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## Lower rates the growth key?

What does the government need to do to stimulate the economy? Is cutting interest rates enough?

K. BHARAT KUMAR

**The story so far:** The Reserve Bank of India (RBI) lowered the repo rate to 5.75% in the Monetary Policy Review in June. This was a level last seen nine years ago. Despite three rate cuts aggregating to 75 basis points in this cycle beginning February, economic growth has failed to pick up and, in fact, has been slowing down even more. There is clamour for another big cut from the RBI in the upcoming monetary policy announcement this week. This is because the transmission of the earlier cuts by banks to borrowers has been poor. By the RBI's own assessment, only 21 basis points have been passed on to borrowers by banks in this cycle.

### What are the repo and reverse repo rates?

The RBI uses the repo rate to influence the interest rate structure in the economy and to manage inflation. Technically, the repo rate is the rate at which commercial banks would borrow from the RBI, and the reverse repo is the rate of interest they would earn when they deposit funds with the central bank.

### What is the stand worldwide as far as governments are concerned on cutting rates?

The traditional argument is that the lower the interest rate, the better for businesses as it brings down the cost of capital, making investments more attractive. Any government would love this as the country would then draw higher investments leading to higher growth and more job creation. Governments abhor higher interest rates as, theoretically, these push up project costs and keep investors away.

A case in point is U.S. President George H.W. Bush's election loss in 1992 to Bill Clinton. The former President actually pointed fingers at Federal Reserve chairman Alan Greenspan as the reason for the defeat. The argument was that had Mr. Greenspan lowered rates, it would have made the economic recovery that the U.S. was going through more visible and hence (purportedly) leading to a re-election of Mr. Bush.

One view on this tug-of-war is that the government of the day typically has a relatively short-term view when it comes to growth but that as an institution, a central bank has the long-term view where low inflation would eventually lead to high growth scenarios.

In this context, nothing comes more quickly to mind than the tussle between P. Chidambaram as Finance Minister and Duvvuri Subbarao as RBI Governor. Despite the best attempts of the government to get the RBI to cut rates, and thus stoke growth, Mr. Subbarao insisted on higher rates in order to keep money supply and inflation low. In his book, *Who Moved My Interest Rate?: Leading the Reserve Bank of India Through Five Turbulent Years*, the former RBI Governor makes this very point: that to experience sustained high growth, a low-inflation scenario is a pre-requisite.

This view is supported by a paper, 'Reconsidering Monetary Policy: An Empirical Examination of the Relationship Between Interest Rates and Nominal GDP Growth in the U.S., U.K., Germany and Japan', published in 2018 in the journal *Ecological Economics*. The authors, Kang-Soek Lee and Richard A. Werner, found that nominal interest rates are consistently positively correlated with growth.

A central bank also keeps an eye on the fiscal deficit maintained by the government. A high fiscal deficit usually makes it difficult for the central bank to rein in inflation, hence causing it to be hawkish and raising interest rates. The late economist and former RBI Deputy Governor Subir Gokarn's was a voice that was constantly egging the government of the day to keep the deficit under control.

### Why aren't Indian commercial banks passing on the RBI's rate cuts to consumers quicker?

Deposits from the public form a chunk of funds that commercial banks use to lend to borrowers. Deposit rates have remained high; only last week, the State Bank of India lowered its rates citing improved liquidity. If deposit rates remain high, then the cost of funds for a bank remains high no matter where the RBI pegs its repo rate. Deposit rates have remained high for two reasons. One, competing interest rates in the government's small savings schemes have remained high – even after a cut in late June, the Public Provident Fund and the National Savings Certificate yield 7.9%. Compare this with the 6.8% or so that one would get at SBI, the nation's largest bank.

The other reason that deposit rates have remained high is the liquidity crunch triggered by the sudden inability of the non-banking finance company IL&FS to pay back loans since last September. The RBI intervened to infuse liquidity soon after but these interventions were not enough.

However, the liquidity position has improved in the last two months following consistent market operations by the RBI under its new Governor Shaktikanta Das. This is reflected in the falling yields on government securities. The environment is, thus, conducive for banks to pass on the benefit of lower interest rates to borrowers.

### Will lower rates spur economic growth?

Capital is one of the three main factors of production, which are critical to the growth of a commercial entity, the other two being land and labour. But capital is only a necessary, not sufficient, condition. Land, unless allocated by the local government, is too costly for investors seeking to set up shop. On labour, even if adequate hands are available for a job, the skill quotient is still low. Training graduates to be job-ready is a form of tax that companies pay. Also to be taken into account is the market environment and demand. If end users are seeing lesser money in hand than earlier, demand will certainly be impacted.

Therefore, in an environment where the other factors of production are not favourable for an investor, low interest rates by themselves may not prove attractive enough. Any revival of economic activity will be contingent on joint efforts by the government on the fiscal front to stimulate demand, and the RBI, to keep interest rates low.

A rate cut in the upcoming monetary policy announcement this week has to be backed with some positive measures from the government. To hope that a rate cut will suffice to re-ignite economic activity would be naive.

# What are the guidelines on migrant camps?

Why is the government keen that States set up detention centres for illegal immigrants? Where should they come up?

VIJAITA SINGH

**The story so far:** On Wednesday, the Delhi Police told the Supreme Court that nearly 500 illegal Bangladeshi migrants have been deported from the capital in the past 28 months. Last month, the Minister of State for Home, Nityanand Rai, informed the Lok Sabha that State governments have been instructed from time to time to set up detention centres. The Ministry of Home Affairs (MHA) has also drawn up a manual for States and Union Territories. At present, there are six detention centres in Assam, the highest among the States. At least 10 more are set to come up before the final publication of the National Register of Citizens (NRC) on August 31.

### What are detention centres?

Detention centres are set up to house illegal immigrants or foreigners who have completed their jail sentence but their deportation process to the country concerned has not been initiated or completed. It is also set up to accommodate foreign convicts in criminal cases who have completed their jail terms and await deportation. According to the MHA, these holding camps are also "to restrict the movement of foreigners staying back illegally and thereby ensure that they are physically available at all times for expeditious repatriation or deportation".

### What does the Home Ministry manual say?

The MHA framed a 'Model Detention Centre/Holding Centre/Camp Manual', which was circulated to all States and Union Territories on January 9. Mr. Nityanand Rai informed the Lok Sabha on July 2 that State governments have been instructed from time to time (2009, 2012, 2014 and 2018), to set up detention centres. Under Section 3(2)(c) of The Foreigners Act, 1946, the Central Government has the powers to deport foreign nationals staying illegally in the country. These powers have also been entrusted to State governments under Article 258(1) of the Constitution and under Article 239(1) for administrators of Union Territories.

