

Two sides: "Libra may have a few things working in its favour. But going by the opposition to the idea, it is not going to be smooth sailing." Representations of virtual currency in front of the Libra logo • REUTERS/DADO RUVIC/

Libra unveiled

What is Facebook's plan to empower billions? What is Libra's technology? Is this cause for worry?

SRIRAM SRINIVASAN

The story so far: On June 18, Facebook announced that it is going to launch a global digital currency by the first half of 2020. The currency has been named Libra. It will be run by the Libra Association, a Geneva-based entity that has over two dozen founding partners, including Facebook, Mastercard, Visa, Uber and the Vodafone group. Almost immediately, concerns were raised by some lawmakers, commentators and even the cofounder of Facebook, Chris Hughes, who is now one of the foremost critics of the social media network he helped create.

Why does the world need Libra?

A white paper released by the Libra Association says its mission "is to enable a simple global currency and financial infrastructure that empowers billions of people". The point it makes is this: in a world with cheap data and smartphones, about 1.7 billion adults are still outside the organised financial system in the world. This, despite a billion of them having mobile phones and nearly half a billion having Internet access.

The reasons for this are high fees, lack of access, and absence of documentation. Libra is being pitched as a solution to this. The promise is of financial inclusion on a global scale.

The white paper says: "Moving money around globally should be as easy and cost-effective as – and even more safe and secure than - sending a text message or sharing a photo, no matter where you live, what you do, or how much you earn."

It is apparently being built on the block chain technology. How similar is it to Bitcoin?

It is true that Bitcoin and Libra are both based on block chain technology, which refers to a form of distributed ledger – not centralised – of transactions. These are created by complicated math functions that make them almost incorruptible. But beyond this, there is very little in common between Bitcoin and Libra.

Libra is an initiative of 28 influential corporate entities. Bitcoin, which the world first came to know of in 2008, is seen as a product of libertarian values. Its

Facebook, with its over 2 billion users, and its partners has acceptability. Also, unlike Bitcoin, the Libra Association is promising to play by the regulatory rule book

founder, whose identity remains a mystery to this day, is referred to as Satoshi Nakamoto.

In Bitcoin: The Future of Money?, Dominic Frisby imagines what would happen if Bitcoin becomes somehow globally preferred: "In a flash, the ability for a government to fund itself through the manipulation of money disappears. You can't obfuscate bitcoin supply inflation is transparent. You can't 'quantitatively

ease' bitcoins... Central banks and private banks can't create bitcoins when it suits them, and government can't print bitcoins. It all means you don't have to pay the price for the mistakes of governments and banks."

Libra is going to be nothing like Bitcoin. The association white paper says, "We believe that collaborating and innovating with the financial sector, including regulators and experts across a variety of industries, is the only way to ensure that a sustainable, secure and trusted framework underpins this new

Those are just some of the differences.

Though Bitcoin has come a long way, it has remained a niche currency. Why should Libra's fate be any different?

Bitcoin, though built on a sound technological base, has had to encounter challenges relating to regulation across the world. Governments of the world, including India, have been wary of it functioning outside the ambit of organised finance. With huge swings in value, it remains one of the most volatile currencies.

Libra immediately has a few things working in its favour. A currency, to be a success, needs to have acceptability amongst many people. Facebook, with its over 2 billion users, and its partners could tick this box. Also, the Libra Association is promising to play by the regulatory rule book.

Plus, to make it a relative stable currency, not prone to wild fluctuations, the creators of Libra are backing this up with a reserve of real assets. Still, going by the opposition to the idea, it isn't going to be a smooth sail

Why is Libra being opposed?

Bloomberg has reported that the French Finance Minister, Bruno Le Maire, has called on the Group of Seven central bank governors to "prepare a report on Facebook's project for their July meeting. His concerns include privacy, money laundering and terrorism

Markus Ferber, a German member of the European Parliament, has also been reported as saying that Facebook could become a "shadow bank" and that regulators should be on high alert.

Facebook's co-founder Hughes, terming the digital currency "frightening", has said it is a shift of power from central banks towards multinational corporations.

Why is the litchi toxin causing deaths?

Why is Methylene Cyclopropyl Glycine lethal for malnourished children? What can be done?

R. PRASAD

The story so far: Acute encephalitis syndrome (AES) in Bihar's Muzaffarpur, Vaishali, Sheohar and East Champaran districts has so far claimed the lives of over 100 children. More than 400 children with AES have been admitted to various hospitals. Most of the deaths have been attributed to low blood sugar level (hypoglycaemia).

What is acute encephalitis syndrome?

AES in short, it is a basket term used for referring to hospital, children with clinical neurological manifestations which include mental confusion, disorientation, convulsion, delirium or coma.

Meningitis caused by virus or bacteria, encephalitis (mostly Japanese encephalitis) caused by virus, encephalopathy, cerebral malaria, and scrub typhus caused by bacteria are collectively called acute encephalitis syndrome.

While microbes cause all the other conditions, encephalopathy is biochemical in origin, and hence very different from the rest. There are different types of encephalopathy. In the present case, the encephalopathy is associated with hypoglycaemia and hence called hypoglycaemic encephalopathy.

Is encephalitis different from hypoglycaemic encephalopathy?

Yes. The two conditions show very different symptoms and clinical manifestations.

Fever on the first day is one of the symptoms of encephalitis before the brain dysfunction begins. While fever is seen in children in the case of hypoglycaemic encephalopathy, fever is always after the onset of brain dysfunction (actually due to the brain dysfunction). And not all children exhibit fever. Some children have no fever, while others may have mild or very high fever.

