefits

These "biobots" can be used to guide individual sperm or to deliver targeted doses of drugs or fertilizing an egg.

Schmidt Said that sperm cells are an attractive option because they are harmless to the human body, do not require an external power source and swam through viscous liquids. Till now researchers



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has only managed to persuade groups of cells to cooperate with the help of chemical gradients and magnetic fields.

Extreme Adaptation of Burmese Python

The Burmese python's ability to ramp up its metabolism and enlarge its organs to swallow and digest prey whole can be traced to unusually rapid evolution and specialized adaptations of its genes and the way they work.

Recycled plastic Kills Drug-resistant Fungi

Researchers have converted polyethylene terephthalate (PET) — widely used to make plastic bottles — into a non-toxic biocompatible material with superior fungal killing properties, which is a potential life-saver.

Studies to Improve Cochlear Implants

Researchers are investigating the implementation of signals in the auditory nerve and the subsequent neuronal processing in the brain. Using computer models, better cochlear implants may be manufactured.

New, long-lived greenhouse gas found

Perfluorotributylamine (PFTBA) — a novel chemical lurking in the atmosphere, is the most radiatively efficient chemical found to date, breaking all other chemical records for its potential to impact climate.

Earth will lose its oceans in a billion years

The natural increase in solar luminosity — a very slow process unrelated to current climate change — will cause temperatures to rise over the next few 100 million years, resulting in evaporation of the oceans.

No lion threat to cheetah cubs

Cheetah cubs in the Kgalagadi Transfrontier Park were seven times more likely to survive than in Serengeti and lions were not the main threat.

New means of growing intestinal stem cells

Researchers have shown that they can grow unlimited quantities of intestinal stem cells, then stimulate them to develop into nearly pure populations of different types of mature intestinal cells.

2012 solar storm points up need for preparation

A massive ejection of material from the sun that narrowly missed Earth last year is an event solar scientists hope will open the eyes of policymakers regarding the impacts and mitigation of severe space weather.

Gene responsing to Cocaine Identified

Scientists have identified a gene that may determine the intensity of our response to cocaine. The gene determines how mammals respond to cocaine.

Mouse inherits learned sensitivity to smell

When a mouse learns to become afraid of a certain odor, his or her pups will be more sensitive to that odor, even though the pups have never encountered it.

Ancient lake bed on Mars was ideal for life

The clay-bearing Yellowknife Bay habitat, scoured by Mars rover Curiosity, an ancient lakebed, consisted of water that was neither too acidic nor too salty, and had the right mix of elements to be an energy source for life.

Uncertainty in forests' role as 'carbon sink'

The length of time carbon remains in vegetation during the global carbon cycle is the key 'uncertainty' in predicting how Earth's terrestrial plant life — and consequently almost all life — will respond to higher CO{-2}levels.

Kiwi probably originated in Australia

New Zealand's iconic kiwi bird probably

descended from an ancestor that flew in from Australia. It did not evolve from the extinct giant moabut was more closely related to emu. Kiwi and emu evolved from a common ancestor, which originated in Australia.

'Designer sperm' leads to Custom genes

Introducing new genetic material via a viral vector into the sperm of mice leads to the presence and activity of those genes in the resulting embryos. If successful in humans this discovery could advance genetic medicine.

KINECT Developed by Microsoft

US software company Microsoft recently developed a new cost-effective sign language translator that converts signs into spoken and written language - and vice versa. In collaboration with researchers in China, Microsoft created the Kinect Sign Language Translator, a prototype system that understands the gestures of sign language and converts them to spoken and written languageand vice versa. The translator uses a computer and a Kinect camera that recognises signing gestures, then gives a spoken and written translation of languages for people who can hear.

The system captures a conversation both sides: the deaf person is shown signing, with a written and spoken translation being rendered in real-time, while the system takes the hearing person's spoken words and turns them into accurate, understandable signs.

The system takes a person's spoken words and translate them into accurate signs carried out by an on-screen avatar. The Kinect's sensors read a user's body position and movements and, with the help of a computer, translate them into commands. The project was collaboration between the Chinese Academy of Sciences, Beijing Union University, and Microsoft Research Asia.

In Mars Findings
Mangalyaan & Maven will Complement Each Other

ISRO and NASA will coordinate functions of their Mars Orbiters-Mangalyaan and MAVEN once both get into orbit of the Mars planet in September 2014. This was announced by ISRO scientists. ISRO scientists also stated that the findings of ISRO' Mars Orbiter mission and NASA's Maven would complement each other. NASA's Mars-bound spacecraft, the Mars Atmosphere and Volatile EvolutionN (MAVEN) was launched aboard a United Launch Alliance Atlas V 401 rocket from Cape Canaveral in Florida, US on 18 November 2013. MAVEN is the second mission for NASAs Mars Scout Program and is likely to obtain critical measurements of the Martian upper atmosphere to help understand the climate change over the red planet-Mar's history.

MAVEN carries eight instruments Neutral Gas and Ion Mass Spectrometer, Imaging Ultraviolet Spectrograph, Magnetometer, Solar Wind Electron Analyzer, SupraThermal And Thermal Ion Composition, Langmuir Probe and Waves antenna, Solar Energetic Particles and Solar Wind Ion Analyzer. After having successfully completed five orbit raising manoeuvres on its Mars Orbiter, ISRO is expected to perform the crucial event of trans Martian injection of the spacecraft in the early hours of 1 December 2013.

The spacecraft will reach the red planet's orbit by 24 September 2014 after an over 10 month voyage. ISRO's PSLV-C25 successfully injected 1350-kg Mangalyaan Orbiter (Mars craft) into orbit around Earth some 44 minutes after launch at 2.38 PM from Satish Dhawan Space Centre at Sriharikota on 5 November 2013 marking the successful completion of the first stage of the 450 crore Rupees mission.

IICT Received
Samples from OPCW

The Indian Institute of Chemical Technology (IICT), Hyderabad, recently received over 50 samples for detection of chemical weapons from the Organisation for Prohibition of Chemical Weapons (OPCW). The samples in the form of soil, water and organic solvents were sent twice a year since 2008 when IICT attained the status of designated laboratory for off-site analysis of

weapons. OPCW had been sending to IICT for analysis only blank samples collected from different parts of the world. Six samples which were coded to hide the identity of the substance and the originating country were sent by courier every six months as part of continuous evaluation of the lab. The report of the institute should be cent per cent accurate to be eligible to get three 'A' grades in succession and pass the proficiency test every year. The institute has already got the proficiency certificate for this year (2013), but it was yet to enter into a technical agreement with OPCW to get authentic on-site samples.

It had the technique to identify chemicals at parts per million (PPM) levels. A dedicated centre for analysis of chemical toxins was set up at the institute to attend to OPCW.

The IICT was one of the 21 labs in 17 countries that were designated by OPCW for off-site analysis of chemical weapons. Apart from IICT, the Defence Research and Development Establishment (DRDE), Gwalior, under the Defence Research and Development Organisation (DRDO) is also one of the 'designated laboratories' of the OPCW. A 'designated laboratory' has to participate every year in the OPCW proficiency test and consistently attain the 'A' grade benchmark to retain its status. From 2008, IICT has retained its status though it has been associated with OPCW since 1998. The Organisation for the Prohibition of Chemical Weapons (OPCW) on 11 October 2013 won the Nobel Peace Prize for the year 2013 for its extensive efforts to eliminate chemical weapons.

About Indian Institute of Chemical Technology (IICT)

Indian Institute of Chemical Technology, (established in 1989) is a national-level research center located in Hyderabad, India under the Council of Scientific and Industrial Research (CSIR), Government of India. IICT conducts research in basic and applied chemistry, biochemistry, bioinformatics, chemical engineering and provides science and technology inputs to the industrial and economic development of the country.

Biosimilar Trastuzumab got Approval of DCGI

Indian Biotech Company Biocon on 26 November 2013 announced that it had received market authorisation from the Drug Controller General of India (DCGI) for its Breast cancer Drug-biosimilar Trastuzumab. The biosimilar trastuzumab will be marketed in India under the brand name of *CANMAb* by the company, and is expected to be available to Indian patients in the fourth quarter of FY14. The drug is jointly developed by Biocon along with US-based pharma company Mylan. Breast cancer is one of the most common types of cancer in India, with over 100000 new patients being diagnosed with this disease every year. The cost of biologics in cancer treatment is high, which makes access unaffordable to a large number of patients. Biosimilar Trastuzumab will offer an alternative affordable option thereby enhancing access to treatment for cancer patients in India and the world over. Biosimilar Trastuzumab drug is used for the treatment of Her 2+ metastatic breast cancer.The Biosimilar Trastuzumab marketed in the brand name of CANMab. CANMab is the first biological equivalent of Herceptin, a breast cancer drug manufactured by Swiss company, Roche.

New View of Saturn and Earth provided by Cassini Spacecraft

NASA in November 2013 released a natural-color image of Saturn from space, the first in which Saturn, its moons and rings, and Earth, Venus and Mars, all are visible. The panoramic mosaic of the majestic Saturn system was taken by Cassini Space-craft of the NASA. It shows the view that can be seen by the human eyes. It was unveiled at the Newseum in Washington on 12 November 2013. To create the panorama, the image team of Cassini processed 141 wide-angle images. The image sweeps 404880 miles across Saturn and its inner ring system, which includes Saturn rings out to the E ring, the second outermost ring of Saturn. On July 19, people for the first time had advance no-tice a spacecraft taking the picture from planetary distance during the Cassini's Wave at Saturn cam-paign. During the campaign, NASA invited public

to celebrate by finding Saturn in their part of the sky, waving at the ringed planet and sharing pictures over the internet. An annotated version of the Saturn system mosaic labels points of interest. Earth is a bright blue dot to the lower right of Saturn. Venus is a bright dot to Saturn's upper left. Mars also appears, as a faint red dot, above and to the left of Venus. Seven Saturnian moons are visible, including Enceladus on the left side of the image. Zooming into the image reveals the moon and the icy plume emanating from its south pole, supplying fine, powder-sized icy particles that make up the E ring. The E ring shines like a halo around Saturn and the inner rings, because it is tenuous and can be seen with the light shine from behind it.

About the Cassini Spacecraft

Cassini Spacecraft was launched in 1997 and explored the Saturn system for more than nine years. NASA has planned to continue the mission through 2017 with the anticipation of many more images of Saturn, its rings and moons, along with scientific data. The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and Italian Space Agency. JPL, a division of the California Institute of Technology, Pasadena, manage the mission for NASA's Science Mission Directorate in Washington. JPL designed, developed and assembled the Cassini orbiter and its two onboard cameras. The imaging team is based at the Space Science Institute, Boulder, Colo.