Some centres already exist in some States and Union Territories. The intention is to standardise the camps, and the States and Union Territories have been asked to implement the orders.

### What triggered the move?

On September 20, 2018 activist Harsh Mander filed a petition in the Supreme Court to highlight the plight of families languishing in six detention centres in Assam; members of the families who were declared foreigners were put in camps separated from each other.

The top court sent a notice to the Centre and Assam government seeking their response. In the petition, Mr. Mander compared the situation of these families with the family separation policy imposed on illegal immigrants in the U.S. by the Trump administration. The petition itself was based on a report submitted by Mr. Mander when he, as Minorities Monitor for the National Human Rights



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Commission, had visited detention centres in Assam from January 22-24 in 2018.

The first major finding of the mission led by Mr. Mander was that the "State does not make any distinction, for all practical purposes, between detention centres and jails; and thus between detainees and ordinary inmates". It found there was no clear legal regime governing the rights and entitlements of detainees. The report said, "Consequently, the jail authorities appear to apply the Assam Jail Manual to them, but deny them even the benefits, like parole, waged work etc., that the inmates get under the jail rules."

The manual says States require 'no specific approval' from the Home Ministry to set up 'detention centres'. It lays down that the centres should be set up outside jail premises

Central or State government to guide the treatment and rights of the detainees." The detention centres are therefore de facto, if not *de jure*, administered under the Assam Jail Manual, and the detainees are treated in some ways as convicted prisoners, and in other ways are deprived even of the rights of convicted prisoners, it was found.

It was in the context of this petition that on November 5, 2018, the Centre informed the Supreme Court that it was framing new guidelines for keeping foreign nationals in detention centres across the country.

### What are some of the guidelines?

There are 39 points in the manual. The manual says that States require "no specific approval" from the Home Ministry to set up "detention centres/holding centres/camps". It lays down that centres should be set up outside the jail premises and their numbers and size should be decided by the States keeping in view the actual number of foreigners to be housed as

well as the progress in deportation proceedings.

The manual says: "On completion of the sentence of the foreigner, the jail authorities concerned may hand over the foreign national to the authority in charge of the detention centre." There should also be a provision to facilitate the stay of such foreigners in "metro" cities during the waiting period between their interview with the embassy concerned and issuance of travel documents.

The MHA has said the detention centres should be designed for inmates to maintain standards of living in consonance with "human dignity". Well-lit, airy rooms adhering to basic hygiene standards and equipped with electricity, water and communication facilities are to be provided at the centre. Other than CCTVs and round-the-clock security personnel, the manual adds, the centre's boundary wall should be at least 10 feet high and ringed with barbed wires with strict access control measures. There should also be a periodic security audit by the appropriate authorities. The order says that detention centres should also have open spaces for detainees to move around and segregated accommodation for men and women. "It should be ensured that members of the same family are not separated and all family members are housed in same detention centre." Mr. Mander's report had highlighted how men, women and boys above six years lodged in detention centres in Assam were separated from members of their families. It says: "Many had not met their spouse for several years, several never once since their detention, since women and men were housed in different jails, and they were never given parole or permission to meet." The MHA manual has addressed these concerns saying no restrictions shall be imposed to meet family members. It also asks States to pay special attention to the needs of women, nursing mothers, transgenders and open a crèche in the camp. The manual says, "Children lodged in [a] detention centre may be provided educational facilities by admitting them in local schools."

### How many detention centres are there?

Assam has six detention centres, the highest among the States. At least 10 more are to come up in the wake of the final publication of the NRC by August 31. The NRC is being updated as per directions of the Supreme Court to segregate Indian citizens living in Assam from those who had illegally entered the State after March 25, 1971. Nearly 41 lakh people were excluded from the final draft. Of these, 36 lakh have filed claims against the exclusion.

Since 1985, when Foreigners Tribunals (FTs) were first set up in Assam, till February 28 this year, as many as 63,959 persons were declared foreigners through ex-parte proceedings. The Assam government informed the State Assembly last week that 1,145 people declared foreigners by 100 FTs across the State were lodged in detention centres till July 9 this year. Of them, 335 people who have spent more than three years in these centres were to be released following a Supreme Court order. The Central government had informed the Supreme Court in February that of thousands of persons declared foreigners by the FTs in Assam, only 162 could be deported to Bangladesh. In 2016 and 2017, 39 Bangladeshi nationals were deported from detention camps in Assam, according to what the MHA informed Parliament in January 2018.

# Why is India pulled to deep-sea mining?

What is the country's Deep Ocean Mission all about? What are the metals that can be extracted?

ASWATHI PACHA

**The story so far:** India's ambitious 'Deep Ocean Mission' is all set to be launched this year. Dr. Madhavan Rajeevan, Secretary, Union Ministry of Earth Sciences, announced on July 27 that the ₹8,000-crore plan to explore deep ocean minerals will start from October. He said, "We finally have the in-principle approval to go ahead with the mission. Now expenditure plans will be drawn up and circulated [to various institutions affiliated to the Ministry] for executing programmes and we hope to launch by October 31."

### What will be mined from the deep ocean?

One of the main aims of the mission is to explore and extract polymetallic nodules. These are small potato-like rounded accretions composed of minerals such as manganese, nickel, cobalt, copper and iron hydroxide. They lie scattered on the Indian Ocean floor at depths of about 6,000 m and the size can vary from a few millimetres to centimetres. These metals can be extracted and used in electronic devices, smartphones, batteries and even for solar panels.

