GETTY IMAGES/ISTOCKPHOTO

# Measuring black money

## Why is it so difficult to quantify unaccounted income both within and outside the country? What are the steps the government can take?

T.C.A. SHARAD RAGHAVAN

**The story so far:** The Standing Committee on Finance recently came out with its report on the 'status of unaccounted income and wealth both inside and outside the country'. It came to the conclusion, after consulting three premier think-tanks and doing multiple analyses using various methods, that there was no reliable way to quantify black money whether in India or abroad.

**What is black money?**
There is no official definition of black money in economic theory, with several different terms such as parallel economy, black money, black incomes, unaccounted economy, illegal economy and irregular economy all being used more or less synonymously. The simplest definition of black money could possibly be money that is hidden from tax authorities. That is, black money can come from two broad categories: illegal activity and legal but unreported activity.

The first category is the more obvious of the two. Money that is earned through illegal activity is obviously not reported to the tax authorities, and so is black. The second category comprises income from legal activity that is not reported to the tax authorities. For example, let us assume that a piece of land is sold, with the payment made in the proportion of 60% by cheque or electronic transfer, and 40% in cash. If that 40% cash component is not reported to the Income Tax Department, then it is black money. A large number of small shops around the country almost exclusively do business in cash without receipts. All of this could potentially be black money.

Another major source of black money is income earned by companies that is routed through shell companies abroad, thereby evading tax authorities.

**Why is it difficult to measure it?**
The very definition of black money makes it extremely difficult to quantify. How is the government supposed to measure the economic activity that is actively being hidden from it? According to the Standing Committee's report, the sectors that see the highest incidence of black money include real estate, mining, pharmaceuticals, pan masala, the gutkha and tobacco industry, bullion and commodity markets, the film industry, and educational institutes and professionals.

> There are several ways in which black money may be traced, through legislative action, monitoring non-filers of income tax and PAN reporting for high transactions

As the report also notes, neither are there reliable estimates of black money generation or accumulation and nor is there an accurate well-accepted methodology to make such an estimation. Every estimate depends upon the underlying assumptions made by the designers of the measurement, and so far there is no uniformity in the assumptions made by the various agencies tasked with measuring the black economy.

The estimates of the black money in the system provided by the Standing Committee vary from 7% of GDP to 120% of GDP, highlighting the wide variance in the methods of estimation.

**What are some of the methods used?**
One of the more popular methods is the monetary method. This method assumes that the existence of and changes in the share of unaccounted income is reflected in the stock or flow of money in the system. In other words, track the money in the economy and you'll get an idea of how much has not been accounted for.

Another method is the global indicator or input-based method. In this method, unaccounted income is modelled using a single universal variable with which it is assumed to be highly correlated, therefore these estimates are also called input-based estimates. Basically, the estimated level of activity in these indicators is compared to the reported level of GDP to arrive at an estimate of under-reporting.

One common input used in this method is the quantity of land freight transport. The idea is that matching the actual amount of freight transported in the country to the reported amount of economic activity in the related sectors could give an estimate of how much is not being reported.

A third method to measure black money is a straightforward survey. This one, however, requires voluntary information from people and businesses concealing their incomes and so is prone to inaccuracies.

**How can the government curb black money?**
There are several ways and the first is through legislative action. The government has already enacted several laws that seek to formalise the economy and make it necessary to report economic transactions. These include the Central Goods and Services Tax Act, the various GST Acts at the State levels, the Black Money (Undisclosed Foreign Income and Assets) and Imposition of Tax Act, 2015, the Benami Transactions (Prohibition) Amendment Act, and the Fugitive Economic Offenders Act to name a few.

Another method employed by the government to make it harder for transactions to be hidden is to mandate the reporting of PAN for transactions of more than ₹2.5 lakh, and the prohibition of cash receipts of ₹2 lakh or more and a penalty equal to the amount of such receipts if a person contravenes the provision.

The Income Tax Department has also started monitoring non-filers of income tax returns using third-party information to identify persons who have undertaken high value financial transactions but not filed their returns.