The blood sugar level is usually normal in children with encephalitis but is low in children with

hypoglycaemic encephalopathy. In the case of encephalitis, fever (due to virus infection) for a day or two is followed by the onset of symptoms caused by the brain getting affected. However, in hypoglycaemic encephalopathy, children go to bed without any illness but manifest symptoms such as vomiting, convulsion and semi-consciousness early next morning (between 4 a.m. to 7 a.m.). At that time, the blood sugar level is low, hence the name hypoglycaemic encephalopathy. The most important difference between the two is the presence of white blood cells in the cerebrospinal fluid. In encephalitis, there are more white blood cells per unit volume of cerebrospinal fluid, which is a reflection of inflammation in the brain. In contrast, no increase in white blood cells is seen in hypoglycaemic encephalopathy as there is no inflammation in the brain.

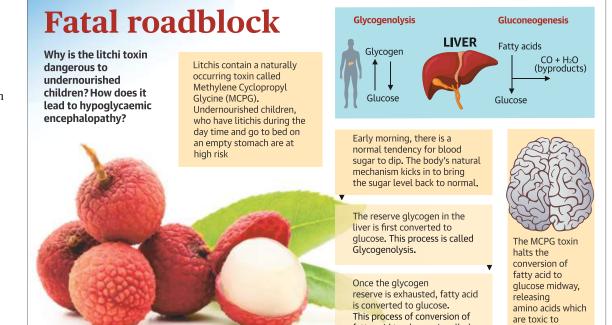
What killed so many children in Bihar? In a majority of cases, children died due to

hypoglycaemic encephalopathy. According to a Press Information Bureau (PIB) release (June 18), hypoglycaemia (low blood sugar level) was reported in a "high percentage" of children who died in Muzaffarpur. Unlike hypoglycaemic encephalopathy, encephalitis does not cause low blood sugar level so death in a high percentage of children couldn't have been due to encephalitis.

Why has it affected only young children?

It is an observed fact that malnourished children between two to 10 years fall ill and die due to hypoglycaemic encephalopathy. It is not known why older children or adults do not suffer the same way. This clear discrimination by age is also a reason why the underlying cause of the illness cannot be a virus. A virus does not discriminate by age, and children younger than two years too are affected by Japanese encephalitis.

It has also been documented that most of the children



Hypoglycaemic encephalopathy can be easily treated. A full and complete recovery can be achieved if affected children are infused with 10% dextrose within four hours after the onset of symptoms

falling ill are from families camping in orchards to harvest the fruits. These children tend to collect and eat the fruits that have fallen on the ground.

Hypoglycaemic encephalopathy outbreaks are restricted to April-July, with a peak seen in June. This is because litchi is harvested during this period.

Is litchi fruit responsible for causing

hypoglycaemic encephalopathy?

In 2012-2013, a two-member team headed by virologist Dr. T. Jacob John suspected, and confirmed the next year, a toxin found in litchi fruit that was responsible for causing hypoglycaemic encephalopathy. In 2017, an India-U.S. team confirmed the role of the toxin called methylene cyclopropyl glycine (MCPG).

Early morning, it is normal for blood sugar to dip after several hours of no food intake. Undernourished children who had gone to sleep without a meal at night develop hypoglycaemia. The brain needs normal levels of glucose in the blood. The liver is unable to supply the need. So the alternate pathway of glucose synthesis, called fatty acid oxidation, is turned on. That pathway is blocked by

Litchi does not cause any harm in well-nourished children, but only in undernourished children who had eaten litchi fruit the previous day and gone to bed on an empty stomach.

Why is the toxin more dangerous for

undernourished children? In well-nourished children, reserve glucose is stored as glycogen (glucose polysaccharide) in the liver. Whenever the glucose level goes down, glycogen is broken down into glucose and circulated in the blood for use. But undernourished children lack sufficient glycogen reserve that can be converted into glucose. Therefore, the natural mechanism in undernourished children is unable to correct the glucose level in blood, leading to

hypoglycaemia. Normally, when glycogen reserve in the liver is exhausted or is not sufficient, the body converts the fatty acid (non-carbohydrate energy source) into glucose. But in the presence of the litchi toxin, the conversion of fatty acid into glucose is stopped midway. As a result, no glucose is generated and the low blood glucose level is not corrected by the body.

How does the toxin cause coma and even death in children?

brain cells.

fatty acid to glucose is called

The toxin acts in two ways to harm the brain and even cause death. Because of the toxin, the body's natural mechanism to correct low blood glucose level is prevented thus leading to a drop in fuel supply to the brain. This leads to drowsiness, disorientation and even unconsciousness. When the toxin stops the fatty acid conversion into glucose midway, amino acids are released which are toxic to brain cells. The amino acids cause brain cells to swell resulting in brain oedema. As a result, children may suffer from convulsions, deepening coma and even death.

Can hypoglycaemic encephalopathy be prevented in undernourished children?

Yes, by making sure that undernourished children do not eat plenty of litchi fruit, ensuring that they eat some food and not go to bed on an empty stomach. Since 2015, the prevention strategy as recommended by Dr. Jacob John's team has helped in sharply reducing the number of deaths from hypoglycaemic encephalopathy in Muzaffarpur. In 2017, the India-U.S. team published a paper corroborating these findings and recommendations.

Can hypoglycaemic encephalopathy be treated? Yes, hypoglycaemic encephalopathy can be easily treated. A full and complete recovery can be achieved if children with hypoglycaemic encephalopathy are infused with 10% dextrose within four hours after the onset of

Infusing 10% dextrose not only restores blood sugar to a safe level but also stops the production of amino acid that is toxic to brain cells by shutting down the body's attempt to convert fatty acid into glucose.