### Where will the team mine?

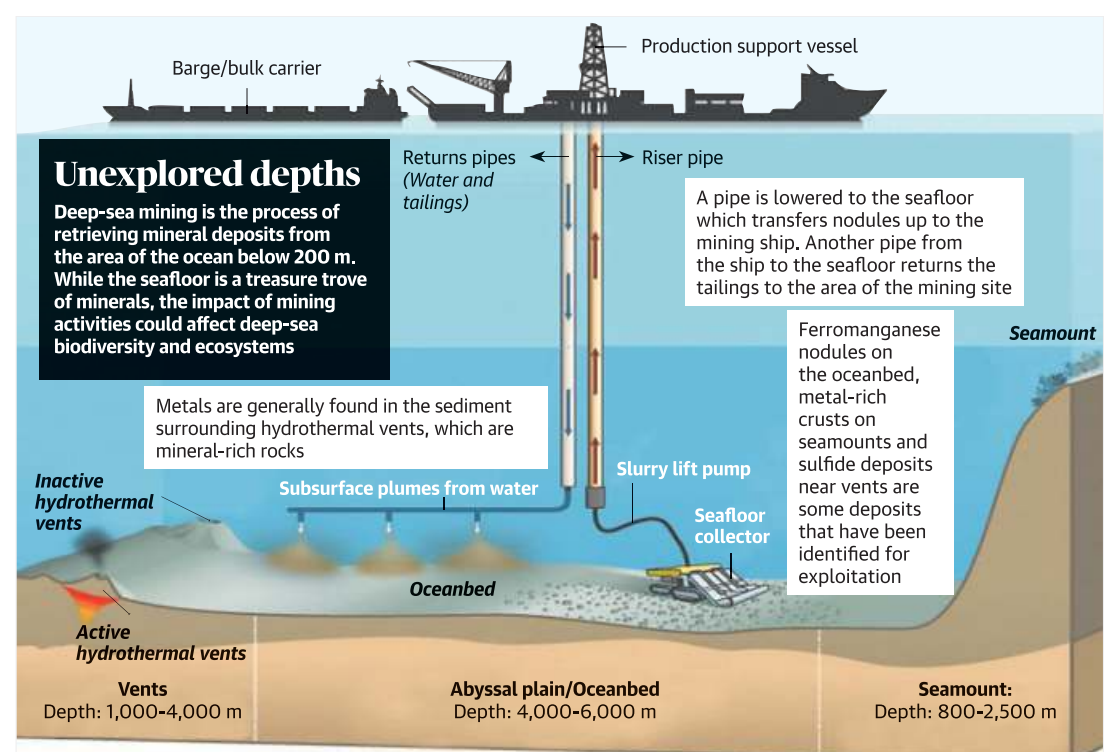
The International Seabed Authority (ISA), an autonomous international organisation established under the 1982 United Nations Convention on the Law of the Sea, allots the 'area' for deep-sea mining. India was the first country to receive the status of a 'Pioneer Investor' in 1987 and was given an area of about 1.5 lakh sq km in the Central Indian Ocean Basin (CIOB) for nodule exploration. In 2002, India signed a contract with the ISA and after complete resource analysis of the seabed 50% was surrendered and the country retained an area of 75,000 sq km.

According to a release from the Ministry of Earth Sciences, the estimated polymetallic nodule resource potential in this area is 380 million tonnes (MT), containing 4.7 MT of nickel, 4.29 MT of copper, 0.55 MT of cobalt and 92.59 MT of manganese. Further studies have helped narrow the mining area to 18,000 sq km which will be the 'First Generation Mine-site'.

### Which are the other countries that are in the race to mine the deep sea?

Apart from the CIOB, polymetallic nodules have been identified from the central Pacific Ocean. It is known as the Clarion-Clipperton Zone.

According to the ISA's website, it has entered into 15-year contracts for exploration for polymetallic nodules, polymetallic sulphides and cobalt-rich ferromanganese crusts in the deep seabed with 29 contractors. Later it was extended for five more years till 2022. China, France, Germany, Japan, South Korea, Russia and also some small islands such as the Cook Islands, Kiribati have joined the race for deep



Source: International Union for Conservation of Nature, Nature Journal

sea mining. Most of the countries have tested their technologies in shallow waters and are yet to start deep-sea extraction.

### When will India start mining?

India's mining site is at about a depth of 5,500 metres, where there is a high pressure and extremely low temperature. Explains Dr. G.A. Ramadass, head of the Deep Sea Technologies Group, National Institute of Ocean Technology, Chennai, "We have developed and demonstrated the mining technology with artificial nodules at 500 metres depth. We have also deployed Remotely Operated Vehicle and In-situ Soil Tester in the depth of 6,000 metres and have a thorough understanding of the mining area at the Central Indian Ocean Basin." He adds, "The mining machine newly developed for 6000 metres depth was able to

move about 900 metres and will be deployed soon at 5,500 metres. We hope to test it in October this year. Weather conditions and availability of ships also play a role. More tests are being conducted to understand how to bring the nodules up to the surface. A riser system comprising an umbilical cable or

electromechanical cable and a hose is being developed."

### What will be the environmental impact?

According to the International Union for Conservation of Nature (IUCN), these deep remote locations can be home to unique species that have adapted themselves to conditions such as poor oxygen and sunlight, high pressure and extremely low temperatures. Such mining expeditions can make them go extinct even before they are known to science. The deep sea's biodiversity and ecology remain poorly understood, making it difficult to assess the environmental impact and frame adequate guidelines.

Dr. Ramadass adds that though strict guidelines have been framed, they are only exploration guidelines. A new set of exploitation guidelines are being worked out and discussions are on with the ISA. Environmentalists are also worried about the sediment plumes harming the filter feeders in the upper ocean layers. Additional concerns have been raised about the noise and light pollution and oil spills.

### Is deep sea mining economically viable?

The latest estimate from the ISA says it will be commercially viable only if about three million tonnes are mined per year. More studies are being carried out to understand how the technology can be scaled up and used efficiently.



CAPSULE



**Elephants and carbon**  
If forest elephants go extinct, it can seriously increase carbon dioxide levels, a study published in *Nature Geoscience* claims. Elephant populations in African forests encouraged the growth of slow-growing trees which had a high wood density and sequestered more carbon, it found. This is because they preferentially eat fast-growing varieties leaving slow-growing ones.



**Habitable world**  
TESS, NASA's mission to search for exoplanets, may have found the first potentially habitable world. The super-Earth exoplanet is named GJ 357 d, which is only 31 light years away, was discovered earlier this year. The exoplanet orbits a diminutive dwarf star and is 22% larger than the Earth. There are two other exoplanets in the system. The super-Earth has a thick atmosphere and may possess water.



## Extreme weather and humans

Study finds European heat wave was made more likely, intense by human-induced climate change

ASIAN NEWS INTERNATIONAL

The extreme heat waves that enveloped parts of Western Europe last month were made much more likely and intense by human-induced climate change, a study has found.

A recent report from the World Weather Attribution group has suggested that the continuous days of extreme heat that hit countries like France and Netherlands would have been a once-in-a-millennium occurrence without climate change but were made up to 100 times more probable as a result of it.

In the U.K. and Germany, the event is less rare (with estimated return periods of around 10-30 years in the current climate) and the likelihood is about ten times higher (at least 3 times) due to climate change, the study added.

Though in all these countries, the temperature would have been 1.5 to 3 degrees Celsius lower without climate change.