Orbit Raising Manoeuvre Performed by ISRO

The Indian Space Research Organisation (ISRO) on 16 November 2013 performed the last of the five orbit-raising manoeuvre on its Mars Orbiter, raising the apogee (farthest point from Earth) of the spacecraft to over 1.92 lakh km. In the series of five orbit raising manoeuvre with a supplementary operation after the fourth one, the space agency had raised the apogee of the spacecraft to over 1.92 lakh km.

After the successful completion of these operations, the Mars Orbiter mission is expected to take on the crucial event of the trans-Mars injection around 12.42am on 1st December 2013. It will reach the orbit of the red planet by 24th September, 2014 after taking on a voyage of over 10 months. ISRO's PSLV C 25 on 5 November 2013 successfully injected the 1350-kg 'Mangalyaan' Orbiter (Mars craft) into the orbit around the earth, from the Satish Dhawan Space Centre at Sriharikota, Andhra Pra desh.

Germany Tested World's First Green Helicopter

Germany's aviation company e- Volo on 17 November 2013 successfully tested the first helicopter which is noiseless and emission-free named- Volocopter. The Volocopter is an environmentally friendly and emission-free private helicopter.

About the Green Helicopter

The helicopter, named Volocopter, developed by the German company e-volo, two seat prototype made it earlier voage in kalsruhe, Germany.

The volocopter uses eighteen electrically driven rotos propel instead of one combustion engine which is environmentally friendly and emission-free.

The emission free Volocopter is a vertical take-off and landing manned aircraft, with rich features and incredibly quiet sound, absolutely no noticeable vibrations, new spring strut landing gear and extremely calm rotor plane that replace conventional aircraft .

Survival of small farms crucial for food security

For the last 25 years, Deccan Developmental Society (DDS) in Medak District, Andhra Pradesh has been working in more than 70-odd villages along with 5,000 dalit women farmers. "More than 60 per cent of their livelihood is derived from small holdings. In fact there must be more than 300 million small and marginal farmers in this country. And everyone who analyses Indian agriculture and farmers clearly says that the survival of these small farmers is crucial to the nation's food security and well being," says Mr. P.V. Sateesh, Director, DDS.

Food analyst

Some of the most respected food analysts in the world such as Miguel Altieri, after a decade of

study have categorically concluded that small farms are the most efficient food producers. Hence the criticality of small farmers for agricultural future today stands undisputed. Most of these farmers were either landless or marginal farmers two decades ago. But with support from DDS they got into active agriculture. "All of them are ecological farmers and producers of food crops. Through their magnificent efforts they have become owners of lands between 5-20 acres though all these lands are non irrigated dry lands," says Mr. Sateesh.

Take the case of Rayapalli Susilamma, a 40 year old woman farmer who owns three acres of rainfed farm of which half an acre is mango plantation, one acre not cultivable, grows an amazing variety of food crops. She is proud that she does not have to buy food grains. She goes to the market for buying only cooking oil, coconut oil, soap and soap powder. Along with Susilamma are five others, all of whom share the same socio economic and agricultural profile.

They all want to own about five acres of farm, a pair of bullocks, one milch animal, a couple of goats and a few chickens.

Governments role

"The government must ensure that all farmers like them must own these animals that generate additional cash to support the needs of their children as they grow and get educated," adds Mr. Sateesh. Increasing cost of cultivation is a major worry for these women. "Weeding wages have gone through the roof. What used to be about Rs.100 per person just two years ago, has gone upto Rs. 250 now. "And even then we find it hard to find labourers," says Susilamma. She thinks the 100 days rural employment scheme (MNREGA) has caused this situation. Everyone seems to echo this feeling. Though all of them also are benefited by it since they all go for wage work in other people's lands, they still think that the scheme has dented their own agriculture. To make MNREGA small farmer friendly, they suggest agricultural activities be included in it. Weeding, ploughing (incidentally ploughing costs have gone up by four times in last five years, they point out) and harvesting costs can be borne under the scheme. "If this is done, surely their agriculture will not be under any threat," asserts Susilamma.'Another farmer, Cheelamamidi Laxmamma, in her late 30's has nurtured her three acre dryland farm with great love and care for decades.

Weeding cost

"During monsoon, weeding must be done quickly in two or three days. Depending on the soil type, 20 to 40 persons are needed. Current rates are around Rs.200-250 per person. Therefore it costs between Rs. 4,000 and 6,000 per acre. The total income from one acre might be around Rs.8,000. Under these circumstances how can the weeding wages be met?" she asks. Agriculture officials think that weeding is something that a small farmer can do on their own. They treat this argument with heavy contempt. In drylands, particularly on red soils weeding during Kharif must be finished within two or three days. If you prolong it, it becomes unproductive, according to her. An acre needs a minimum of 25 persons. If the farmer does this on her own, it takes 25 days for her to finish the job. Weeds become unmanageable over this gap of time.

Local money lenders

Most of these women borrow from local moneylenders at three per cent interest to complete weeding. Add to this the fact that crops like millets and other food crops need more weeding compared to cash crops. Therefore the government must offer 100 per cent subsidy for agricultural activity on millet lands and 50 per cent for cash crops by including these activities under MNREGA scheme.

Need encouragement

According to Mr. Sateesh, this is the only area where these proud women farmers in spite of their small holdings and difficult farming need help and encouragement from the Government.

ATV-4 accomplished its Mission

The heaviest-ever cargo-carrier of Europe to the International Space Station burned up in the Earth's Atmosphere in the controlled manoeuvre after a five month mission on 2 November 2013.

When the cargo was burnt, it carried about six tonnes of garbage and waste produced on the board of the ISS. The Automated Transfer Vehicle (ATV) was burnt over the uninhabited zone of the southern Pacific Ocean. The ATV-4 set the record for the heaviest Ariane 5 launch and its mission started on 5 June 2013 from Europe's Spaceport in French Guiana. The record cargo of 2480 kg included more than 1400 individual items. Albert Einstein performed a series of delicate manoeuvres to reenter below the Station in order for the astronauts to observe the spacecraft's fragmentation in the upper atmosphere, providing unique information on reentry physics.

Automated Transfer Vehicles (ATVs)

Automated Transfer Vehicles (ATVs) are the most complex space vehicles ever developed in Europe and are the largest and most capable resupply ships to dock with the Space Station.

European Space Agency (ESA)

The European Space Agency (ESA) is Europe's gateway to space and its mission is to shape the development the space capability of Europe ensuring that the investments done in the space can deliver benefits to the people of Europe and the world. ESA is an international organisation with 20 Member States. By coordinating the financial and intellectual resources of its members, it can undertake programmes and activities far beyond the scope of any single European country.

Study says that Oceans acidifying at Unprecedented Rate

A report released in second week of November 2013 claimed that the world's oceans are becoming more acidic at an unprecedented rate. The oceans of the world are becoming hot, sour and breathless due to the impact of the greenhouse gases. As per the new report from scientists, the way those changes work together is creating a very serious outlook for global water.
The scientists from the International Biosphere Geosphere Programme said that the human emissions of Carbon Dioxide are the matter to be blamed. The human activities add 24 million tonnes of Carbon Dioxide to the World's ocean every day. These emissions will have a profound effect on the chemistry of sea water. The increasing acidity of the oceans is making the life of the marine organisms hard.

The acidity is happening in the polar oceans at a higher speed, where the cold water holds the larger amount of CO2. The researchers and scientists claim that by the end of this century the acid effect would be global and scientists warn, at least 30 per cent of ocean species will be unable to survive.

The acidification of the ocean has increased at an unprecedented rate in the past 300 million years. The scientists have calculated that the world oceans have became 26 percent more acidic since 1880 due to the increase of carbon in the water.

ISRO's Mars orbiter sent first pictures of earth

The Mars Orbiter Mission also known as Mangalyaan has beamed back the first set of pictures of Earth on 21 November 2013 that was captured by Mars Color Camera fitted on Mars Orbiter spacecraft. The picture of earth has captured the Indian subcontinent and parts of Africa. The camera has also captured the cyclonic storm Helen that is heading towards Andhra Pradesh coast. The Picture was taken on 19 November 2013 from an altitude of 67975 km with a resolution of 3.53 km. This is the first time after launch that an instrument on board has been checked for its operation. Earlier, ISRO had performed all five orbit raising manoeuvres planned on the Mars Orbiter and raised the apogee of the spacecraft to over 1.92 lakh km.

RH 200 launch spotlights TERLS' humble beginning

Rohini (RH) 200 took to the sky at 6.25 p.m. on Thursday from the Thumba Equatorial Rocket Launching Station (TERLS) to mark the golden jubilee of the first successful launch of a sounding rocket from Indian soil, the beginning of India's big leap forward in space exploration. It was on this day in 1963, a small American-built rocket named Nike Apache was fired at 6.25 p.m. from Thumba, a fishing hamlet near here, which was chosen by

Vikram Sarabhai and his team of scientists for its proximity to the earth's magnetic equator. Since then, the TERLS has grown rapidly. RH 200, built indigenously, which carried copper chaff as payload, was the 2,328th test flight. RH 200 was a two-stage spinning and fin-stabilised vehicle, with 200 mm in diameter and 3,875 mm in length, weighing 114 kg. These types of rockets are extensively used for meteorological studies and the chaff they release is tracked with the help of radars for processing wind data.

'A low-key affair'

"The day being a momentous occasion we wanted to make it a major event. However, we had to keep it a low-key affair as the top scientific community of the Indian Space Research Organisation is busy with the Mars orbiter probe and the scheduled launch of the GSLV. We would organise a major event to felicitate the top scientists, including A.P.J. Abdul Kalam, who worked for the first launch from here," TERLS Deputy General Manager Koshy Mammen told The Hindu.

Corrections & Clarifications

The fourth paragraph of "RH 200 launch spotlights TERLS' humble beginning" (Nov. 22, 2013) talked about rockets used for metrological studies. It should have been meteorological studies.

Gold in the Eucalyptus Trees Discovered

Researchers from the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Perth, in the month of October 2013 revealed that they found tiny particles of gold in the eucalyptus trees. The researchers explained that the discovery of hidden gold in trees can help the future prospectors to find out more about the precious metal. The Australian researchers explained that the trees were on the top of gold deposits which were rooted deep in the ground. In order to search for the moisture, these trees suck more of gold. The Geochemist at CSIRO, Melvyn Lintern explained that seeing the gold particles in leaves was surprising. Certain trees on which the research was done, brought the gold from a depth of 30 metres, which is equal to the 10-storey building. This gold was found in resource-rich Kalgoorlie region of Western Australia, which, in late 1800s was a primary site of the major gold rush. In order to analyse the extremely small particles at the high resolution, the scientists made use of CSIRO's Maia detector at Australian Synchrotron in Melbourne for X-ray imaging.