Together with dextrose infusion, infusing 3% saline solution helps in reducing oedema of the brain cells. The concentration of ions in the fluid outside the brain cells becomes more than what is inside the cell; this causes the fluid from the cells to come out thus reducing oedema

and damage to brain cells. Using 5% dextrose, as is the norm in cases of general low blood sugar level, may help children with hypoglycaemic encephalopathy recover from hypoglycaemia, but the accumulation of amino acid is not turned off. And so, even if children survive, they will have brain damage

If dextrose infusion is not started within four hours after the onset of symptoms, the brain cells may not recover but will die. As a result, even if they survive, children suffer from various aspects of brain damage speech getting affected, mental retardation, muscle stiffness/weakness and so forth.

How will Jet's insolvency process play out?

Will potential buyers be interested in capitalising on the airline's brand value and try to relaunch the carrier?

PRASHANTH PERUMAL J.

The story so far: Jet Airways, the troubled private airline that has failed to meet its huge debt obligations, was admitted to the National Company Law Tribunal (NCLT) on Thursday. This happened after a consortium of lenders led by State Bank of India (SBI) that had lent money to the airline over the years approached the NCLT to begin insolvency proceedings. Shares of the airline soared more than 120% on Thursday after news broke that the airline has been admitted by the NCLT for bankruptcy proceedings.

In accordance with the procedures laid out under the Insolvency and Bankruptcy Code, 2016, the court ordered an interim resolution professional to take control of Jet Airways. The professional appointed by the court will now look at ways to salvage the most value out of the airline so that the money can be used to pay back lenders.

Why did Jet Airways fail?

It was founded by Naresh Goyal in 1992, and began flying a year later. It was one of the earliest private entrants into India's airline industry after the government slowly began to liberalise the economy. The opening up of the airline industry to more private companies in the ensuing years caused a boom in air travel in the country. At the same time, greater competition put increasing pressure on airlines to either deliver better services to justify their high prices, or cut costs to operate more efficiently as budget airlines. Jet, which was unable to adapt to changing market conditions, suffered losses for many consecutive years. The unpredictability of the price of oil in the global market also played a role in messing up its cost calculations. In the first quarter of financial year 2018, Jet posted a loss of ₹1,323 crore.

additional money into the airline to meet its operating costs and has also announced various aggressive measures to cut down costs. But all this may have come a little too late. Lenders, seeing the writing on the wall, have refused to keep throwing good money after bad just to keep the airline afloat. Kingfisher and Sahara are two other private airlines which failed under the pressures of competition. Air India, which is again burdened by a huge amount of debt like Jet, was another prominent loser in

Since that huge loss, its management has tried to pump



the battle for market share. But unlike Air India, Jet does not have the government to bail it out of its financial

What made lenders approach the bankruptcy court?

It is estimated that Jet may owe about ₹20,000 crore in the form of short- and long-term debt obligations to an array of lenders. A consortium of lenders that loaned money to Jet has already been in talks with some potential buyers such as Etihad (UAE) and Tata Sons who could invest capital in Jet in order to make the airline fully operational once again. However, these talks have failed to materialise into an actual deal given the high level of debt on Jet's balance sheet. It is worth noting that buyers of troubled companies are generally reluctant to take responsibility for the debt of the troubled entity as it will affect their own return from the investment. The lender consortium led by the SBI, on the other hand, may believe that it can salvage more value from the failed airline through the insolvency proceedings carried out under the purview of the court.

Further, the lenders may also be able to gain greater control over Jet's management by approaching court. Mr. Goyal's resignation from the airline's board in March may have been in expectation of unilateral action by the lender consortium to take it to the doorstep of the bankruptcy court. Mr. Goyal's exit may give Jet's lenders

the confidence to infuse more money in case they decide to make the airline fully operational. The removal of the old management may also make Jet more endearing to buyers who prefer to wrest full control over it. It is worth noting that Jet shares soared on Thursday after the company was admitted to the NCLT. This suggests that investors expect value to be extracted out of Jet through the bankruptcy proceedings.

What lies ahead for the airline and its lenders? Jet Airways is the first airline company in India to be admitted to undergo bankruptcy proceedings under the Insolvency and Bankruptcy Code, 2016. In contrast to other companies that have previously undergone bankruptcy proceedings under the bankruptcy code, Jet has very few assets, especially when compared to the size of its debt obligations. Many of the airline's aircraft have already been seized by lenders after Jet stopped making payments. This leaves banks such as the SBI with very

The airline has very few assets compared to its debt obligations. Many of its aircraft have already been seized after it stopped making payments. This leaves banks with little to salvage

little to salvage from the airline, so it is very doubtful whether Jet's lenders will be able to make any significant recovery of their debts just by selling off its assets.

The resolution professional in charge of Jet may thus want to keep the airline running as a going concern so that it might fetch the best value for lenders in the long run. Potential buyers may be interested in capitalising on

the airline's brand value and trying to re-launch the carrier by infusing fresh capital. Buyer interest, however, will depend largely on the amount of debt that lenders are willing to write off. The sale of Air India earlier this year failed to attract any bids due to the airline's heavy debt burden that the lenders were unwilling to write off before the sale. If no buyer shows interest in purchasing Jet as a going concern, the only option left may be to sell each of Jet's assets individually. Jet will then cease to exist as a company.



Dialogues in the brain Imagining a scene requires a dialogue between different regions of the brain, a new study finds. While the region called ventromedial prefrontal cortex selects the elements for a scene, the hippocampus constructs the scene imagery. The researchers imaged the brains of participants who were asked to imagine novel



Small world of fish

scenes or single objects.