The said group has analysed all seven heat waves in the 21st century in Europe (2003, 2010, 2015, 2017, 2018 and June 2019), and found that each one was made more likely and more intense due to human-induced climate change.

"The July 2019 heatwave was so extreme over continental Western Europe that the observed magnitudes would have been extremely unlikely without climate change," the report concluded.

## NCBS study shows how stress can affect fear memory

It may be possible to reverse fear memories that have been abnormally strengthened by severe stress

SHUBASHREE DESIKAN

Fear memories formed before and after experiencing chronic stress can have very different behavioural effects. They also affect the brain morphology differently, finds a study. The researchers, based in National Centre for Biological Sciences (NCBS) Bengaluru came to this conclusion by studying male Wistar rats.

The researchers find that it may be possible to reverse fear memories that have been abnormally strengthened by severe stress. This is because, they find, the process of fear memory reversal itself is not impaired by stress. "This is the good news emerging from our study. Of course, these ideas need to be tested in human subjects in great detail before therapeutic relevance can be fully assessed," says Sumantra Chattarji of NCBS in

## Tigers in India face lurking threat from virus

There is heightened risk of disease transfer from dogs to tigers, leopards in Ranthambhore National Park

ASWATHI PACHA

The Prime Minister's announcement that tiger numbers have increased in the country may be good news. But the loss of habitat, a decline of prey and poaching continues to be a threat to tigers' survival. Along with these, a potential virus – Canine Distemper Virus (CDV) – that can be transmitted from CDV-infected dogs living in and around wildlife sanctuaries has started to raise concern among wildlife biologists.

Canine distemper is a contagious and serious disease caused by a virus that attacks the respiratory, gastrointestinal and nervous systems of puppies and dogs.

### Risk of disease transfer

A recent study published in *Threatened Taxa* notes that 86% of the tested dogs around Ranthambhore National Park in Rajasthan carried CDV antibodies in their bloodstream. This means that the dogs are either currently infected or have been infected sometime in their life and have overcome the disease. This finding points out that there is an increased risk of disease transfer from the dogs to tigers and leopards that live in the park.

Last year, over 20 lions from the Gir forest succumbed to the viral infection and now a guideline has been prepared by the National Tiger Conservation Authority to prevent the spillover of the disease to wild animals.

"The main aim should be to vaccinate the free-ranging and domestic



**Loss prevention:** Last year, over 20 lions from the Gir forest succumbed to the canine distemper virus infection, and now a guideline has been prepared by the National Tiger Conservation Authority. • RAJEEV BHATT

dogs in the area around national parks. A lot of NGOs have started animal birth control programmes. They need more support from the government," says Dr. Jimmy Borah, Consultant, Species Conservation and Law Enforcement, Panthera, and the corresponding author of the paper. "The disease needs to be recognised and more targeted studies need to be initiated to collect baseline data on CDV from wherever they are reported from in wild carnivores. Understanding the role of domestic animals as contribu-

tors to a local CDV reservoir is imperative precursor in considering control measures."

### Blood samples

The study was done from July to August 2015 when the team visited villages (in a 4 km radius) around the Ranthambhore National Park and collected blood samples from over 100 dogs. The results showed that 86% of the studied dogs had CDV antibodies in their blood. These dogs wander into the forest along with the humans, and there

have been cases where leopard have hunted these dogs. "Studies from Russia and Africa have shown that small, isolated wildlife populations are more susceptible and when the virus transmits from one species to another the disease manifestation is worse," adds Dr. Borah.

### Easier route

"The easy way out is prevention. Managing any disease in a wildlife population is extremely difficult. Most dogs are free ranging and not owned by any particular person in the village. The government should take the initiative to vaccinate the dogs around wildlife sanctuaries in the country. This would be a good time to vaccinate against rabies as well. It is an investment that requires time and effort but increasing herd immunity will reduce chances of disease spillover to wildlife," says Nadisha Sidhu, first author of the work. She was a researcher with the World Wide Fund for Nature-India when the work was done and is now a consultant for Ashoka Trust for Research in Ecology and the Environment, Bengaluru.

Ms. Sidhu says there were only a few CDV suspected cases in India when she started her work in 2015, and so was considered not important. But with the CDV confirmed deaths of lions in Gir, more attention has been drawn to the disease. She hopes more studies are conducted to get countywide data on the disease prevalence so that necessary prevention guidelines can be laid out.



**Bonding:** Eye contact has an important role in dog-human relationships. • S. RAMESH KURUP

## Eyes of the beholder and the beheld

It is not how the dog looks, but how he 'puppy looks' at his owner



### SPEAKING OF SCIENCE

D. BALASUBRAMANIAN

A recent report described the remarkable prowess of a female dog in the Kaziranga National Park in Assam. She could sniff the presence of poachers of the rhinoceros and tigers and warned the forest officials about it. The officials named it Quamy since she was equal to a quarter of an army. Likewise two dogs named Nirman and Myna sniffed the presence of tigers and their poachers in the Madhya Pradesh forests.

### Keen senses

Dogs belong to the wolf family and have inherited a keen sense of smell and vision from them. Wolves have over 300 million smell receptors compared to just 6 million in humans and can smell the presence of someone 3 kilometres away. And they have sharper vision and hearing – they can hear their prey 10 km away. Dogs have inherited these senses of smell, sight and hearing. We know of how dogs sniff malaria and even cancer in humans (see earlier article on 9-12-2018). Happily enough, dogs are tamer than wolves and can be domesticated. A recent report by a team of researchers from UK and USA describes yet another feature of dogs, namely how a dog's facial muscles have evolved over the years as they were domesticated and that their ability to raise their eyebrows resembles ours. This ability, argue the researchers, have triggered their nurturing by humans, making dogs our "best friends" (Kaminski et al., *Evolution of facial muscle anatomy in dogs*, *PNAS*, 116: 14677-81, July 16, 2019).

Dogs were domesticated about 33,000 years ago. As they were domesticated by us, we started selecting and preferring those that better matched our relationships. Such selections have involved the ability of dogs that are able to read and use our communications better than other animals are not able to. As the authors point out: "dogs are more skillful in using humans communicative cues like pointing gestures or gaze direction even than human's closest living relative chimpanzees."

Eye contact has turned out to be an important contribution to the dog-human relationship. A Japanese group points out that mutual gaze between dogs and human leads to biochemical changes both in the owner and the pet dog, and an attachment akin to that between a mother and her infant! To quote the researchers again: "The most likely evolutionary scenario is that dog's ancestor must have, to some extent, expressed characteristics that elicited care-giving response from humans. Humans then consciously or unconsciously favoured and therefore selected for those characteristic leading to the analogous adaptations in dogs today".