# Should India stay with RCEP?

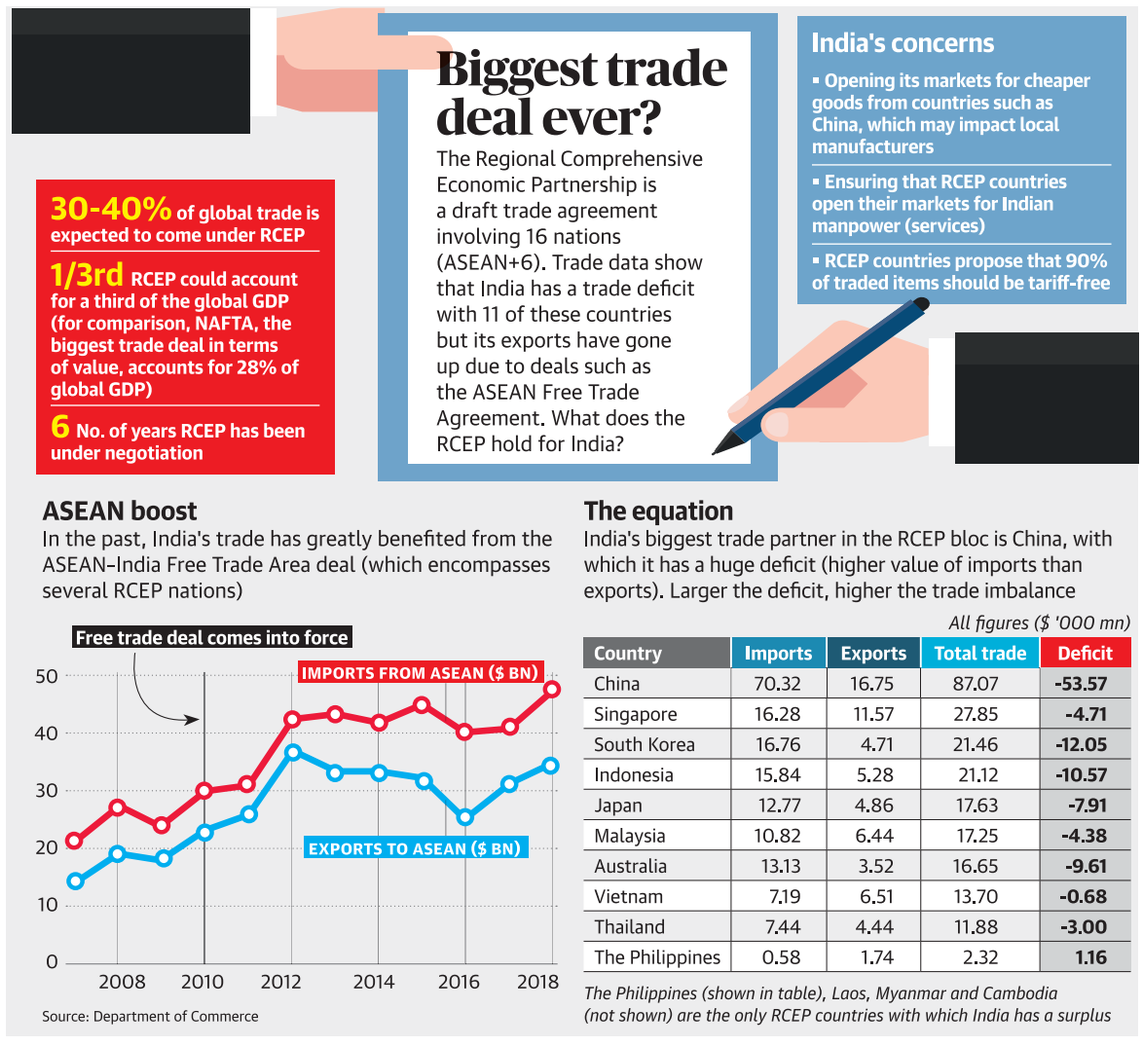
## What are the concerns regarding the Regional Comprehensive Economic Partnership mooted by ASEAN? What is holding up India's entry into the trade pact?

SUHASINI HAIDAR

**The story so far:** The Association of South East Asian Nations (ASEAN), which announced the idea of a Regional Comprehensive Economic Partnership (RCEP) in 2012, is pushing stakeholders to conclude talks by the end of 2019 and take it forward. At the ASEAN summit which ended in Bangkok last Sunday, the Malaysian Prime Minister, Mahathir Mohamad, said he is willing to push through the trade agreement without India "for the time being." Others said all 16 members must agree on the final RCEP document. India apart, Australia and New Zealand have raised concerns about joining such a partnership.