New research finds that global fish populations behave like a small world network, with currents carrying populations far and wide. The researchers modelled how currents distribute the larvae of about 700 species of fish. Using network analysis, they assessed the distribution. This has implications for global conservation and management of fish and food supplies



Medicine munchers

Researchers have shown how a person's gut microbiome can taken. They used levodopa, the Parkinson's disease drug and pointed out that Enterococcus faecalis in the gut was able to degrade the drug. This reduced the amount of drug reaching the brain. making patients take a higher dose leading to side-effects.

IIT Guwahati uses water-repelling cotton for sustained drug release

Duration of drug release can be tuned by varying the water-repelling property of cotton

R. PRASAD

Sustained release of drugs for as long as 110 days has now been achieved by researchers at the Indian Institute of Technology (IIT) Guwahati by immobilising the drugs on cotton that is extremely water repelling (superhydrophobic). A team led by Uttam Manna from the Department of Chemistry found that 30% of the drug was released within 48 hours and the remaining drug over a period of 110 days. Two drugs - aspirin and tetracycline - were tested sustained release.

Collaboration

"We have extended this approach [use of superhydrophobic cotton coated with the drug for sustained release] to make bandages for wound healing," says Dr. Manna. "Animal studies will be undertaken soon. The collaborative work with the Delhi-based International Centre for Genetic Engineering and Biotechnology (ICGEB) has already begun."

The researchers found that the duration of drug release can be tuned by varying the degree of water repelling property of cotton. For instance, when water repellence was reduced from 155 degree to 125 degrees, the duration of drug release reduced sharply from 110 days to over 50 days. "When the cotton was



Tuning in: We can tailor water repellency from 125 to 150 degrees so that the drug is released in a sustianed manner over several days, say (from right) Uttam Manna, Arpita Shome and Adil Rather.

moderately water-repelling (125 degrees), 64% of the drug was released over 48 hours and the remaining drug was released over 50 days in the case of both the drugs tested," Arpita Shome from IIT Guwahati and first author of a paper published in the journal ACS Sustainable Chemistry & Engineering.

Altering properties

To make the supremely water-absorbing cotton to repel water the researchers coated the cotton with a naturally occurring protein – bovine serum albumin (BSA). The BSA protein is dissolved in water

and when ethanol is added it forms nanoparticles, which get embedded on the cotton. The BSA nanoparticles are made to bind to each other to form a 3D coating on the cotton with the addition of a cross-linker (5ACl). "The residual acrylates of 5ACl are further exploited to react with amine-containing long-chain hydrocarbons. The long hydrocarbon chain of the alkyl amine renders hydrophobicity to cotton," says

"Two essential criteria are needed for achieving extreme water repellence – topography which can trap a layer of air and low

surface energy coating that makes the cotton inert so it does not react with water," says Dr. Manna. In this case, the BSA nanoparticles provide the required topography and the long hydrocarbon chain of the alkyl amine makes the cotton inert.

"We can tailor water repellency to varying degrees - 125-150 degrees by selecting an appropriate alkyl amine to react with the residual acrylates on the BSA nanoparticles," Dr. Manna says.

The drug to be loaded onto the extremely waterrepelling cotton is dissolved in ethanol and the cotton is soaked in the

drug-containing ethanol. When the cotton is removed, the ethanol evaporates leaving behind the drug molecule on the cotton. Superhydrophobicity returns once ethanol evaporates.

How it works

When the cotton containing the drug comes in contact with water, the air that is trapped gets displaced. Water slowly starts penetrating the cotton and comes in contact with the drug molecule and dissolves it. The dissolved drug diffuses out of the cotton and thus the slow release of drug over a period of over three months is achieved.

When cotton is supremely water repelling, there is sustained release for about 110 days after the burst-release in the first 48 hours. When the cotton is moderately water-repelling, 64% of drug is released in 48 hours and the remaining over the next 50 days.

Both the drugs were released in a similar fashion and the bioactivity of the tetracycline released at one, three and seven days was examined. "The bioactivity was similar to the native drug at all three time periods. Tetracycline was able to prevent the proliferation of both E. coli and Streptococcus aureus," says Dr. Manna.

The antibacterial study was done in collaboration with Prof. Biman Mandal's group at IIT Guwa-

Why did woolly rhino, mammoth go extinct?

Yak dung analysis helped to map out the different plants and trees in the area

ASWATHI PACHA

A pile of dung may irk many, but not these researchers who spend days analysing yak dung to understand the vegetation and climate of the past and the connections they have to extinct mega herbivores such as the woolly rhino and mammoth.

The wild yak is an endangered species restricted to the higher Himalayas of Asia, the Tibetan plateau and parts of North Russia. It can tolerate temperatures as low as -40 degrees Celsius and is associated with the Himalayan tahr and White-bellied musk deer. The most non-invasive way to study its diet and the local vegetation is by examining its

During the summer of 2017, researchers from Birbal Sahni institute of Palaeosciences, Lucknow set out to the hilly terrain which is about 25 km from the Dronagiri village in Chamoli district of Uttarakhand and collected the dung samples. This exercise was repeated in the winter season too.

Diverse diet

Once back in the laboratory, they carried out the macro- and micro-botanical analyses to decode its diet. A good diversity of pollen, spores and phytoliths (silica bodies found in plants) were seen. This meant that the yak preferred a variety of food - simple grass to leaves and fruits of woody trees. This diversity was high during summer and the yak could walk up to 50 km in search of food.