### Mutual gaze

And of these, mutual eye contact and gazing has been an important contribution. Dog owners know only too well how moving the gaze of their pet is – sometimes so sad that they need to be hugged, and some other time so upsetting that you want punish them. The UK-USA group has done particular research on how the facial muscles and the anatomy of dogs have been selectively evolved to contribute to this mutual eye contact and the "language" expressed in such gazes. We humans favour dogs that show "paedomorphic" (infant-like) features like large forehead, large eyes and so on. The team has also shown that a particular set of facial muscles make the eyebrows raise and lower, which is appealing to us humans.

In order to determine whether domestication has shaped facial muscles to facilitate dog-human communications, the researchers compared in detail the facial anatomical features of domestic dogs on the one hand and grey wolves on the other. Compared to dogs, wolves are unable to raise the inner part of their eyebrows. Also, while dogs have a muscle that pulls the eyelid towards the ear, wolves are not able to. Dogs are also able to produce eyebrow movements that are more frequent and expressive. These are what people call the "Puppy Dog" eye movements – sad, happy, don't care, and other expressions remarkably similar to human infants. There is no such "Puppy Wolf" movement of the eyebrow. And this puppy dog movement of the facial muscle anatomy has come about thanks to selection pressure in breeding based on human preferences.

The best dog need not be the cutest or the most beautiful. It is the one that looks at you and you return. The look is mutual affection. In the California annual contest called the World's Ugliest Dog, the winner in 2019 is "Scamp the Tramp", one with beady eyes, no teeth, short stubby legs, and his owner Ms Yvonne Morones is justly proud of him. It is not how the dog looks, but how he 'Puppy Looks' at his owner and she at him. Beauty is in the eyes of the beholder and the beheld.

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## A step closer to oral administration of kala-azar drug

IIT Hyderabad achieved controlled, sustained drug release for 10 days

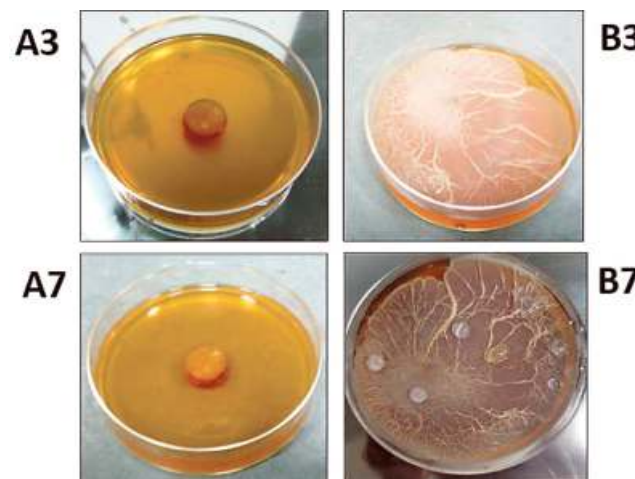
R. PRASAD

By encapsulating an antifungal drug in polymer nanofibres, researchers at the Indian Institute of Technology (IIT) Hyderabad have been able to achieve controlled and sustained release of the drug for up to 10 days. As a result, no fungal growth was seen up to seven days when the drug (Amphotericin B) was encapsulated in the polymer. The encapsulated drug can also be used for treating kala-azar.

### Oral administration

Most importantly, the antifungal activity against *Candida albicans* was observed when the encapsulated drug was compressed to form oral tablets. This would mean that oral administration of the drug might become possible if initial results achieved in the lab can be replicated in animal and human clinical trials. Currently, oral administration of the drug has major challenges – high toxicity, reduced bioavailability in the body due to poor solubility in water and high cost.

Researchers from IIT Hyderabad led by Chandra S. Sharma and Saptarshi Majumdar from the Department of Chemical Engineering produced nanofibres containing the drug by electrospinning the drug-gelatin polymer solution. The gelatin polymer is extremely



**Effective:** Drug-loaded tablet displayed antifungal activity on days 3 and 7 (left column) compared with control (right column)

water-loving (hydrophilic) and so is not stable. To increase the stability and allow the drug to be released in a controlled and sustained manner, the researchers used a commercially available crosslinker.

"The drug is found on the surface of the gelatin nanofibres but remains encapsulated when compressed into tablets," says Prof. Majumdar.

"The cross-linked polymer matrix allows the drug to diffuse slowly when the polymer degrades. We have controlled the diffusion rate so it is released over a period of 10 days," says Prof. Sharma. Only *in vitro* studies have been carried to test the stability of the tablet and controlled release.

The results of the study were published in the journal *Nano Structures & Nano-Objects*.

### Stability of tablet

Since the main goal was to study if the drug can be administered orally, the researchers tested the stability of the tablet for eight hours at extremely acidic condition (1.5 pH). The stomach has acidic pH and the polymer should be stable for up to four hours. After eight hours at low pH, the tablets were kept for 10 days in an alkaline medium of 7.4 pH. "The tablets were stable for eight hours at low pH. The polymer matrix showed signatures of degradation after the sixth day but was stable for 10 days," says

Mrunalini K. Gaydhane from IIT Hyderabad and one of the first authors of the paper.

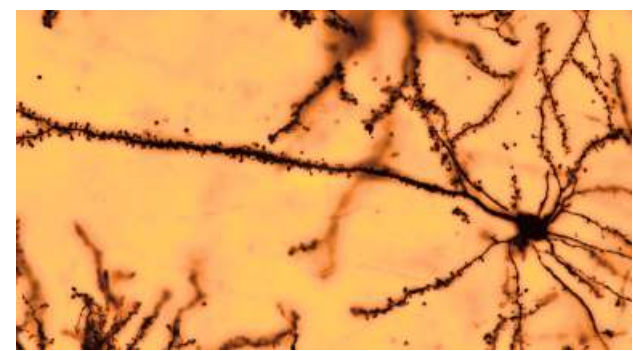
The researchers found that each day 10% of the drug was released from the polymer through diffusion. The drug was completely released from the polymer matrix at the end of the 10th day.

### Negligible toxicity

"We had used mice fibroblast cells for testing toxicity of the drug. There was negligible toxicity to cells even at the end of five days. In fact, the cells continued to multiply," says Gaydhane.

Only 20 mg of the drug in 500 mg of polymer was used for making the table used for testing. "Our next target is to achieve the same drug release profile with dosages used for therapeutic purposes," Prof. Sharma says.