The scientists found out that gold particles with the diameter one-fifth of a human hair were present in the trees. Melvyn Lintern also explained that the eucalyptus acts as a hydraulic pump. The roots of these trees extend to tens of metres into the ground. Because the gold is toxic for the plants, therefore, it eventually moved into the leaves as well as the branches where it can be shed to ground. The researchers made use of the technique called biogeochemical sampling in order to give indication of gold's presence beneath the surface. The same method can also used for finding out other metals like copper and zinc. The researchers also explored the gold in leaves of other trees like Acacia Mulga. The latest discoveries of gold fell by 45 percent in past 10 years. In the year 2011, the US Geological Survey revealed that there was around 51000 tonnes of gold remaining in reserve of the world.

World's First Bionic Man

Scientists developed the world's first robot human (Bionic man) made entirely of prosthetic parts. The bionic man can walk, talk and has a beating heart. Bionic man was assembled from prosthetic body parts and artificial organs donated by laboratories around the world. The bionic man also has a nearly complete set of artificial organs including an artificial heart, blood, lungs (and windpipe), pancreas, spleen, kidney and functional circulatory system. He also sports a cochlear implant, speech recognition and speech production systems. The engineers equipped the bionic man with a sophisticated chatbot programme that can carry on a conversation. It also has a pair of robotic ankles and feet from BiOM in Bedford, Massachusetts, designed and worn by bioengineer Hugh Herr of MIT's Media Lab, who lost his own legs after getting trapped in a blizzard as a teenager.

To support his prosthetic legs, the bionic man wears a robotic exoskeleton dubbed Rex .It was

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made by REX Bionics in New Zealand. He lacks a few major organs including liver, stomach and intestines, which are too complex to replicate in a lab. His brain can mimic certain functions of the human brain and he has a retinal prosthesis. Roboticists Rich Walker and Matthew Godden of Shadow Robot Co in England developed the bionic man. The robot was modeled in some physical aspects after Bertolt Meyer, a social psychologist at the University of Zurich in Switzerland, who wears one of the world's most advanced bionic hands. The total cost for development of the robot is around 1 million US Dollars.

Farthest-yet galaxy & others

The universe's farthest galaxy… so far

Astronomers have caught a glimpse of the farthest, most ancient galaxy to date, a star factory that was bustling with activity a mere 700 million years after the big bang. The researchers estimate the galaxy, named z8_GND_5296 and located 13.1 billion years away, formed stars at a rate that was a hundred times more prolific than today's Milky Way. The find, reported in Nature this week, suggests the early universe may have witnessed more bursts of frenetic star birth than astronomers had thought.

The Decline of Wikipedia

The sixth most widely used website in the world is not run anything like the others in the top 10. It is not operated by a sophisticated corporation but by a leaderless collection of volunteers who generally work under pseudonyms and habitually bicker with each other. It rarely tries new things in the hope of luring visitors; in fact, it has changed little in a decade. And yet every month 10 billion pages are viewed on the English version of Wikipedia alone. When a major news event takes place, such as the Boston Marathon bombings, complex, widely sourced entries spring up within hours and evolve by the minute. Because there is no other free information source like it, many online services rely on Wikipedia. Look something up on Google or ask Siri a question on your iPhone, and you'll often get back tidbits of information pulled from the encyclopedia and delivered as straight-up facts.

Chemists present a way to infer the enigmatic temperature variations inside a reactor

Most chemical products start their lives as oil. And most of the conversion processes used to turn the black stuff into plastics, fuels and the rest rely on catalysts. Given the sensitivity of catalysts and Earth's dwindling supplies of oil, you might think that these reactions would be among the most studied and the best understood in the chemist's cookbook. Unfortunately not, In fact, for many chemists and chemical engineers — those who work with bucketloads of reactants rather than the contents of pipettes — what goes on inside an industrial reactor is something of a mystery. It's a black box. Indeed, when some textbooks and academic papers on the subject show flow charts of chemical processes, they actually represent the reactor, the beating heart of our industrial society, as a black box. If process engineers want to know what happens inside — and so how to make it more efficient, safer or more environmentally friendly — they measure what comes out, compare it with what goes in, and make an educated guess.

New free expression tools from Google Ideas

As long as people have expressed ideas, others have tried to silence them. Today one out of every three people lives in a society that is severely censored. Online barriers can include everything from filters that block content to targeted attacks designed to take down websites. For many people, these obstacles are more than an inconvenience—they represent full-scale repression.

The threat in the pocket

Given all the talk about mobile malware—Trojans, viruses, keyloggers, phishing expeditions and other scams infecting the phones in people's pockets—users might be forgiven for thinking cybercrooks are cleaning up at their expense. Truth is, surprisingly few bits of malware have found their way into mobile phones. More by accident than design, smartphones have turned out to be much tougher to infect than laptops and desktop PCs. At least, that is the case at present.

How trees drinking gold can help the mining industry

It's not just the gods of antiquity who sloshed back cups of liquid gold. Trees drink gold, too. A paper published this week in Nature Communications reports that gold crystals can be found in Eucalyptus trees growing above buried deposits of the mineral. The report offers a tentative solution to a worldwide slump in new gold deposit discoveries, suggesting that, somewhat counter intuitively, an effective means of peering into the Earth is to look up – not to the gods, but to the trees.

Researchers keep mum on botulism discovery

Scientists have discovered a new strain — the first in 40 years — of Clostridium botulinum, the bacterium that is ultimately responsible for causing botulism. And although they have reported their findings in a scientific journal, the investigators have taken the extraordinary step of withholding key details of the discovery. That's because the toxins made by C. botulinum are the most dangerous known to humankind and currently there is no antidote for a toxin generated by the new strain. The fear is that malevolent organizations or rogue governments might use the information to reverse engineer their own version of the new bug, making it a potent and real bioterrorism threat.

Seven Planet System Discovered

Astronomers, in the last week of October 2013, revealed that they identified one of the richest planetary systems. The astronomers discovered the seventh planet around the dwarf star KIC 11442793. The discovery was done by two different teams of researchers from the University of Oxford and team of astronomers from several European countries. The newly discovered planetary system has a lot of similarities like our own system. However, all the seven planets orbit closer to the host star which is situated around 2500 light years from the Earth. One of these identifications was done by the volunteers using the Planet Hunters website. This site was established in order to enable the volunteers to search through the public data from NASA's Kepler space telescope. The NASA's Kepler space telescope makes use of the transit method in order to explore new planets. Chris Lintott, from the University of Oxford, co-author on the Planet Hunters paper explained that this was the first seven-planet system from Kepler, by making use of the transiting search. The research done by the team of Chris Lintott was submitted to the Astronomical Journal for peer review. Another research conducted by the astronomers from several European countries submitted their paper to the Astrophysical Journal. It is worth noticing that the newly discovered planet is the fifth furthest from the parent star and orbits with the period of around 125 days. Though there is a lot of similarity of this planet system with our own Solar System, but in the new system, all the seven planets are close to their host star. The Planet Hunters team after conducting the simulations revealed that the planetary system is a stable one. Apart from this, there is another star, HD 10180, which is claimed to have either seven or even nine planetary signals. Yet another sun called GJ 887C might have seven planets.

New Blood Test to Detect Gastrointestinal Disorders

Scientists from Cedars-Sinai Medicla Centre, Los Angeles, for the first time developed a blood test to determine if a person is suffering from Irritable Bowel Syndrome (IBS), or another serious condition such as Inflammatory Bowel Disease (IBD). Researchers conclusively identified a test for antibodies that form against a particular protein, *vinculin*, found in the guts of patients. The study and results of the research work were presented on 11 October 2013 at the American College of Gastroenterology's 78th Annual Scientific Meeting in San Diego, California. In the study, 221 patients were evaluated; some had a diagnosis of IBS, some were diagnosed with IBD and some were healthy, with no symptoms. Anti-vinculin antibodies were significantly elevated in IBS patients as compared to those with IBD or those who were healthy. Until this study, there had been no accurate biomarkers identified specifically for

IBS. The new blood test has the potential to distinguish IBS from IBD and reduce the need for unnecessary testing, expense and years of suffering.

About Irritable Bowel Syndrome (IBS)

Irritable Bowel Syndrome is a gastrointestinal disorder characterised by diarrhea, bloating and abdominal pain. However, millions of patients are never diagnosed correctly. A simple blood test at the first sign of symptoms means patients who have IBS could get effective treatment sooner. Food poisoning has been identified as a significant risk factor for developing this disorder which is characterized by a cluster of symptoms including diarrhea, bloating and abdominal pain.

Chemists show life on Earth was not a fluke

How life came about from inanimate sets of chemicals is still a mystery. While we may never be certain which chemicals existed on prebiotic Earth, we can study the biomolecules we have today to give us clues about what happened three billion years ago. Now scientists have used a set of these biomolecules to show one way in which life might have started. They found that these molecular machines, which exist in living cells today, don't do much on their own. But as soon as they add fatty chemicals, which form a primitive version of a cell membrane, it got the chemicals close enough to react in a highly specific manner. This form of self-organisation is remarkable, and figuring out how it happens may hold the key to understanding life on earth formed and perhaps how it might form on other planets. The 1987 Nobel Prize in Chemistry was given to chemists for showing how complex molecules can perform very precise functions. One of the behaviours of these molecules is called self-organisation, where different chemicals come together because of the many forces acting on them and become a molecular machine capable of even more complex tasks. Each living cell is full of these molecular machines. Pasquale Stano at the University of Roma Tre and his colleagues were interested in using this knowledge to probe the origins of life. To make things simple, they chose an assembly that produces proteins. This assembly consists of 83 different molecules including DNA, which was programmed to produce a special green fluorescent protein (GFP) that could be observed under a confocal microscope.

The assembly can only produce proteins when its molecules are close enough together to react with each other. When the assembly is diluted with water, they can no longer react. This is one reason that the insides of living cells are very crowded, concentrated places: to allow the chemistry of life to work. In order to recreate this molecular crowding, Stano added a chemical called POPC to the dilute solution. Fatty molecules such as POPC do not mix with water, and when placed into water they automatically form liposomes. These have a very similar structure to the membranes of living cells and are widely used to study the evolution of cells. Stano reports in the journal *Angewandte Chemie* that many of these liposomes trapped some molecules of the assembly. But remarkably, five in every 1,000 such liposomes had all 83 of the molecules needed to produce a protein. These liposomes produced large amount of GFP and glowed green under a microscope. Computer calculations reveal that even by chance, five liposomes in 1,000 could not have trapped all 83 molecules of the assembly. Their calculated probability for even one such liposome to form is essentially zero. The fact that any such liposomes formed and that GFP was produced means something quite unique is happening.