This also indicated that the yak was able to modify its diet according to the climatic change of the past. "The end of the Pleistocene epoch (11,700 years ago) and the start of Holocene brought about a change in vegetation and also introduced hu-



Endangered: The wild yak is restricted to higher Himalayas of Asia, the Tibetan plateau and parts of North Russia..

mans," explains Swati Tripathi, one of the authors of the paper published in PLOS ONE. "Giant mammoth and woolly rhino which used to live with the yak about 18,000-20,000 years ago were not able to adapt to these changes and thus went extinct. This is a classic example of 'survival of the fittest'. Our humble yak proved to be the fittest one."

The yak dung analysis also helped to map out the different plants and trees in that area, thus, generating modern botanical analogue for palaeo environmental studies in higher Hima-

Mega herbivores

"Across the globe, many researchers are working on coprolite or fossilized dung of extinct animals. A comparison of the present results with the extinct ones can help understand more about ancestor climatic factors and other adaptation strategies of mega herbivores.

"These animals mostly depend on the regional flora and studies can throw light on the past vegetation of an area," adds Dr. Sadhan Kumar Basumatary, corresponding author of the

Controversial telescope to be built on sacred Hawaiian peak

PRESS TRUST OF INDIA

After years of protests and legal battles, officials have announced that a massive telescope which will allow scientists to peer into the most distant reaches of our early universe will be built on a Hawaiian volcano that some consider sacred.

Hawaii Governor David Ige said it was the final legal step in a long, often contentious, process, and that construction is expected to begin sometime this summer.

Scientists say the summit is one of the best places on Earth for astronomy. The telescope would be three times as wide as the largest existing visible-light telescope in the world, with nine times more area. Several telescopes and observatories are already on the

But opponents say the telescope will desecrate sacred land atop Mauna Kea, a place of religious importance to Native Hawaiians.

State officials arrived at the summit to remove Native Hawaiian structures that had been built on land where the telescope will be constructed.

Native Hawaiians have used the structures for years, said Kealoha Pisciottaa a Native Hawaiian activist who considers the removal of the structures to be desecration and discriminatory.

The new telescope will allow astronomers to reach back 13 billion years, to the time just after the big bang, and scientists say it will help fundamental questions about the advent of the universe.

Bhubaneswar becomes 0.5 degree C hotter due to urbanisation

Cuttack and Bhubaneswar have seen the most incresase in local temperature while warming in rural areas is less

How urbanisation of cities in the last decade can sharply increase the local temperature has been well documented by a recent study undertaken by researchers at the Indian Institute of Technology (IIT) Bhubaneswar. Blame it on increased ur-

banisation, the local surface temperature in large cities in Odisha - Cuttack and Bhubaneswar – has increased by as much as 40-50% during the period 2001-2010. While temperature has increased by about 0.9 degree C due to regional warming, which is a global phenomenon, urbanisation or changes in land use and land cover alone has contributed 40-50% of that increase in these cities. In other words, there has been a 0.5 degree C increase in absolute

ties in the State during the period 2001 to 2010 solely due to urbanisation.

In the case of smaller cities and town in the State of Odisha, the change in local warming caused by urbanisation or changes in land use and land cover has been about

Thirty-year data

The team used 30 years of surface temperature measurements taken from over 22 sites over the state of Odisha coupled with Earth Observation data and model output to explore the effect of land use land cover and its changes.

"When compared with rural areas, the local warming in cities in Odisha is double due to urbanisation," says Dr. V. Vinoj from the Institute's School of Earth, Ocean and Climate Sciences and corresponding author of a paper published in



Hot days: The local surface temperature in large cities in Odisha, such as Cuttack and Bhubaneswar, has increased by 40-50% during the period 2001-2010. • ASHOKE CHAKRABARTY

the journal Scientific Reports. "The local warming due to urbanisation in Odisha in 2001-2010 is comparable to any other developed region of the

The 0.5 degree C increase in

local temperature in Bhubaneswar can be traced back to rapid urbanisation of the city in about 15 years. An earlier study by the team led by Dr. D. Swain from IIT Bhubaneswar and a co-author of the latest

paper had found 83% increase in urbanisation of Bhubaneswar between 2000 and 2014. The rapid increase in urbanisation was at the cost of dense vegetation and crop fields. While dense vegetation reduced by 89%, crop fields shrunk by 83%.

Cropping patterns

The study shows that across the State of Odisha, changes in cropping pattern and urbanisation have together had a clear effect on long term temperature changes. For instance, the cropping pattern has seen a clear shift from Kharif crops (July-October) to Rabi crops (October-March). Compared with 2004, Kharif crop cultivation area in 2010 had reduced by 28,000 sq. km, whereas there has been an increase of 38,000 sq. km in Rabi crop cultivation area during the same period.

The northeast part of the State has witnessed the greatest change in land use and land cover during the period 2001-2010. During the period 1991-2000, the western part of the State saw the most change in land use and land cover causing more warming in that region. However, during the period 2001-2010, the trend shifted to northeast as changes in land use and land cover were more pronounced in that part of the State causing more warming in northeast Odisha.

"Our study provides crucial information for policy makers to understand the relative contribution from each land use type to surface temperature, we believe this information would help with future land use planning in the state of Odisha," Prof. J. Dash from the University of Southampton, UK and a co-author of the paper says in a release.

Remotely sensed indices unreliable in informing elephant forage

Grass abundance, which indicates elephant fodder, tends to be low in locations with dense canopy cover

local temperature in large ci-

SHUBASHREE DESIKAN

A field study by researchers from Bengaluru shows that a popularly used index that remotely estimates density of vegetation does not yield a reliable estimate of food abundance for elephants in tropical forests. In fact, researchers show that this index has a negative correlation with graminoids (grassy food - grasses, sedges and rushes - preferentially consumed by elephants) in tropical forests.