The chemical crosslinker used in the study is highly toxic. In order to reduce toxicity, the researchers exposed the gelatin polymer to saturated vapour of the crosslinker for just six-eight minutes. In the conventional process, crosslinking takes 24 hours to complete. "Reducing the time taken to cross-link reduces toxicity. But we are now looking at increasing the stability of the polymer matrix without using any crosslinker," Prof. Majumdar says.



**Spiny neurons:** Pyramidal neuron from the medial prefrontal cortex of a rat, showing the dendritic spines.

whose lab the study was conducted. The results are published in the journal *Psychopharmacology*. In a pair of experiments that studied the behavioural aspects, the rats were taught to fear a 20-second-long tone of approximately 70 decibels. Later, they were subjected to a training where they were made to realise and learn that

they need not fear the tone, which the scientists call as fear extinction exercise.

In the first experiment, the experimental rats were subjected to chronic immobilisation stress for 10 days after which fear memories were formed. Another group was subjected to same stress for 10 days but here the fear memories were formed on the

first day. The control groups in both cases were not subjected to the stress treatment and were only given the fear formation and extinction treatments.

The results showed that when fear memories were formed after stress treatment, both acquisition and overcoming the fear were impaired.

In a separate experiment, the morphological effects of stress were studied by studying eight rats. Four of these were controls and four were subjected to stress. After 10 days, the rats were sacrificed and thin slices of their brains were examined.

The researchers studied and counted the dendritic spines on specific neurons in the two sets of animals. Dendritic spines are contact points where a neuron communicates with other neu-

rons. "We found that due to stress, the number of dendritic spines increases in the amygdala [where fear memory is formed], but decreases in the infralimbic area [where memory reversal happens] of the medial prefrontal cortex," explains Prabhakar Chakraborty from NCBS and the first author of the paper.

### Effect on neurons

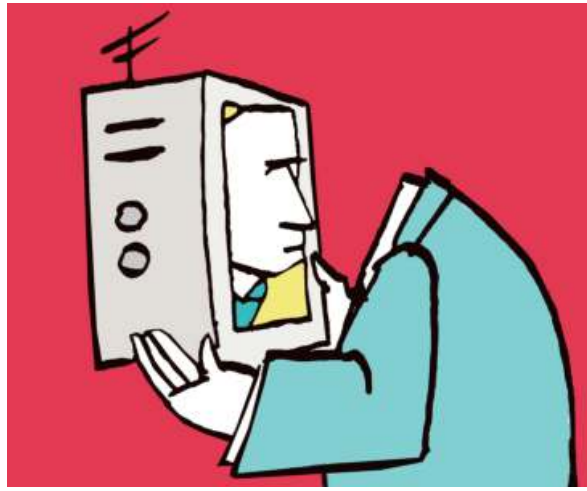
An increase in the number of dendritic spines is seen as an increase in the capacity of the neuron to communicate with other neurons. This strengthens the functioning of that neuron. So the above morphology experiment shows that stress acts in two ways. It not only increases the capacity of neurons involved in fear memory formation but also decreases the capacity of the neurons involved in memory reversal, thereby making it

doubly difficult to erase the fear memory.

"While these results are pretty novel and add an entirely new dimension to earlier research, we feel that our findings are quite robust for several reasons," says Dr Chattarji. According to him, an important reason is that the analysis of cells in different brain regions involved in these behaviours also undergo structural changes that are consistent with the results of the behavioural experiments.

One of the main challenges was to train the animals and execute the experiments flawlessly over a long time. "Experiments in animal behaviour are often susceptible to the finest fluctuations in something as trivial as handling the animals. Extreme care was needed to avoid unnecessary experimental confounds," says Mr Chakraborty.





## Unreal spectacle on the screen

Reality TV projects false values

DIVYA GRACE

Drama, jealousy, tears, overrated comedy and underrated values – reality TV has it all. Nothing seems to bring viewers greater joy than to watch fellow human beings being humiliated and reduced to tears in front of millions. Does reality TV have a negative impact on the younger generation? Should it be banned?

First, reality TV shows are usually far from reality. People take advantage of the word “real” and use it as a green flag to say and do whatever they want on TV. It may seem like a peek into real human nature, but all the drama shown on screen is simply a result of clever editing. One cannot be natural when being filmed. Modern technology has distorted the lines between what is real and what is not, and reality TV is the finest example of it.

Reality TV projects false values and standards. The people, especially teenagers, who watch such shows may be influenced into rethinking their own values and strive to change their lifestyles, aiming for an unattainable and fake benchmark. This may, in turn, cause them to starve themselves to become thinner or try to squeeze their legs into a pair of jeans that is at least three sizes too small. These efforts not only harm them physically but also mentally and emotionally, when they realise that they can't meet the standards on TV and resign themselves into thinking that they are not “good enough”.

### Inappropriate ideas

A “no boundaries” reality TV show can illustrate some inappropriate and uncomfortable ideas. Most of these shows start and end with bad language, and the “behind the scenes” gossip, which is supposed to give you an insight into a character, is just an excuse for gossip. This type of behaviour can influence the younger generation who are always anxious to seek out role models. These shows manipulate them into thinking that such behaviour is acceptable, leading to many social problems among their peers.

As instant noodles, “instant stars” are all the rage now. The standards of acting and clean, fun television have dropped drastically. The people who appear on reality TV are usually unprofessional and though this may seem to make the whole thing more real, it couldn't be further from the truth. Since these people are not used to the spotlight, they don't know how to handle stressful situations and how to cope with

**Reality TV has taken away the real purpose of watching television – breaking away from the harsh reality**

criticism. There are many reported cases of how criticism from TV judges has caused people to give up on their dreams, develop social disabilities and become a shadow of their past selves. Reality TV may be entertaining, but it is in truth just a façade put up to hide the cruelty and horrors of human nature.

The popularity of such shows is fed by people's rising thirst for fame. Reality TV has increased the temptation of money and popularity. Many of the populace don't even care for what reason they come on TV, as long as they can have the spotlight on themselves for five minutes. Priorities, values and ethics have changed and this is the kind of culture we are exposing the future generation to.

When one considers it, TV is one of the most amazing man-made inventions and gives us access to hundreds of stories that change and inspire our lives every day. Quality television is wholesome entertainment and is capable of bringing people together, connecting them. But reality TV has taken away the real purpose of watching television – breaking away from the harsh reality.

In conclusion, reality TV shows encourage people to chase after false hopes and dreams, all in bad taste. Without such shows, society will be happier and healthier with a broader outlook towards life.

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## Confessions of a TECHNOPHOBE

A Luddite he is, but he wants software to help reply to the birthday greetings flooding his phone

TAJENDER SINGH LUTHRA

I am a self-confessed Luddite. However, I like using social media in moderation for its convenience, speed and reach.