Stano and his colleagues do not yet understand why this happened. It may yet be a random process that a better statistical model will explain. It may be that these particular molecules are suited to this kind of self-organisation because they are already highly evolved. An important next step is to see if similar, but less complex, molecules are also capable of this feat. Regardless of the limitations, Stano's experiment has shown for the first time that self-assembly into simple cells may be an inevitable physical process. Finding out how exactly this self-assembly happens will mean taking a big step towards understanding how life was formed. Andrew Bissette does not work for, consult to, own shares in or receive funding from any

company or organisation that would benefit from this article, and has no relevant affiliations.

Brain Makes Use of Sleep to Drain Waste Toxins

The researchers at the University of Rochester Medical Centre, in the third week of October 2013 revealed that the brain makes use of sleep in order to drain the waste toxins which are built during the thinking of the hard day. The team of researchers explained that the waste removal system is actually one of the primary reasons of sleep. The study conducted by the researchers explained that the brain cells shrink when a person sleeps, in order to open the gaps between neurons and enable the fluid to clean the brain from toxins. The study also suggested that failure to clean a few toxic proteins can lead to brain disorders as well. The findings were developed on the discovery of brain's own network of glymphatic system. The discovery was made by the same team of researchers in the year 2012. The glymphatic system actually carries the waste material out from the brain. The researchers used the images of the mice for the study and concluded that the glymphatic system became at least 10 times more active while the mice were asleep. The researchers however explained that the actual importance of the findings would come up after the human studies only. Doing the same experiments in the MRI machine can prove relatively simpler. It is important to note that a lot of brain-related conditions such as Alzheimer's or Parkinson's disease have the common characteristic of building up of damaged proteins in the brain. Both these diseases are caused because of the loss of brain cells. The researchers, in this context, explained that the issues with the cleaning mechanism of the brain can lead to diseases like these. However, further research was required on this.

Management of canker infestation in citrus

Acid lime variety is highly susceptible to citrus canker. Yield losses range from 5 to 30 per cent, depending upon the variety. The disease attacks seedlings and grown up trees. In young plants in the nursery, the disease causes serious damage. Badly cankered leaves fall down and in serious infestation the entire plant dies. The disease affects leaves, twigs, thorns, older branches and fruits. On the leaves the disease first appears as a small, watery, translucent yellow coloured spot. As the spots mature, the surface becomes white or grey in colour and finally ruptures in the centre giving a rough, hard, corky and crater-like appearance.

Gumming

The infection spreads to the fruits on which spots are formed. The cankers may be scattered all over the surface or several cankers may occur together forming an irregular scurfy mass. Gumming is sometimes associated with spots on fruits.

Canker has never been observed occurring naturally on roots of even badly diseased trees. However the disease has been found on grape fruit roots exposed above ground surface.

Management

- Dropped off canker affected leaves and twigs should be collected and burnt.
- Disease-free nursery stocks should be used for planting in new orchards.
- The plants before planting in new orchards should be sprayed with Bordeaux mixture 1.0 per cent.
- In old orchards pruning of affected plant parts before the onset of monsoon and spraying with Bordeaux mixture 1.0 per cent at periodical intervals depending upon weather conditions controls the disease.
- Spraying should be done immediately after the appearance of every new flush of leaves.
- The vigour of the plant should always be maintained by proper fertilization and irrigation.
- Manuring should be done in such a way that its maximum effect is felt during wet weather.

Chinese Scientists Developed Vaccine for H7N9 Bird Flu Virus

Chinese scientists on 26 October 2013 announced the independently developed a vaccine for the H7N9 bird flu virus. The vaccine was jointly developed by the School of Medicine of the Zhejiang University, Hong Kong University, Chinese Center for Disease Control and Prevention, National

Institute for Food and Drug Control, and the Chinese Academy of Medical Sciences. China reported the world's first human case for H7N9 bird flu infection in March 2013. As of now, a total of 136 people were confirmed to have been infected with the virus. Of the infected, 45 died, representing a fatality rate of about 33 per cent.

What is the avian influenza A (H7N9) virus/Bird Flu Virus?

Avian influenza A H7 viruses are a group of influenza viruses that normally circulate among birds. The avian influenza A (H7N9) virus is one subgroup among the larger group of H7 viruses. Although some H7 viruses (H7N2, H7N3 and H7N7) have occasionally been found to infect humans.

Jelly-making protein could help make cheap fuel cells

New research shows that a catalyst made from gelatin, the same protein used to make jelly desserts, helps fuel cells be more efficient. This may offer a cheap alternative to the expensive metal-based fuel cells. In a fuel cell, energy released from a chemical reaction (most commonly hydrogen and oxygen combining to form water) is converted into electricity.

Many carmakers like Toyota are racing to find a commercially viable fuel cell. If they are able to, cars of the future will spit out only water, instead of the carbon dioxide, water and other pollutants that today's fossil fuel powered cars do. Researchers from the UK, Japan and China, led by Zoe Schnepp at the University of Birmingham, reported their new catalyst in the *Journal of Materials Chemistry A*. To make the catalyst, they mixed salts of magnesium and iron with gelatin to create a foam. Heating this foam to 800 °C in a process called calcination degrades the gelatin and oxidises the metals, producing a sponge which contains metal nanoparticles (which are a million times smaller than a human hair). Any remaining metal is washed off with acid, leaving behind a porous structure made of carbon.

This porous structure is an advantage for the catalyst. The network of pores and bubbles inside the catalyst provides a very large surface area for chemical reactions to occur. The more places there are for hydrogen and oxygen to react to produce water, the more efficient the catalyst is. The choice of metal salts proved to be important too. The identity of the metals used determined the size of the pores formed, and thus affected how well the reactions occur. The two metals used react differently during calcination: the magnesium is converted to nanoparticles of magnesium oxide, while the iron bunches together into much larger particles of iron carbide. This meant that the ratio of magnesium to iron can be used to tune the pore size. During heating iron carbide converts the carbon around it to a thin sheet, which happens to be good for a fuel cell reaction. Nitrogen atoms from the gelatin become embedded in this thin sheet of carbon, and previous results have shown this makes the catalyst even more effective.

When Schnepp compared commercial platinum catalysts with her catalyst, she found they did just as well. Crucially, the new catalyst is also as durable as the platinum ones. Platinum is too expensive to be used for commercial fuel cells. In recent years, there have been many efforts to find a cheaper and better alternative. Schnepp's catalyst needs cheap gelatin and plentiful metal nitrate salts, making it one of the best alternatives yet. By exploiting the properties of biological polymers, Schnepp and colleagues have found simple route to a structurally complex and useful material. Simplicity, as Steve Jobs would say, is often the first step to a great product.

RV Samudra Ratnakar dedicated to the Nation

Union Minister for Mines Dinsha J. Patel dedicated state of art Geo-scientific research vessel RV Samudra Ratnakar to the nation at Kandla Port of Gujarat on 12 October 2013. RV Samudra Ratnakar is specially designed to carry out sea bed-mapping, mineral exploration in the deep waters along with geo-scientific oceanographic researches. The Geological Survey of India (GSI) in the last week of September 2013 took the delivery of Korean manufacturer Hyundai Heavy Industries' oceanographic research vessel RV Samudra Ratnakar.

About RV Samudra Ratnakar

- The research vessel RV Samudra Ratnakar is 103 m long, 13 m wide and can travel at an average speed of 11.4 knots. It will be used for survey and exploration of the seabed in Indian and international waters at depths of 10000 m.
- The vessel Samudra Ratnakar will be docked in Mangalore.
- RV Samudra Ratnakar built at world's largest Ship building yard of Ulsan, South Korea. Cost of the vessel is 600-crore Rupees.
- The Geological Survey of India on 7 August 2013 entered into an agreement with Shipping Corporation of India for the management, operations as well as maintenance of Samudra Ratnakar.

First Unit of Kudankulam Nuclear Power Plant Synchronised with Southern Power Grid

The first unit of the Kudankulam Nuclear Power Plant (KKNPP) was on 22 October 2013 synchronised with the southern regional electricity grid. Earlier, the nuclear reactor achieved criticality on 13 July 2013. The power generation in the nuclear reactor will be increased in stages to attain full capacity of 1000 MW by end of 2014. As the nuclear plant is synchronized to the southern grid, the power generation will now be increased to 500 MW, 750 MW, 900 MW and then finally 1000 MW. Nuclear Power Corporation of India is constructing two 1000 MW units at KNPP jointly with Russia at Kudankulam in Tiruneveli district, 650 km from Chennai. The Kudankulam nuclear power plant which was to be commissioned on December 2007 got inordinately delayed because of protests by locals. Kudankulam is the first pressurized water reactor belonging to light water reactor category in the country.

About KKNPP

The Kudankulam Nuclear Power Project (KKNPP) is an Indo Russian joint venture for establishig a nuclear power station with 2 units (KKNPP 1&2) of 1000 MWe Pressurized Water Reactors of VVER design at Kudankulam in Tamilnadu.

Synchronization in power plants

When two power supplies are to be connected to a common distribution, voltages, frequencies and phase angles of both power plants should be adjusted to equal values (or grid values). Synchronization supports the generation and transfer the electricity.

Criticality in Nuclear power plants

Criticality is the term refers to the balance of neutrons in the nuclear system. In a nuclear reactor, the neutron number at any instant is a function of the rate of neutron production (due to fission processes) and the rate of neutron losses (via non-fission absorption mechanisms and leakage from the system). When a reactor's neutron population remains steady from one generation to the next (creating as many new neutrons as are lost), the fission chain reaction is self-sustaining and the reactor's condition is referred to as critical. When the reactor's neutron production exceeds losses, characterized by increasing power level, it is considered supercritical, and when losses occur, it is considered subcritical and shows decreasing power.

Internet through Lightbulbs

Scientists from Fudan University, Shanghai successfully developed Li-Fi Technology-a new cheaper way of getting connected to internet by using signals sent through light bulbs instead of radio frequencies as in 'Wi-Fi'. According to the School of Information Science and Technology at Fudan University, researchers modulated Internet signals to a 1watt LED lamp. Under the light, four computers were able to access the Internet.