Monitoring vegetation For both academic and practical purposes, there is the practice of remotely moni-

toring vegetation in an area and representing it in terms of maps and parameters. One such parameter used is the normalized difference vegetation index (NDVI)



Out of reach: Grazing elephants that cannot reach up to the level of the canopies mostly feed on the grassy species. • KABINI ELEPHANT PROJECT

which is measured remotely from satellite data. This has been used to estimate the amount of food abundance available to herbivorous animals, for example, elephants. The NDVI is used, for instance, in attempts to track the presence of elephants using the vegetation they con-

sume. However, this work clearly establishes that this can be misleading, and fieldbased studies are the ones which can yield definitive results. The work is published in the journal *Biotropica*. 'There is a need to esta-

blish this, because the obvious has not been understood," says Ajay Desai who is a consultant to World Wildlife Fund, India, and an expert on Asian elephants.

The researchers were led by T.N.C Vidya from the Evolutionary and Organismal Biology Unit of Jawaharlal Nehru Centre for Advanced Scientific (JNCASR), Bengaluru.

They carried out the study in the Nagarhole National Park, in the Nilgiris-Eastern Ghats in southern India and sampled five 20m X 5 m vegetation plots along each of 17 transects (lines along which the regions to be sampled can be marked out) in the wet season in 2011 and 22 transects in the dry season. The transects included three

We found that NDVI was negatively

correlated to grasses. This means grass abundance tends to be low in locations where NDVI is high and vice-versa.

Evolutionary and Organismal Biology Unit

forest types: moist deciduous, dry deciduous and teak forests. "We found that the abundance of food plants is not correlated with NDVI. This should be a prerequisite before using NDVI as a proxy of food abundance," says Hansraj Gautam, the first author of the paper, who is also at JNCASR.

The NDVI is a simple indicator which tells how much of the ground is covered with vegetation. It basically calculates the difference between the red and near infrared components of light reflected by objects, from, say, a satellite. Since healthy vegetation strongly absorbs red and reflects near infrared light, this difference can indicate the presence of healthy vegetation and map it into a colour code.

Negative correlation

"We found that NDVI was negatively correlated to grasses. This means grass abundance tends to be low in locations where NDVI is high and vice-versa," says Dr Vidya. Though this is counterintuitive, she explains why this occurs: "While canopy cover and shrub abundance contribute positively to NDVI, they negatively affect grass abundance. Because of the poor correlation, NDVI cannot be reliably used as a measure of forage abundance in a multi-storeyed forest with a low proportional abundance of food species." Grasses form a large component of food of elephants and also ungulates (hoofed animals) like deer, sambar and

"NDVI is extremely useful... and has been used to inform the ecology of various species, from elephants and red deer to mosquitoes and birds. But it is known to perform badly to help assess changes in primary productivity of plants under a dense canopy," says Nathalie Pettorelli, a conservation ecologist from Zoological Society of London and an expert on remote sensing and management of natural resources. "The results do not surprise me... this pattern was shown in other settings [in Poland, in deciduous forests]," she







Towards mindfulness

ASHWIN SHANKER

t happened during yet another terrible day at work. I was frustrated with my boss, who simply wouldn't listen to my suggestions to better the code we were cracking, and would favour my partner's opinion over mine. Despondent thoughts crept into my mind - the politics, the favouritism, the bullying, all of which seem to come to no end. I thought I was about to explode, and I quickly retreated to the washroom. I closed the door behind me and pulled the lid down to sit on the commode. I wanted to tear up, but the rage wouldn't let me give in to my vulnerability.

It was at that moment when I observed the slow ticking of the second hand of my

It was the right kind of rhythm that my mind needed amid the chaos around my work life.

I thought about how the deliberate and irreverent movement of time, captured in this tiny device, would have witnessed both the happiest and the saddest periods of my life. The slow, rhythmic movements of the second hand tell me that this too shall pass. All I had to do was to hold on.

Regardless of how uplifting or upsetting that particular moment is in our life, there is no option but to accept the fact that things could change for the better or for the worse in the very next second. The moment cannot be controlled, but the mindset can be.

The calming realisation woke me up from my mindless slumber, and as I walked back to my desk I realised that most people around me are living their lives asleep.

I am glad that I listened to the timeless advice that my watch gave me, instead of reacting to my impulses. The ticking helped cut off the emotional time bomb.

The second hand is all about bringing vour mind from a state of chaos to one of order. The minute hand will, however, sharpen your focus by bringing your attention to a dial that almost looks stationary, but is also moving forward, every minute. It has a hyp-

Have you ever wondered how many times a day you check the time? A study by a U.S. newspaper showed that Americans on an average check their watch once every 12 minutes. What if you could convert those moments into those of mindfulness:

By simply observing how each second passes by, we could reach a certain calm state. Then every moment would not be just about knowing what time it is, but about what best we could make of that time gifted

Zen master Osho believed that by simply observing and moving our attention to one thing, we could raise our state of self-awareness; it morphs to a form of mindfulness.

Remember that mindfulness can never be something to be achieved or something to be desired for, because every desire has a chance of being a disappointment if not met.

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Why we often get it wrong

Snap judgments made intuitively on the basis of limited information invariably lead you to trouble

BADDAM ARAVINDA REDDY

few years back I used to experience thumping palpitations Lin my heart whenever I climbed steps. This condition came about suddenly without any advance warning. I consulted a noted physician in my town, and after doing blood and other tests he diagnosed my problem as rheumatic heart disease. He prescribed drugs and warned me that I had to be on lifelong medication. I was totally depressed. Friends and relatives suggested that I should consult another doctor for a second opinion. The second doctor was a cardiologist. He ordered an echocardiogram test and found a lump of tissue in my left atrium. I had left atrial myxoma. After the tumor was surgically removed, my problem was gone.