**What is RCEP and why does it matter for the world?**
Billed as the world's biggest trade agreement, the RCEP of 10 ASEAN countries with its six free trade agreement (FTA) partners India, China, Australia, New Zealand, Japan and South Korea could well change the face of global trade as we know it. The RCEP includes countries that make up 45% of the world's population with 33% of its GDP, and at least 28% of all trade in the world today. If the RCEP is concluded, as ASEAN countries that are driving it hope it will be, by the end of this year, it will bring stability to an otherwise unpredictable world market. The worry is that it could also make world trade less flexible, putting members into a quasi-bloc with China at the helm. Most RCEP members also conduct substantial trade with the United States, and the ongoing U.S.-China trade war may force many of them to take sides, causing a geopolitical rift within the group even before it is fully formed. As a result, the next four months leading up to the next RCEP summit will be watched closely by the entire world. Anticipation levels are high, and the ASEAN grouping even has a countdown to the summit, to be held on November 19 in Bangkok, on its website (https://bit.ly/2XcjAe2).

**Why has it taken so long to negotiate?**
This week marks the 26th round of negotiations for the RCEP, which are being held amidst high secrecy in Melbourne, Australia (June 22-July 3). So far, seven of the 18 final RCEP agreement chapters have been concluded, say officials, and ASEAN chair Thailand has committed to wrapping up all the rest in time for the November summit. The concept of the RCEP was promoted by ASEAN countries in 2011, but an RCEP declaration came at the ASEAN summit in Phnom Penh in 2012, and negotiators met for the first time in 2013. Six years later, the main stumbling blocks for the RCEP are the India-China trade relationship, as well as some concerns from Australia and New Zealand on labour and environmental protections. While much has been agreed on, and all countries remain committed to concluding the RCEP agreement, the last-mile will only be crossed when all those concerns are met. In May this year, China proposed a plan to conclude the negotiations without the naysayers, i.e. take the ASEAN+3 (China, Japan and South Korea) into the agreement, while leaving space for India, Australia and New Zealand to join later. The Malaysian Prime Minister, Mahathir Mohamad, echoed the idea after the ASEAN summit last week, but the move was opposed by most in the grouping. As one ASEAN diplomat put it, given the size of India's market there is "no point without India in RCEP". For India, too, there are many reasons to stay in the deal. Apart from giving up the first mover's advantage, India would give up the chance to frame the grouping's rules and investment standards if it fails to join the RCEP at this stage. Staying out would also run counter to the Narendra Modi government's plans to ramp up its engagement with ASEAN countries through the "Act East" policy, as well as its hopes for maritime cooperation in the India-Pacific.




**Why is India holding up the deal?**
India's chief concern with the RCEP is the fact that it needs to protect its economy from the flooding of cheap imports from China. Of all the countries in the RCEP, India is the only one not involved in any bilateral or multilateral negotiations for an FTA with China, and the worry for the government and industry is that an FTA within the RCEP will just become a cover for duty free trade into India for Chinese goods. RCEP negotiators have thus far agreed to allowing India a differential tariff ladder, for its FTA partners and its non-FTA partners (China, Australia and New Zealand) within the grouping. China wants zero tariffs for over 90 per cent tariff lines however, which could see low-cost "Made in China" goods kill locally manufactured goods.

> Several industry groups have already petitioned the government not to go ahead with the RCEP. Adding to this is political pressure

Several industry groups have already petitioned the government not to go ahead with the RCEP, including manufacturers of steel and aluminium, copper, pharmaceuticals and textile, which will be the worst hit in such a scenario. Adding to the pressure on the Modi government is its own protectionist underpinnings within the Bharatiya Janata Party (BJP) and its parent body, the Rashtriya Swayamsevak Sangh (RSS). Ahead of the last round of negotiations in February 2019, the RSS's trade body, the Swadeshi Jagran Manch, had called for a clear declaration that the government would quit RCEP negotiations entirely, citing the impact the agreement would have on agriculture and dairy sectors. The SJM also pointed out, like many other industry bodies, that India's trade deficits have only grown with each country it has an FTA with, and already has deficits with 11 of the 15 other RCEP countries. As a result, the government has been cautious about moving ahead. India has asked for strict "Rules of Origin" markings on all goods, so they don't come in through a third country. In addition, India wants to ensure the free flow of services (manpower) to RCEP countries as well, but has faced an uphill task as most countries tighten their immigration laws. During the current round of talks in Melbourne, trade negotiators are focussing on market access for goods, services, and investment as well as negotiations on Rules of Origin, Intellectual Property and e-commerce, and the outcome of this round will be most keenly watched.