What is Li-Fi Technology

The LED-based alternative to Wi-Fi, dubbed Li-Fi, or Light Fidelity, refers to a type of visible light communication technology that delivers a networked, mobile, high-speed communication solution in a similar manner to Wi-Fi. As with radio waves, light is also a type of electromagnetic wave. The basic rule for sending and receiving Internet signals via light waves is similar to that for radio waves. Light-emitting diodes are switched on and

off much faster than the eye can detect, which makes the light source appear to be continuous. By adding a microchip to an LED bulb to control on and off switching, the data will flow as binary code: an on LED is a logical "1" while when off it is a logical "0". The term Li-Fi was coined by Harald Haas from the University of Edinburgh in the UK and refers to a type of visible light communication technology that delivers a networked, mobile, high-speed communication solution in a similar manner as Wi-Fi. Sample Li-Fi kits will be on display at the China International Industry Fair that will kick off on 5 November 2013 in Shanghai.

Aircraft Noise Led to Increased Risk of Heart Problems

The researchers from the Imperial College London and the King's College London, in the second week of October 2013 revealed that a lot of aircraft noise can increase the risks of circulatory, heart and stroke diseases. The study was conducted on 3.6 million residents near Heathrow Airport. The study suggested that the risks of these people increase by 10-20 percent with the highest levels of aircraft noise. However, the researchers agreed that noise was not the only reason to blame and that further research was required in this area. The research suggested highest risk for the hospital admissions as well as deaths from the stroke, circulatory diseases or heart diseases for the 2 percent of study. This meant that around 70000 people were at an increased risk in UK where the aircraft noise was the loudest. The lead author, Dr Anna Hansell, from Imperial College London explained that louder aircraft noise can contribute to other factors such as rising blood pressure because of disturbance in the people's sleep. This can lead to a startle reaction to the loud noise, which in turn can lead to other factors.

In the study, the data about the noise levels in 2001 from the Civil Aviation Authority was used. This data covered 12 London boroughs and nine districts outside of London where the noise exceeded 50 decibels. However, the researchers explained that other factors can also contribute towards the risks of heart disease and heart stroke. These included smoking-related factors, South Asian ethnicity and deprivation. The UK Government spokesman also explained that the number of people affected by the noise around the Heathrow Airport was falling considerably in recent years because of the improvements in the aviation technology as well as better planning of the flight paths. In the meanwhile, in next few months, the Public Health England will recruit experts in order to examine the public health issues around the exposure of the noise.

Polonium-poisoned politician & others

Arafat and polonium-poisoning: A sort-of update

On Friday, the news network Al Jazeera made an announcement: the British medical journal, The Lancet, was now supporting the theory that the deceased Palestinian leader, Yasser Arafat, had died of polonium-210 poisoning. According to the report, independent scientists had reviewed earlier findings by Swiss scientists and: "endorsed their work, which found high levels of the highly radioactive element in blood, urine, and saliva stains on the Palestinian leader's clothes and toothbrush".

Curiosity confirms origins of Martian meteorites

Earth's most eminent emissary to Mars has just proven that those rare Martian visitors that sometimes drop in on Earth—a.k.a. Martian meteorites—really are from the Red Planet. A key new measurement of Mars' atmosphere by NASA's Curiosity rover provides the most definitive evidence yet of the origins of Mars meteorites while at the same time providing a way to rule out Martian origins of other meteorites. The new measurement is a high-precision count of two forms of argon gas—Argon-36 and Argon-38–accomplished by the Sample Analysis at Mars (SAM) instrument on Curiosity. These lighter and heavier forms, or isotopes, of argon exist naturally throughout the solar system. But on Mars the ratio of light to heavy argon is skewed because a lot of that planet's original atmosphere was lost to space, with the lighter form of argon being taken away more readily

because it rises to the top of the atmosphere more easily and requires less energy to escape. That's left the Martian atmosphere relatively enriched in the heavier Argon-38.

Stanford drones open way to new world of coral research

Like undiscovered groves of giant redwoods, centuries-old living corals remain unmapped and unmeasured. Scientists still know relatively little about the world's biggest corals, where they are and how long they have lived. The secret to unlocking these mysteries may lie with a shoebox-size flying robot.

New "magic number" inside atoms discovered

"Magic numbers" of protons and neutrons can make an atomic nucleus exceptionally stable—and a new one has just been added to the existing menagerie that helps sketch a fuller picture of the complicated inner workings of atoms. By smashing beams of nuclei together at high speeds, researchers have discovered that when a calcium atom has 34 neutrons in its nucleus, things stay pretty quiet—at least for a few milliseconds. The discovery overturns some of scientists' previous notions about magic numbers and opens up a new line of inquiry for nuclear physics.

Jellyfish are taking over the seas, and it might be too late to stop them

Last week, Sweden's Oskarshamn nuclear power plant, which supplies 10% of the country's energy, had to shut down one of its three reactors after a jellyfish invasion clogged the piping of its cooling system. The invader, a creature called a moon jellyfish, is 95% water and has no brain. Not what you might call menacing if you only had to deal with one or two.

En masse, jellyfish are a bigger problem. "The [moon jellyfish swarm] phenomenon…occurs at regular intervals on Sweden's three nuclear power plants," says Torbjörn Larsson, a spokesperson for E.ON, which owns Oskarshamn. Larsson wouldn't say how much revenue the shutdown cost his company, but noted that jellyfish also caused a shutdown in 2005.

DNA has a 521-year half-life

Few researchers have given credence to claims that samples of dinosaur DNA have survived to the present day, but no one knew just how long it would take for genetic material to fall apart. Now, a study of fossils found in New Zealand is laying the matter to rest — and putting an end to hopes of cloning a Tyrannosaurus rex.

After cell death, enzymes start to break down the bonds between the nucleotides that form the backbone of DNA, and micro-organisms speed the decay. In the long run, however, reactions with water are thought to be responsible for most bond degradation. Groundwater is almost ubiquitous, so DNA in buried bone samples should, in theory, degrade at a set rate.

Huge Floating Ice Shelf in Antarctica Discovered

Researchers from the University of Exeter, Newcastle University, the University of Bristol, the University of Edinburgh, the British Antarctic Survey and the University of York announced in the first week of October 2013 that they discovered Giant 250-metre high channels, beneath a floating ice shelf in Antarctica.

The height of the ice shelf is around 250 metres and the channels are almost as tall as the Eiffel tower and stretched hundreds of kilo metres along the ice shelf. Giant 250-metre high channels of ice will help to predict future of Antarctic ice. Researchers used satellite images and airborne radar measurements to reveal the channels under the ice shelf. The researchers also predicted the path of melt water flowing under the part of the ice in contact with the land - known as the ice sheet. When the melt water flowing under the ice sheet enters the ocean beneath the ice shelf, it causes a plume of ocean water to form, which then melts out the vast channels under the ice shelf.

Previously, it was felt that water flowed in a thin layer beneath the ice sheet. But the evidence from this research suggests it flows in a more focused manner much like rivers of water.

However, the implications for the future of the ice sheet are yet to be determined. The channels

are likely to influence the stability of the ice shelf and their discovery will help researchers understand how the ice will respond to changing environmental conditions.

Most Distant Galaxy as of Now, Discovered

The international team of astronomers, using the Hubble Space Telescope, in the month of October 2013, detected the most distant galaxy as of now, entitled z8_GND_5296.

The discovery was confirmed with the ground-based Keck Observatory in Hawaii. The newly discovered galaxy is around 30 billion light-years away and will help the scientists in knowing about that period which followed just immediately after the Big Bang. Lead researcher from the University of Texas at Austin, US- Steven Finkelstein explained that this was the most distant galaxy. The galaxy is seen as it was 700 million years after the Big Bang.

About the newly discovered galaxy

- The galaxy is named z8_GND_5296.
- It is the most distant galaxy as of now.
- It is 30 billion light years away from the Earth.
- The galaxy is redder than the usual. Astronomers rated it as the red-shift.
- The researchers discovered that this galaxy had the red-shift of 7.51, which in turn, beat the previous record of 7.21 red-shift.
- The system of the galaxy is small- around 1-2 percent the overall mass of the Milky Way.
- The galaxy z8_GND_5296 is rich in the heavier elements.
- The most remarkable feature of this galaxy is that it is turning the gases as well as the dust into new stars at a faster pace.
- It is important to note that this is the second far-off galaxy which has the high star-production rate.

In the times to come, the astronomers will discover more galaxies after the launch of NASA's James Webb Space Telescope (JWST).

New Technique to Detect Faults in Coaches, Wagons & Locos

Indian Railways on 4 October 2013 adopted first ever unique modern technology for maintenance of its passenger coaches, wagons and locomotives in its continuous endeavour to enhance safety in Railway operations. The new maintenance technique which uses acoustic method of diagnostics is known as Acoustic Bearing Detectors (ABD) & Wheel Impact Load Detectors (WILD). When used in combination together they are known as Online Monitoring of Rolling Stock (OMRS) systems. This technique involves placing arrays of microphones and sensors that record the audible noise and forces generated by the running coaches, wagons and locomotives. Conventional method to maintain passenger coaches, wagons and locomotives is to physically examine when these are in stationary condition at the maintenance depots. Under the new technique, the faults in the Rolling stock can be detected while on run which is a big advantage as it will make maintenance faster reducing turn -around time for Rolling stocks thereby ensuring availability of high number of wagons/coaches etc. for operation.

The OMRS equipment is so sensitive and accurate that it is often able to indicate the specific sub-component that is not behaving the way it should and therefore causing abnormal noise. Moreover, this can be monitored remotely using mobile communication facilities. In the conventional method, it is nearly impossible to detect this problem unless major assemblies are completely dismantled and checked in the maintenance depot. One such system, which is a combination of ABD, OMRS & WILD systems, is installed near Bakkas in Lucknow division of Northern Railway as a pilot project. It has successfully detected a number of wheel bearing faults avoiding the problem of wheel bearing becoming hot which results in the stoppage of the train at the station or worse still-in between two stations. WILD have been installed in 15 locations across the country in the initial phase and these have also detected faulty vehicles that have caused higher than normal impact force on the rails. These 15 locations are; Ajni, Asansol, Mughal Sarai-I, Mughal Sarai – II, Barwadih, Vishakhapatnam, Arakkonam, Gunakal, Mahalimarup, Dongargarh, Bilai, Hospet, Bina, Itarsi and New Katni.