Not long ago I purchased a piece of land in a bustling town. The purchase decision was made without much thought, on the advice of a

Those days real estate prices were shooting up by the day and l was in a tearing hurry to get on to the real estate bandwagon. After the purchase was made, I realised that the land had no proper access and that the seller had a previous agreement with another buyer. With great difficulty and some financial loss I could finally get rid of the land.

Daniel Kahneman, econo-

mist and psychologist, a Nobel prize winner, in his book, Thinking Fast and Slow, slots the human thinking process into two categories. System 1 thinking wherein the brain takes snap and intuitive judgments

based on limited

knowledge. System

2 thinking is a deliberate thinking process in which lot of information is gathered and options are considered. If we analyse the two cases mentioned above, the first case was an outcome of System 2 thinking. Options were searched and the better option was chosen. The second case

ment was made on the basis of a limited amount of information and this led to lot of trouble. System 1 thinking was best suited when human beings were wandering in the African savanna. He had to make a quick judgment whether the figure lurking behind a bush was a lion or a harmless deer. In his daily life he had

think through things.

But modern life affords humans the luxury of security, time and abundant information to use System 2 thinking. Unfortunately for many of us, System 1 thinking is the default thinking mode. We use it constantly and make many mistakes.

Rolf Dobelli, the Swiss author, in

The common theme running through all these biases is snap judgments made intuitively on limited information. Most of our purchases of branded goods are influenced by the halo effect. Our minds are mesmerised by the aura built around them. We purchase them without examining quality parameters. Knowing full well that System 1

biases in human thinking which lead

to wrong judgments. The list of bias-

es include the contrast effect, the fear

of regret, loss aversion, reciprocity,

the anchor effect, the sleeper effect,

story bias, the halo effect, the availa-

bility bias and so on.

thinking leads us to make mistakes we can't free ourselves from System 1 thinking. From morning to evening in our daily life we have to make hundreds of judgments. We can't sit on each event and ponder over options. If we do that, we'll be stuck. Many of our decisions are snap decisions and most of the time it is ok with these decisions. When it's a big event such as choosing a life-partner, choosing a career, leaving a job, buying a home, making a large investment or any instance of substantial stake, we have to sit up and play System 2 thinking.

There is no guarantee that when we use System 2 thinking, we'll get the best outcomes. In spite of the time and effort put into System 2 thinking, sometimes the result may be contrary to expectations. A big black swan may come up to thwart our expectations. In such cases, we have to console ourselves by remembering that the world is its own master and that cannot control it. Life

could throw up surprises. We have to take them in our stride and move on.

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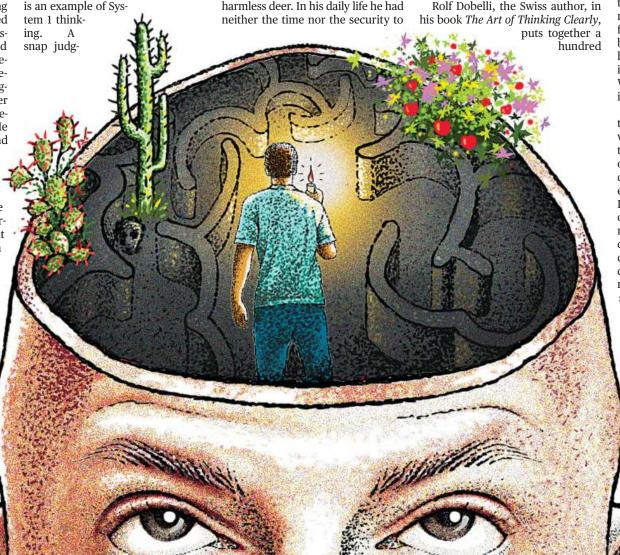


ILLUSTRATION: J.A. PREMKUMAR

A lone golfer waiting for a weekend game

What could have been a blissful time on the course...

T.P. KANNAN

fter a busy week in the office, the least that a golfer worth his salt may look forward to at the weekend is a round of golf. Blissful tour hours, devoid of the bane of the stressful office and domestic preoccupations. The blue sky above, just green grass below, a cool breeze...

But try getting a game-slot on a Saturday or Sunday on your own. This is what will

happen. You couldn't book one because the slot booking rules demanded that you give at least three players' names, but you are a loner. You go to the course around 1.30 and tell the marshal you would like to play. He asks you to wait as there are several four-ball groups. One three-ball, the last group, is scheduled to tee off at 2.34 p.m., and you may perhaps join them.

You sit on a bench under the shade watching team after team tee off. The first few minutes of watching are interesting - two OBs, one water hazard, two hitting the trees and one powerful air shot with intermittent fairway shots. But as time passes you get restless. The shade is not of much help. It's a hot day. The penultimate group on the tee box leaves. And the last group you are to join is nowhere to be seen.

The tee box is now deserted. You are sitting there all alone on the bench getting anxious, with only a skinny dog that is enjoying an afternoon nap under a nearby tree for company. The breeze seems to have stopped. Exasperated, you go up to the marshal, who hates coming out of his cabin,

and ask, "Where are they?" He looks towards the car park through the window and announces, "They've arrived, sir." Ah, finally! You get up with a sigh of relief, flex your muscles and, pulling out the

driver, take practice swings.