Generally, I refuse to join social media groups. But since I don't want to be called rude or reclusive, I break that rule. Missing out on interesting chats in a few chosen groups, particularly one formed by my Civil Service batch mates, is not the done thing. But rarely do we have stimulating discussions on what ails public policy and administration or remedies for poverty and backwardness. Serious discussions may ruffle egos. So primarily, we use this group to exchange birthday wishes and stay connected.

The group makes my birthday extra special. I am elated to receive over 40 messages when I check my phone in the morning, and by night, the figure touches 100. But my happiness is short-lived as I am confronted with a difficult question: how do I thank everyone? My heart wants to acknowledge all who wished me, but I am lazy.

A friend suggested that we need software to help us write everyone's name with ease, élan, speed and dexterity. Just click a button and all the names pop up. But can software really help us do this?

Birthday wishes start pouring in from early morning. I feel lazy and convince myself that I will write my thank-you note in the evening.

By then, everyone who wanted to wish me, would have done so. But a little later, I feel under pressure. If I write so late, wouldn't my early-morning friends think that I am lazy, uncivilised or ungrateful?

In such a large and diverse group, I have forgotten some names. I haven't met many of them since our training got over 29 years ago.

Several Sanjays and Viveks are there in the group. How do I address each of them individually? Use the first name for one Sanjay and the last name for another? But I feel offended when an acquaintance addresses me by my last name.

Then, there is a chatterbox in the group, but I don't know her name. I wish to call another batch mate to ask her name. But I know his frivolous suspicions. He may post openly on the group – hey, what's the plan?

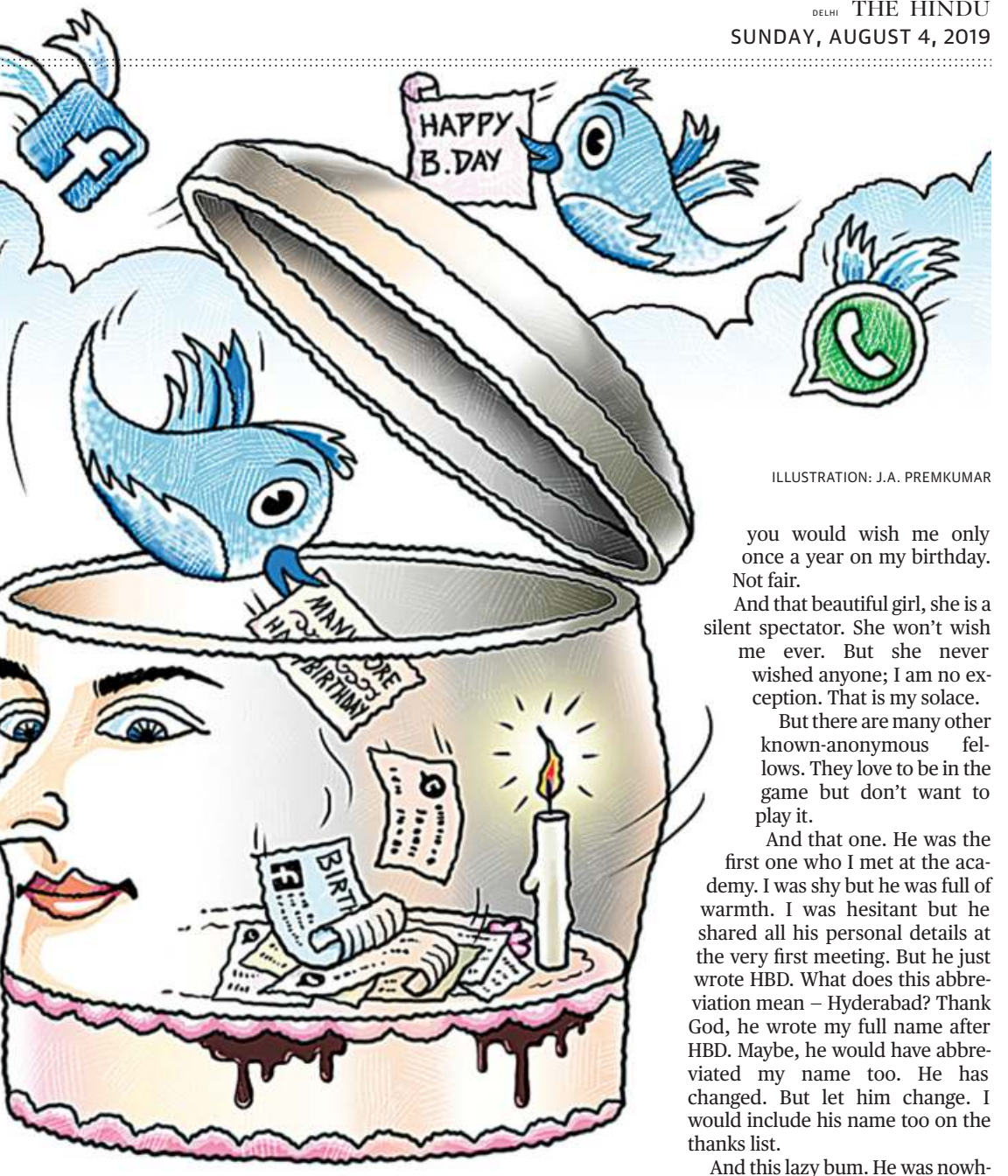


ILLUSTRATION: J.A. PREMKUMAR

you would wish me only once a year on my birthday. Not fair.

And that beautiful girl, she is a silent spectator. She won't wish me ever. But she never wished anyone; I am no exception. That is my solace.

But there are many other known-anonymous fellows. They love to be in the game but don't want to play it.

And that one. He was the first one who I met at the academy. I was shy but he was full of warmth. I was hesitant but he shared all his personal details at the very first meeting. But he just wrote HBD. What does this abbreviation mean – Hyderabad? Thank God, he wrote my full name after HBD. Maybe, he would have abbreviated my name too. He has changed. But let him change. I would include his name too on the thanks list.

And this lazy bum. He was nowhere till I laboured to make the list. But just after I posted it, he writes his best wishes on the group. He rather needs to be ignored for being lazy in wishing me. But, I am confused. Software won't really solve my birthday problems.

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## Sunshine thoughts on a better world, to win over hate with love

The nascent rays touch off a stream of musings on where the world is headed to

POOVITHA MUTHURAMAN

As the morning sun's rays find their way through the thick curtains of my bedroom window, I wake up right away. I have always been a light sleeper – the slightest disturbance, and sleep deserts me. Just like my mind which at the slightest provocation leads to a cascade of thoughts that engulf my whole being.