E-Management of INSPIRE Award Scheme

The Ministry of Science and Technology, Government of India launched on 10 October 2013 a new project of Electronic Management of INSPIRE Award Scheme (E-MIAS) for the future *Innovation in Science Pursuit for inspired Research* (INSPIRE)Awards. It was launched during the 3rd National level Exhibition and Project Competitions (NLEPC) being held under the INSPIRE Awards Scheme of the Ministry of Science and Technology. The application software is ready for use by all the States / UTs, Districts and Schools and the 3 Central organizations Kendriya Vidyalaya, Navodaya Vidyalaya Schools and Sainik Society School. All the concerned authorities are requested to start using the new application software and send future proposals for awards and funds for conducting competitions at various levels online.

What is E-Management of INSPIRE Award Scheme

- Department of Science and Technology (DST) plans to e-manage the entire INSPIRE Award Scheme by using State-of-Art latest Information Technology which would enable e-filing of nominations by the schools across the country.
- Under the INSPIRE Award Scheme, large number of nominations, running into lakhs, have to be processed for selection of the students for INSPIRE Award.
- Its processing by the District and State authorities as well as DST in accordance with the norms of the scheme, transmission of data of selected students to the banks, credit of Award amount to the bank accounts of selected Awardees (wherever notified) or preparation of INSPIRE Award Warrants by the bank and their dispatch to the selected Awardees and all such related activities concerning implementation of the scheme, management of the data, generation of various MIS returns etc.

Salient Features of E-Management of INSPIRE Award Scheme (E-MIAS)

- It will enable about 5 lakh middle and high schools all over the country to log in online and file nominations under the Scheme, which would be received electronically by the District Education authorities for further processing. The schools will also be able to view, download and print list of sanctioned awardees and their certificates.
- It will enable all the (nearly) 700 District Education Authorities and 35 States / UTs and 3 Central Educational Organizations (Kendriya Vidyalaya Sangathan, Navodaya Vidyalaya Sangathan and Sainik School Sangathan) to log in online and process the proposals received from schools and submit to the National Authority i.e. Department of Science and Technology (DST) for sanction.
- The State and Districts authorities will also be able to submit the proposals for funds release for DLEPCs / SLEPCs online.
- It will enable the National Authority (DST) to process the proposals and Awards / Funds so received from the State Authorities online and issue sanctions electronically, as per the approved norms.
- The software will also have facilities for registration of schools, District Authorities and State Authority, sending and receiving online communications to / from these authorities, receiving utilisation certificates, summary reports, electronically generate standard and tailor-made MIS reports and so on.
- It will also have the public domain home page where even public at large would be able to view not only the basic details of the scheme but also the awards sanctioned to various States / schools , various reports / documents / forms relating to scheme, submit suggestions / feedback and so on.
- The service provider will also put in place a call centre, which will run six days a week, to cater to the need / grievances of stakeholders.

About the INSPIRE Scheme

- INSPIRE stands for *Innovation in Science Pursuit for inspired Research.*

- It is a National Programme implemented by the Ministry for attraction of talent amongst students to study science and pursue career with research.
- The basic objective of INSPIRE is to communicate to the youth of the country the excitement of creative pursuit of science, attract talent to the study of science at an early age and thus build the required critical human resource pool for strengthening and expanding the science and technology system and R&D base.
- The programme was launched by the Prime Minister of India on 13 December 2008. The implementation started during 2009-10.

GSAT–7 Successfully Placed in the Geosynchronous Orbit

India's advanced multi-band communication satellite GSAT-7, launched from Kourou, French Guiana on 30 August 2013, was successfully placed in the Geosynchronous Orbit with an altitude of about 36000 km above Earth's surface on 3 September 2013. French Guiana is an overseas region of France on the North Atlantic coast of South America. GSAT-7 was placed in the Geosynchronous Orbit after successfully completing the last of the three orbit-raising manoeuvres commanded from ISRO's Master Control Facility (MCF) at Hassan. Later, on the same day, the communication antennae of GSAT-7, including the UHF Helix antenna, were deployed successfully. Thereafter, the GSAT-7 was put in its final orbital configuration, stabilised on its three-axis by the momentum wheels. The GSAT-7 Satellite would reach its assigned orbital slot of 74 degree East longitude in the Geostationary Orbit within the next 10 days. It is planned that on 14 September 2013, the communication transponders in UHF, S, C and Ku bands will be switched on. The GSLV Vehicle assembly and checkout would be completed at the Vehicle Assembly Building by the first week of December 2013 and the launch would take place by December 2013.

About GSAT–7

- It is an advanced communication satellite that will help by providing low bit rate voice to high bit rate data communication.
- Payload of the GSAT–7 is designed to provide communication capabilities to users in distant oceanic regions.
- Its solar arrays generate 2900 W of electrical power.

What is Geosynchronous Orbit?

Geosynchronous Orbit is also abbreviated as GSO. It is the orbit around Earth which has the orbital period of one sidereal day or around 23 hours 56 minutes and 4 seconds. This sidereal day matches the Earth's sidereal rotation period.

Battery that Uses Microbes for Turning Sewage into Energy

A team of US scientists from Stanford University developed a new and better method of making use of the microbes for harnessing the electricity from the wastewater. The US scientists created a new battery for this purpose. The new study published in the Proceedings of the National Acadamy of Sciences (PNAS) on 16 September 2013 revealed that the scientists discovered a new methodology for producing clean energy by making use of the dirty water. The US scientists explained that their new technique can be used at the wastewater treatment facilities as well as for breaking down the organic pollutants in dead zones of the lakes and oceans where the fertilizer runoff has caused depleted oxygen, leading to suffocating marine life.

About the newly developed battery

- The team of US scientists from Stanford University started off with a prototype which is equivalent to the size of the D-cell battery.
- The battery comprises of two electrodes, one negative and one positive, and it is pushed into the bottle of wastewater which is filled with the bacteria.
- As and when the organic material is consumed by the bacteria, all the microbes accumulate around the electrode which is negative, thereby throwing off the electrons, which are captured by the positive electrode. This process is called fishing for electrons.

A step Closer to regenerative medicine

A landmark study published today (Sept 12) in*Nature* shows that reprogramming of adult cells that behave like stem cells can be achieved right inside the body (*in vivo*). Till now, reprogramming of adult cells has been achieved only in labs (*in vitro*). This opens a promising window to repairing tissues right inside the body. "This is still speculation. We can imagine transitory reprogramming could help in the natural regeneration of a damaged tissue," said Manuel Serrano from the Spanish National Cancer Research Centre (CNIO), Madrid, and the senior author of the study. "This in principle has several advantages. This does not require *in vitro*manipulation and [therefore] does not require engraftment." Dr. Serrano said. "Engraftment is usually very inefficient." Reprogramming of adult cells (induced pluripotent stem cells — iPS cells), say skin cells, to become embryonic-like stem cells capable of becoming any of the specialised cells like liver cells or heart cells has tremendous therapeutic benefits. "The main surprise of our work is, it is possible to produce pluripotent stem cells within living organisms," Dr. Serrano said. "This was a surprise as so far this has been done only *in vitro* ."

If reprogramming of adult cells inside the body is a stupendous achievement, the researchers crossed another milestone by making the reprogrammed adult cells exhibit totipotency. Aside from having the potential to become any of the specialised cells, totipotent cells can also differentiate into extraembryonic cells of the placenta. Even embryonic stem cells only rarely exhibit totipotency. They most often only exhibit pluripotency — ability to become any of the specialised cells but not the extraembryonic cells of the placenta. A blastocyst, a bunch of cells that is formed a few days after the fertilised egg starts dividing, has an inner cell mass and an outer cell mass. The inner cell mass, which contains the embryonic stem cells, becomes the foetus, while the outer cell mass, called the trophoblast, develops into extraembryonic tissue of the placenta. The study was thus able to produce totipotent cells that are seen in human embryos at the 72-hour stage of development, when they are composed of just 16 cells.

For the study, the researchers used genetically modified mouse models that had all the four cell-reprogramming factors used in adult cell reprogramming; these factors could express themselves in the presence of a drug. Several weeks after the factors were exposed to the drug, teratomas "emerged from multiple organs." The emergence of teratomas was proof that reprogramming had occurred inside the body of the mice. "Teratomas consist of disorganised tissues of all three embryonic germ layers," notes an accompanying news piece. "Occasionally, they display a remarkable degree of organisation, containing whole organs." They found the totipotent primitive cells in major organs like the stomach, intestine, pancreas and kidney. Even the iPS cells circulating in the blood were found to exhibit totipotency.

Ovarian Tissue Transplant

A team of doctors at Melbourne IVF and The Royal Melbourne Hospital, in the first week of September 2013, managed to help an infertile woman conceive with the world's first IVF technology where new eggs were grown in the ovarian tissue and transplanted in woman's abdomen. The doctors declared that the treatment will revolutionise the fertility treatment. The woman called Vali is now 26 weeks pregnant. Vali was earlier rendered as infertile after her treatment for the ovarian cancer. The team of doctors helped the woman in growing egg follicles and producing two healthy eggs after transplanting her own frozen ovarian tissue into her abdomen. It is important to note that earlier only one baby was born in Australia after the ovarian tissue transplant. Less than 30 babies have been grown like this across the world, but it is for the first time that the tissue was successfully transplanted at a completely different site in a body to where it was taken from. Gab Kovacs, the international medical director of Monash IVF, which did first successful Australian ovarian tissue transplant explained that this was a breakthrough treatment.

The sample of the ovarian tissue of Vali was extracted from her cancer-free ovary through keyhole surgery. It was then frozen. After seven years, the tissue was grafted on the left and right sides of the front wall of her abdomen. The tissue started functioning after a few months and also produced follicles and two single eggs with the mild dose of hormone treatment. Both these eggs were fertilised, implanted as well as became viable pregnancies. Over 1300 women are diagnosed with the ovarian cancer every year in Australia. Of these, 39 percent are under the age of 60 years.

Research says Tuberculosis Originated in Humans

An international team of researchers led by Swiss Tropical and Public Health Institute (Swiss TPH) revealed in the month of September 2013 that the origins of human tuberculosis traced back to the African hunter-gatherers who lived around 70000 years ago. The study conducted by the international team of researchers suggested that the origin of Tuberculosis (TB) was not in the animals that lived around 10000 years ago, as it is believed commonly. It is important to note that TB is one of the deadliest infectious diseases of humans and it kills 50 percent of the individuals who are left untreated. In the developing countries, it is found that even today, TB leads to 1-2 million deaths. The major threat in fighting against the disease is multidrug-resistance. The researchers have now identified about the origin in space and time of this disease. The researchers made use of the whole-genome sequencing of 259 Mycobacterium tuberculosis strains, which were collected from various parts of the world. These were used for determining the genetic pedigree of the deadly bugs. The comparison of the genome indicated that TB mycobacteria originated around 70000 years ago in Africa.