The three senior gentlemen, all well past their seventies, are however in no hurry to reach the tee box. They are in fact always the last to tee off. With no group behind, they play the game at their own leisurely pace. While walking they talk about their grandchildren, the annual baby-sitting trips to San Jose or Atlanta or New Jersey, President Trump and local politics, stopping in between to say 'good



ILLUSTRATION: SREEJITH R. KUMAR

100-yard drive. "Good shot! Straight and long. Must be easily 100

yards." "What do you mean 100 vards? It must be a minimum of 280 yards. I can't even see the ball."

"That's because you have

Presently they are strolling towards the first tee box. Looking at their tired walk, one would think they have just finished playing 18 holes.

The marshal walks up to them and asks, "Sir, that gentleman over there, he is alone and wants a game. Can he now join you?'

They stop where they are, to take a good look at you, now doing your pre-game stretching exercise - you in your early-40s, neatly tucked T-shirt with matching shorts, branded golf shoes and black cap with a premier logo. They also see your new expensive golf bag leaning majestically on its stand. As they watch, you take a practice swing with your arms fully stretched and the

hip turning ninety degrees. The club hits your back as you complete the swing. A typical pro-like golf swing. They exchange glances with

'Are-you-thinking-what-I-amthinking?' kind of expression on their faces. Decision made but still they had a question.

"What is his handicap?" one of them asks.

"He says twelve," replies the marshal.

The marshal starts towards you. Seeing him come, you climb up the tee box and place the tee, not wanting to lose a minute more after the onehour wait. You are all geared up to hit the tee shot. You see the threesome approaching you, and giving them a friendly smile, you extend your hand. "Good afternoon, gentlemen. I am..."

That's when the marshal would interrupt you to say, "Sorry sir, their fourth ball is joining them after two holes. And at weekends you cannot play alone."

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Live and let live: some thoughts on a sustainable future

Humans are not what they imagine themselves to be

VIDULA CHOPRA RASTOGI

nyone who has ever bought a plant from a Inursery, watered it every day and watched in dismay as it failed to thrive, knows that gardening isn't easy. Even if you manage to grow a plant successfully, growing food is another ballgame altogether. Vegetables such as bitter gourd and tomato grow almost like weeds, but others are trickier. They have varied water needs, soil requirements and temperature and sunlight preferences. In the event vou get all of this right, you still need to protect them from pests. Finally, after weeks or months of care and patience, your plants may yield just a

few kilograms of vegetables. Recently, I watched in astonishment as a vine took root in my balcony, sprouted



ILLUSTRATION: SATWIK GADE

leaves and filled up the entire length of my planter in a matter of days. Flowers blossomed, and before long I spotted a tiny pumpkin, as big as an avocado. The children were beside themselves with excitement.

We watched it grow each day, and I helped it along by cutting back the vine and snipping off the browning leaves. When we finally cut it off, it weighed a good 4 kg.

In our home of seven, the fruit of our labour didn't last long, but the children were convinced it tasted better than any they had ever tasted. Not a crumb was wasted.

If only we looked at all food in the same manner, for every fruit or vegetable that makes its way to us has been grown painstakingly by some farmer somewhere. One bad monsoon can ruin a crop, but we always have food on our tables and find it difficult to imagine that a day may come when we may not. The truth is, that day may arrive

sooner than we think. There was a book I read to my daughter, titled Millions of Cats. It's an old classic, printed as far back as 1928. Although the book's subject matter deals with aesthetics, a few lines stood out in my mind. A very old man was returning home with millions of cats. They came to a pond. Each cat took a sip, and the pond was gone. When they were hungry, each ate a mouthful of grass on a hill, and not a blade was left. Humans have been

around for an estimated two lakh years by some accounts. Think about it. It took thousands of centuries to reach the level of a billion people, and today we are at 7.5 billion. Have we ever wondered just how many people earth can take? How many can it feed before there's just a mouthful left for each of us?

We presume we have an endless supply of food, but the truth is that the quality of our soil is deteriorating thanks to the large-scale use of pesticides and toxins that enter the soil and water through garbage disposal.

Dead zones – areas in the ocean that can no longer sustain growth – are gradually increasing. Species are growing extinct at an alarming rate. More and more of marine life are being found with plastic in their bodies. Fish is getting progressively unsafe to eat and pregnant women are cautioned against eating many forms of seafood because of concerns about the mercury level in them. If our water is growing unfit to support marine life, how will it support us?

We buy things we don't need, often tire of them, and throw them away, without a thought to all the resources it took to make them. The numerous artefacts we gift each other make no sense, serve no purpose and destroy the environment. Everything, from fast fashion to fast food, is a burden the

We can do a lot to help not just the earth but ourselves – by gardening, composting, planting trees, avoiding single-use plastic such as straws and plastic water bottles. Eating locally grown, organic foods and reducing meat consumption will go a long way in addressing environmental concerns. A few nights ago, when de-

bating the advantages and disadvantages of a vegetarian diet, a friend declared that, much like the beautiful lion, we are at the top of the food chain and can eat whatever we want. The survivalof-the-fittest argument is old and tired. We don't eat meat for survival, we eat it for pleasure. But that aside, there is a fundamental difference between lions and humans. The lion is a predator. It takes what it needs without destroying the environment. On the other hand, a tapeworm lives in our intestine, sucks nutrition and slowly destroys us - and itself.

It's time we realised that earth shouldn't have to bear. we should change; we're not the magnificent predators we imagine ourselves to be. We're actually the parasites.

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The visual carnival

The days of voyeuristic reading are here, with words seemingly overshadowed by pictures P. DALAI

A profession and a passion

The portrait of an acclaimed artist in an unlikely life-setting UMESH PATRA

Perils of excessive screen-time

Why early action by vigilant elders could help youngsters avoid the digital trap RAJESH KRISHNAN

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