I check the time on my phone and habitually, my messages and Facebook feed. As I scroll through the horrible stuff (rapes, honour killings, shootings and suicides) that we call news today, the spark in my mind had already begun. I close my eyes and feel myself being sucked into my messy thoughts, the primary one being – “Where and when did we begin to fail as humans?”

Was it when we were taught never to give up on our goals, ideologies, dreams and desires at all costs?

Was it when we made our children feel like a failure when they scored less in a



ILLUSTRATION: SATWIK GADE

**Somewhere along the way, we forgot to love without expectations, to care without demands and to give without getting**

test and seeded the thought that life was a competition?

Was it when we taught our boys that it was shameful to be human and cry their feelings out?

Was it when we gave our pride and ego more priority over a relationship with a loved one?

Was it when we portrayed that to succeed in life meant

to hoard loads of money and give up on every other aspect of life?

Was it when the real learnings and experiences in life didn't matter anymore unless you had a degree from one of the top universities?

Was it when we started believing that everyone else's lives was better by looking at the social media stories and statuses?

Was it when we were taught too much science and logic, that we forgot we are emotional beings?

As we are in the age where we are told to “live our lives

to the fullest” or “to follow our passion” or “to be happy and positive no matter what”...

Somewhere along the way, we forgot to love without expectations, to care without demands and to give without getting. We have lost touch with our basic human nature.

### Blurring lines

As the lines between right and wrong and black and white blur and merge into grey, the grey matter of my mind pushes me further into the whirlwind of thoughts and I end up asking the most dreaded, unanswerable question: “What is the purpose of this life?”

Before I reach my breaking point, the ringtone of my phone brings me back to reality. As I pick up and hear his sleepy voice at the other end, all my worries on existential crisis vanish. I realise, at the end or beginning of the day, all we need to survive is a little more love than the previous day until it begins to overturn all the hate in the world.

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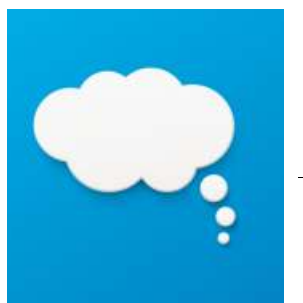
## Space-hopping on a rocketing mind

V. SHREE SAUPARNIKA

Why do couples decide to separate after 25 years of marriage? Why do so many teenagers run away from home every year? What do modern, advanced nations compete for? What holds all matter together, gives it shape, size and feel?

One of the definitions of space is “an unoccupied expanse or area”. In another use, the word is found in “I think I need some space”, “I have no space at all” and other such declarations. But can you imagine a world without space, in any of its connotations? And what about a world without personal space? I am sure most teenagers might just lose their minds if asked just to think about it.

Personal space is important. Never breach this barrier when man is in “commune” with nature lest you regret it for the rest of your life. It could even change the course of life. For instance, in Hindu mythology, if Sita had not crossed the Lakshman Rekha (the boundary of her personal space drawn by her brother-in-law, which may lead to controversy if done today), we would have had a different story alto-



gether without the war and other legendary exploits.

That is not to say that personal space can never be breached. There is the matter of consent. You cannot invade a person's space without permission. People often fail to understand the significance behind personal space. Often, the violators do not know that they are violating. Even worse is when the person whose personal space is being breached, does not know it. This often happens to children. So they need to be taught how to identify the breaches. The same goes for cyberspace.

The invasion of a person's privacy is caused by ignorance, thoughtlessness, spite or stupidity. The earlier people know this, the better the virtual world will become.

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## Toothsome kachoris with a stuffing of serendipity

When the mind plays games with you, it can sometimes be for a little side trip to fortune

SUDHIR VOMBATKERE

I make a “to-do” list whenever I go out so that I don't miss out any chores, which may, otherwise, necessitate additional trips. You know, “bank”, “vegetables” and such.

We love Gujarati snacks such as *papri*, *ganthia* and *khakra*, and stock these purchased from Mansukhlal's shop not far from home. Asha had asked me to buy *papri*, four 100-gram packets, and I dutifully wrote “Mansukhlal” on my list.

There were other tasks, each involving searching for a parking space and walking to the place of business. In the day's planned “circuit”, I parked some distance from Mansukhlal's and ambled

across. There were some customers at the counter, and it took a little time to meet the proprietor and exchange pleasantries with him. He asked what I would like to buy. I could not for the life of

**Forgetfulness is 'normal' with advancing age...**

me recall what it was I had come for, and noticing my confusion, he gently said, “Don't worry, take your time. This happens to all of us.”

I took the “to-do” list from my pocket, but all it said was “Mansukhlal”.

There were others waiting, so after a minute or two I told him I would do some other chores and come back

when I recall what it was I needed. And off I went to the bank where I got my passbook updated after waiting in the longish queue at the updating machine. After that I went, passbook in hand, to meet the manager to remind her I needed Form 16 to file my return.

When I eventually got back to Mansukhlal's, I discovered that I had left my passbook on the bank manager's table. Damn! I'll pick it up the next time I go there, if it doesn't get misplaced or lost, I thought. I entered Mansukhlal's and without hesitation ordered four *kachoris*. These packed and paid for, I drove home.

As I was parking, I received a jolt as *papri* suddenly came to mind. Gosh, now



ILLUSTRATION: SREEJITH R. KUMAR

Asha is going to give me a lecture!

I went up to our flat, let myself in with my key, and quietly placed the purchases on the kitchen counter before announcing my return.

Asha's response was, “You didn't take my call! What were you doing?” I apologised, “I put my phone on ‘silent’ yesterday at the music performance, I forgot to restore the ring. Sorry I didn't

take your call.”

She said, “I was calling to tell you we already had *papri* in the cupboard. Now I don't know what we'll do with so much *papri*.” I smiled to myself. Asha loves *kachoris*!

Forgetfulness is “normal” with advancing age, but thankfully, *kachoris* are every bit as tasty as *papri*. Pushing 80, I once told my visiting son that I must remember to get some things urgently done, because I did not know how much longer I had to live.

Prompt came his reply: “No hurry, daddy, you'll live to be a hundred. Only the good die young.”

And we laughed together for a long time.

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A culture of cleanliness and tidiness must be inculcated from an early age  
D.B.N. MURTHY

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The big debate at homes these days is what to eat.  
SEETHA JAVAKUMAR

### A thought for talent

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AJAY CHANDRA  
ARKALGUD RAMAPRASAD

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