During the study, the researchers compared the genetic evolutionary trees of mycobacteria and humans alongside. The phylogenetic trees of humans and the TB bacteria had a lot of similarity. The evolutionary paths of TB a well as humans had a striking similarity. The researchers explained that TB bacteria and humans did not emerge in same region of the world but they migrated outside Africa together. Both these, thereafter, expanded across the world. It was the migratory behaviour of modern humans, along with their lifestyle changes, that led to favourable conditions for TB. The researchers also explained that because of this, the diversity of tuberculosis bacteria enhanced remarkably when the expansion of human population took place. Human expansion is also known as Neolithic Demographic Transition (NDT) period. This NDT is combined with the new human lifestyles which lived in the larger groups as well as village-like structures, which in turn would have created the conditions for human-to-human transmission of TB. The results also pointed out towards the fact that it is unlikely that TB would have been communicated from the domesticated animals to the humans, like in the case of other infectious diseases.

Why Some times our body parts and our eyes twitch involuntarily?

Muscle twitching is a phenomenon by itself, and it is due to aberrant conduction of nerve impulses or due to problems in the muscle working itself. A muscle reacts to a nerve impulse, because the electrolyte changes in the membrane of the muscle causes equal transport of sodium, potassium, and calcium, depending on the similar induction on the surface membrane, by a chemical called acetyl choline. Acetyl choline is released as particles out of a nerve end, which attach themselves to the muscle membrane receptors, and cause a cascade of chemical changes inside the muscle. When calcium enters the cell it causes a reaction on the muscle protein called actin and myosin, making them combine, which shortens the muscle fibres. This is the phenomenon of contraction of the muscle. But when individual muscle fibre (not as a group) have aberrations due to abnormal volleys of nerve impulses like in a disease called Motor Neuron Disease, or due to inflammatory muscle disorders like myositis, this mechanism of regularity and rhythmicity fails.

Occasionally it can happen physiologically owing to fear, emotional imbalance, stress and

anxiety disorders, and also during conditions where electrolyte disturbance of the blood like dehydration etc. Why it is common in eyes, is because of the direct observability of visibility to others, and greater perception of the muscle twitching in the eye lids. It is prominent in tongue but no body notices, unless one inspects, especially in motor neuron disease. This condition is called fasciculation. Except in pathological diseases, it can be controlled. With adequate hydration, proper intake of electrolytes like fruit juices, salt etc, one can avoid it. Of course one should avoid stress full situation and other precipitating events.

Most Powerful Super Computer of Australia

Australia unveiled its most powerful super computer Raijin in Canberra on 31 July 2013. Raijin, is named after the Japanese God of thunder and rain. It did cost 45.2 million US dollars to build and will cost 10.85 million US dollars a year to run. Raijin is considered the 27th most powerful computer in the world. The supercomputer can perform the same number of calculations in one hour that 7 billion people with calculators could perform in 20 years. Raijin forms a part of the new National Computational Infrastructure (NCI) facility at the campus. The computer itself is bigger than the size of a house.

The key features of Rajin are as following:

- It has 57000 processing cores which is something like 15000 ordinary personal computers.
- It has 160 terabytes of memory which is equal to memory of 40000 ordinary PCs together.
- It has 10000 terabytes of disk which is like 10000 ordinary PCs.

New Super-Heavy Element Ununpentium

Scientists from Lund University, Sweden in the last week of August 2013 discovered a new super-heavy chemical element, which can be a part of the periodic table in the coming future. The atomic number of the super-heavy element is 115 and is made by combining atoms of calcium americium. The scientists have not named it yet but for time being it will be referred as, Ununpentium. The element was discovered by an international team of researchers, who conducted an experiment at GSI Research facility in Germany for confirmation of the earlier measurements done by the Russian research group.

Process of Creation

Scientists shot a beam of calcium (with 20 protons) into a thin strip of americium (with 95 protons), for creation of the element. Till the time it doesn't get a name, scientists will refer it as Ununpentium (a greek and latin combination of the words that represents atomic number of an element, one-one-five). Ununpentium belongs to the group of manmade elements. Before being acknowledged, the findings of the research of the newly discovered super-heavy element will be reviewed by a committee that comprises members of international unions of pure and applied physics and chemistry. The researchers have also identified the structure as well as the properties of the super-heavy element's atomic nuclei. In 2011, scientists approved three new elements for being added into the Periodic Table with their atomic numbers 110, 111 and 112. and were named Darmstadtium (Ds), Roentgenium (Rg) and Copernicium (Cn), respectively.

Ring for Protecting Women against Sexual Assualt

Imran Khan, the Karnataka pharmacist devised a protective ring which stings the women assaulter like a honey bee. The new ring is known as Sting Bee silver ring. The device inventor created the ring in the backdrop of the Delhi gangrape which took place on 16 December 2012. Imran khan explained that the safety ring can be worn by the women in their right index finger in order to defend themselves from a potential rapist or killer.

Features of the Sting Bee silver ring

- The Sting Bee silver ring is said to be a reliable device for self defense.
- It has liquid chemical compound (Capsaicin) in the head of the ring, which is released from the micro tank and weakens the offender. It then halts the offender from attacking or assaulting any woman or girl.

- The ring also has RFID (radio frequency identification) tag on the top most side as well as dual lock mechanism. The dual lock mechanism prevents the misuse of the ring and it can be made out of any safe metal.
- Imran Khan explained that the device is easily operational as well as tamper-proof.
- The micro tank which has 0.2ml of the drug (Capsaicin) has the capability of being injected into even 5 people at the same time by unlocking it.
- It is important to note that trials have been conducted to study the safety of the device on the one who wears the ring and the one on whom it is used. Barring pain, itching, burning sensation and inflammation, the chemical used in the ring is not life-threatening.

What is Capsaicin?

Capsaicin is four times hotter than Bhut Jolokia (pepper) and 300 times spicier than Guntur red chillis (from Andhra Pradesh). The Capsaicin stimulates the chemoreceptor nerve endings in skin and then leds to shooting pain which lasts for 45-60 minutes when injected into someone's body from the micro tank of the ring.

Nano Medicine for Blood Cancer Developed

The Kochi-based Amrita Centre for Nanosciences and Molecular Medicine on 22 September 2013 announced it's newly developed a nano-medicine for drug-resistant blood cancer. This invention expected to dramatically improve the treatment of drug-resistant Chronic Myelogenous Leukemia (CML), when used in combination with Imatinib, the standard drug for the disease.

In another significant invention, the institute has devised a mechanism that can effectively prevent recurrence of glioma or brain tumour. This deadly disease affects about four out of every 100000 people in India. The life expectancy of high-grade glioma patients is about one to two years. Chronic Myelogenous Leukemia (a form of blood cancer) annually affects approximately two out of every 100000 Indians. Almost 40 per cent of these cases are resistant to Imatinib. For such patients, treatment options are extremely limited.

If nails are dead tissue, how are they able to grow?

Nail is not made up of dead tissue. It is a part of a living tissue, like bone internally. Nail has a nail bed, and root from which it grows. It contains a thick keratin protein, which is equivalent to animal nails, or horns. It grows from its root, like a hair grows from root. Cutting the hair is painless, but we do not call it dead tissue. It is the outgrwoth of the living nail bed, which is meant to protect the soft tip of the finger from the injury, which we touch. Patients with removed nail, subject themselves to severe injury, since a sense of deep sensation is passed by the nail to the underlying nervous tissue, called Pacinian corpuscles and free nerve endings underneath. There is enormous blood circulation beneath the nail, capillaries which are visible in fair individuals, through the nail like a ground glass. There is a small semicircular white area under the base of the nail, called lunula, which is the growing part. Nail lives with the man. Many diseases are identified through nail, as it reflects health, and does not behave like dead tissue. For example, diseases like anemia of various types, chronic arsenic poising, psoriasis, neuro-cutaneous markings, jaundice, etc. If it is a dead tissue it will not reflect the health. Only the terminal portion of the nail which protrudes away from the tip of the finger, has no sensation and no blood supply which is equivalent to a horn of animals.

Dextrose Gel Treatment Can Help Reverse Hypoglycaemia in Premature Babies

Researchers from the University of Auckland, New Zealand revealed in the last week of September 2013 that the dose of sugar in the form of gel can help premature babies against the risk of brain damage. This is known as Dextrose gel treatment. The sugar gel should be rubbed in the inside of cheeks and this is proven as the effective and cheapest possible way. It is important to note that around one out of every ten premature baby faces the risk of low blood sugar level, which

eventually affects them. If left untreated, it can lead to permanent harm. For their study, the researchers tested the sugar gel therapy on 242 babies under care. Based on results of their findings, it was revealed that this should become the first-line treatment. The cost of Dextrose gel treatment is merely 1 Pound per baby and is also simple to administer in comparison with the glucose through the drip. Prof Jane Harding and her team at the University of Auckland explained that the present treatment involved extra feeding as well as repeated blood tests in order to measure the blood sugar level. However, there are a lot of babies who need to be admitted in the intensive care as well as given the intravenous glucose. This is done because their blood sugar level remains very low. This condition is medically known as hypoglycaemia.

In the study, the researchers assessed whether the treatment involving dextrose gel was better and effective than the feeding alone, for the purpose of reversing hypoglycaemia. Andy Cole, chief executive of premature baby charity Bliss explained that the research was interesting and that this had the potential of improving the outcomes for the babies who are sick or premature. However, despite showing the early positive signs of benefit to the premature babies with low blood sugar level, it is important to note that further research was required for implementation of the treatment.

Evidence of Water on Lunar Surface

NASA-funded lunar research conducted by NASA Lunar Science Institute (NLSI) on 27 August 2013 unveiled about the evidence of water which was locked in the mineral grains on the surface of the moon from unknown source that was present beneath the surface of the Moon. The scientists remotely detected about the presence of magmatic water, using the data from NASA's Moon Mineralogy Mapper (M3) instrument aboard the Indian Space Research Organization's Chandrayaan-1 spacecraft. Magmatic water is the water which has the source of origin from within the interior of the moon or on the surface of Moon. The findings represented the first detection of this form of water on the Moon. The previous studies had shown existence of the magmatic water in the lunar samples which were brought on the Earth by the Apollo program. M3 instrument imaged the lunar impact crater Bullialdus. The Bullialdus lies near lunar equator. The scientists wanted to study this particular area because it would have enabled them to quantify the amount of water in the rocks, in a better form. The crater's location as well as the kinds of rocks on it enabled the scientists to get a better understanding about this. The central peak of Bullialdus is composed of the kind of rock which forms deep inside the lunar crust and mantle when magma is captured underground.

Rachel Klima, a planetary geologist at the Johns Hopkins University Applied Physics Laboratory (APL) in Laurel, Md, explained that the rock which usually lives beneath the surface was excavated from the depths of the lunar surface. In comparison with its surroundings, it was found that central portion of Bullialdus contained considerable amount of hydroxyl - a molecule consisting of one oxygen atom and one hydrogen atom. This proved that the rocks in the Bullialdus contained water which had the source somewhere beneath the surface of the Moon. In the year 2009, M3 had provided the first mineralogical map of the lunar surface. It had also discovered the water molecules in polar areas of the Moon. The water found on the lunar surface is considered to be the thin layer formed from solar wind which hits the Moon. Bullialdus crater lies in the region with unfavorable environment for solar wind in order to produce huge amounts of water on lunar surface. The detection of water from lunar orbit will enable the scientists to test some other findings from sample studies in much broader sense. For years, scientists believed that rocks from the Moon were dry and that there was no water. The water detected in Apollo samples was thought to be contaminated from Earth.

Who conducted the research?

APL or Applied Physics Laboratory is the non-profit division of Johns Hopkins University. The paper which described about the detected of water

on the Moon was co-authored by Joshua Cahill and David Lawrence of APL and Justin Hagerty of the U.S. Geological Survey's Astrogeology Science Center in Flagstaff, Arizona. The research was supported by NASA's Lunar Advanced Science and Engineering Program, the NASA Lunar Science Institute (NLSI) at Ames and the NASA Planetary Mission Data Analysis Program. NLSI is the virtual organization jointly funded by NASA's Science Mission Directorate and NASA's Human Exploration and Operations Mission Directorate in Washington.

Oldest infectious disease of humans

Modern humans (or homo sapiens) emerged out of the "hominid" group almost two million years ago, and began wandering out of Africa about 70,000 years ago to populate the world. How healthy were these people? What kind of illnesses affected them? Do we carry these afflictions to this date? Questions such as these form the main research themes for a group of scientists who call themselves paleopathologists — *paleo* for ancient and pathology to define and describe the kind of illness. One such paleopathologist, Dr. Charlotte Roberts of Durham University, U.K. has written the book "The Archaeology of Disease", where she argues that analysis of the DNA found in ancient human samples would help in understanding the origin and history of diseases that have affected us since antiquity.

Dr. Garth Sundem writes in his lucid essay "10 oldest known diseases" that in such studies, one should distinguish between diseases caused by external agencies (addiction, poisoning, infection) and age-dependent bodily dysfunctions (arthritis, epilepsy and such "conditions") which are innate natural process of systemic malfunctions. The clue to zone in on the most ancient infection comes from both a study of bone abnormalities (seen in excavated bodies and mummies) and from analysis of all the DNA present in them. He points out that, contrary to the oft-quoted statement, dead men do tell tales. Such a double analysis, plus information contained in ancient texts from across the world suggest the presence of ten diseases to be among the oldest to affect mankind. These are: tuberculosis (or TB), leprosy, cholera, smallpox, rabies, malaria, pneumonia, trachoma (chronic infection of the eyelid), influenza, measles and the black plaque. This list has been compiled by analysing information available from ancient texts and books such as the Vedas, the Bible, Greek history, oriental texts and oral history. The Rigveda (about 1500 BC) refers to TB and leprosy, the Egyptian "Ebers papyrus" (about 1500 BC) mentions leprosy, Thucydides of Greece (430 BC) mentions the plague, the Bible (Leviticcus 13.2) talks about leprosy and the Romans describe malaria. Aboriginal skeletons (800 BC) have shown skull lesions around the eyes, later suggested by circumstantial evidence as due to trachoma.

Sundem also refers to the analysis in Israel of the fossilized bones of a mother and child (estimated to be about 9000 years old) revealing the infection as due to TB, and also to a Turkish sample even older (50,000 years old!) again with the suggestion of TB affliction. It would thus seem that mycobacterium tuberculosis (MTB) may well be the oldest pathogen to have infected humankind.

MTB comes not as single strain but there are as many as 259 varieties that we know of today. Yet, DNA analysis of these strains has revealed not a great deal of diversity or heterogeneity, but very few mutations and nearly identical DNA sequences. Earlier work on such low level genetic variation, studied in 2005 by Dr. Veronique Vincent and colleagues at the Pasteur Institute, Paris, suggests that the present-day bacterium originated form a precursor or progenitor species — call it *mycobacterium proto-tuberculosis* , which could be as old as 3 million years. And the question is — when did this divergence from the single ancestor progenitor occur, how closely related in their DNA these 250 strains are and how sensitive or resistant each set of these strains is towards anti-tubercular drugs that we have today.

It is here that the recent paper by an international group led by Dr. Sebastien Gagneux of the Swiss Tropical and Public Health Institute, published in the 1 September 2013 issue of *Nature*

Genetics is of value. The group analysed the DNA sequences of 259 TB strains from around the world, and showed that genetic diversity arose in them roughly around 70,000 years ago, concurrent with the outward migration from Africa of anatomically modern humans. When interviewed, Dr Gagneux pointed out that "the evolutionary path of humans and the TB bacteria show striking similarity. We see that diversity of MTB has increased markedly when human population expanded." In other words, what was dormant and restricted largely to the Rift Valley of Africa, where our far remote ancestors lived, became active and diverse as they started living in communities and passed on infection from person to person. And contrary to conventional wisdom, rather than getting infected from domesticated animals, we may even have passed on the TB germ to our pet animals.

China Launched First Ever Deep UV Laser Device

The Chinese Academy of Sciences (CAS) on 10 September 2013 launched a Deep UltraViolet (DUV) solid-state laser device. The Deep UV Laser Device would help to detect the biological, chemical agents and explosives.

The device marks the world's first-ever output of 1064-nanometer's 6 harmonic frequency multiplication, shortening the diode-pumped solid-state laser (DPL)'s wavelength to 177.3 nm. China is the first-ever country in the world to possess such technology.

About Deep UV laser device

A DUV wave refers to the light wave whose wavelength is shorter than 200nm. Synchrotron radiation and gas discharge are among the main non-coherent light sources to produce DUV lasers. A KBBF prism coupling device-based DPL source features a smaller size, higher energy resolution and higher photon influx density. Potassium beryllium fluoro borate (KBBF) is a non-linear optical crystal that can transform laser light into DUV for use in solid state lasers.

Applications of Deep UV Laser Device

- Improved detection of airborne chemical and biological agents.
- Enhanced detection of explosives and explosive residuals.
- Significant improvement in the ability to inspect microchips with solid state metrology.
- Advanced research and development of new semiconductor materials and applications.
- Deep ultraviolet (UV) light can be used to sterilise bacteria and viruses, decontaminate drinking water and in fluorescence sensors to detect chemicals.

Universal Flu Vaccine discovered

A team led by a scientist of Indian origin made a roadmap to develop universal flu vaccine. The influenza virus that causes flu is considered to be one of the world's most rapidly changing organisms. Flu vaccines tend to be ineffective after every season and can't cure cough, cold and other complications. Therefore, scientists planned new vaccines with new strains of the virus each year. A team led by professor Ajit Lalvani from the National Heart and Lung Institute at Imperial College London used a 2009 pandemic virus strain to analyse why some people appear to resist severe illness, to create the world's first universal flu vaccine. The volunteers were asked to donate blood samples just as the swine flu pandemic was in progress so that their response could be analysed over the next two flu seasons.

The scientists discovered those who avoided severe illness had more CD8 T cells in their blood at the start of the pandemic. CD8T cells are a type of virus killing immune cell. A vaccine that stimulates the body to produce more of these cells could be effective at preventing flu viruses, including new strains that infect humans from birds and pigs. The immune system produces these CD8 T cells while responding to usual seasonal flu. Unlike antibodies, they target the core of the virus, which doesn't change, even in new pandemic strains. This provided the blueprint for developing a universal flu vaccine. Scientists planned to stimulate the immune system to make CD8 T cells by vaccination. The flu vaccines make the immune

system produce antibodies that identify structures on the surface of the virus to stop infection with the most common circulating strains. However they have to be replaced each year as new viruses with different surface structures evolve.

Scientists identified Genes Key to Human Longevity

A new scientific study showed that ageing works through a special set of genes that everyone has, the rDNA genes. The international team led by Dr Takehiko Kobayashi from the National Institute of Genetics in Mishima, Japan, found that if we improve the stability of the rDNA genes, which are quite unstable, the lifespan of baker's yeast could be extended. It could help in studying cell ageing. The scientists tried to understand how the Sir2 gene reduces aging in yeast. Sir2 genes gained prominence as potential human anti-ageing genes with the discovery that resveratrol, a component found in red wine, activates them. However, subsequent research has shown that resveratrol doesn't extend lifespan in mammals. The yeast Sir2 gene controls rDNA stability, but also has many other targets in the cell. The breakthrough came when the scientists found a way to separate Sir2's effect on the rDNA from its other effects. This allowed them to show that Sir2's anti-ageing effect comes exclusively through stabilisation of the rDNA genes. Kobayashi originally proposed a role for rDNA instability in ageing five years ago, but unequivocal support for this theory has been lacking until now. These new results suggest that finding a way to artificially improve rDNA gene stability may delay the ageing process in humans too. However, Ganley cautions that the role of the rDNA genes in human ageing still needs to be clarified.

Computer-like ways of the brain

The working of the human brain has always fascinated scientists. One of the questions concerning the brain is whether it works like a classical computer or not. University of Colorado researchers now seem to have an answer to this question. In a study published in the *Proceedings of the National Academy of Sciences* , of the U.S., they have described experiments that show a similarity of the working of the human brain to computers.

In particular, our ability to make sense of known objects placed in unfamiliar contexts — recognising a familiar face in a new crowd, for example. The brain employs a system very similar to the "pointer" system used by computers — a pointer indicates to a computer in which location a piece of information is stored. To perform the test, the team made up sentences in which known words are used in an unfamiliar way, not even necessarily used in a sensible way, and tested the brains ability to recognise them in this unfamiliar context.

For instance in the sentence "I am going to desk you" the noun "desk" is used as a verb; even though the sentence does not mean anything, we recognise the word "desk" and that it is used as a verb here. So it is clear that the brain processes sentences in terms of its parts. But the way it does this has not been understood so far. The scientists in the University of Colorado, Trenton Kriete et al, show that the connections in the brain between the prefrontal cortex and the basal ganglia perform the role of the pointers. The brain, however differs from a computer in the sense that while a computer can simply be programmed to use a pointer, this ability has to be learned by the brain.

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