**What lies ahead?**
Once the Melbourne round ends, a three-member delegation consisting of ASEAN Secretary General Lim Jock Hoi and representatives from Thailand and Indonesia will be coming to New Delhi to put the negotiations on a fast track. For its part, China says it is willing to reassure India on its concerns, and sent a delegation led by Vice-Minister for Commerce Wang Shouwen for talks with India's Commerce Secretary Anup Wadhawan earlier this month. In the past year, China has improved market access to several Indian agricultural and pharmaceutical products, and says it is working on ways to balance the nearly $60 billion-plus trade deficit that India suffers at present. Officials privy to the discussions on the RCEP, however, said the talks were inconclusive. Last year, Mr. Modi and others at the RCEP summit had convinced the group to wait a year, given that elections in India, Indonesia, Thailand and Australia were due. With fresh mandates, each of the leaders of those countries, including Mr. Modi, is expected to have a greater ability to take tough decisions this year. The worry, say many diplomats, is that 2019 is a make or break year for the RCEP, and if it doesn't conclude now, the deal itself could be "dead in the water".

# Why are monsoons difficult to predict?

## Have the methods to forecast India's seasonal rain changed? What are the factors that can turn predictions awry?

JACOB KOSHY

**The story so far:** The southwest monsoon made a late entry into Kerala on June 8, after a delay of nearly a week. However, things haven't looked rosy. With India having posted its lowest pre-monsoon rain from November 2018 to March 2019, reservoirs were depleted and a good monsoon was necessary. As of June 27, India got only slightly more than two-thirds of rain it normally gets in this month. Many places, including Chennai, are in the grip of a water crisis and about 80% of the country's meteorological divisions have registered deficient rainfall.

**What is the prediction for the months ahead?**
July and August are most important for the monsoon and contribute nearly 66% of the 89 cm of rainfall that India gets from June-September. This year, the India Meteorological Department (IMD) had forecast in May that July rainfall would be 95% of what it usually gets and August 99% of its normal. These numbers were calculated on the assumption, in April, that an El Niño– characterised by a warming of the Central Pacific Ocean – that seemed to be visible on the horizon, would slowly lose steam. An El Niño is generally associated with a weakening of monsoon rains in India though there are several other climatological factors that too could cause a drying up of monsoon rains. In May, the IMD said India would get 'normal' rains from June-September. The agency, however, refrains from giving a specific forecast for the month of June. Historically, there's no correlation between the amount of rainfall in June to what lies in the month ahead. Cyclone Vayu that formed in the Arabian Sea and threatened Gujarat was a major hurdle to the progress of the monsoon. Later a western disturbance – a rain-bearing system that passes over Pakistan, Jammu Kashmir and parts of north India – was also obstructing monsoonal currents.

The delayed progress of the monsoon, that is causing national consternation, is largely due to the laggardly branch of the monsoon that begins in Kerala and travels upwards along the western coast. The monsoon branch that enters eastern India, around the same time as the southern branch, is relatively better performing thanks to convective currents formed in the Bay of Bengal.

**To what extent has the monsoon covered the country?**
The monsoon has covered the whole of south as well as eastern India. By July 15 the monsoon should have ideally covered its last outpost in western Rajasthan, but this is unlikely given the delay in the monsoon's advent. In the week ahead, it's expected to make further inroads into central India and most of Gujarat and Uttar Pradesh. However, the geographic spread obscures the quantity of rain. Only two of India's 36 meteorological subdivisions have posted normal rainfall and 27 of them are grappling with deficient rainfall. By June 30, a low pressure pulse is expected to form over the Bay of Bengal and give a significant push to the monsoon.

K.K. MUSTAFAH

**How is the monsoon forecast?**
Until about 2010, the only method employed by the IMD to forecast the monsoon was statistical models. These essentially involved identifying climate parameters linked to the performance of the monsoon – for instance, the sea surface temperature gradient between North Atlantic and North Pacific, the volume of warm water in the equatorial Pacific and the Eurasian snow cover. Their values in February and March are correlated to values of actual rainfall over a hundred years and then, using statistical techniques, extrapolated to forecast a particular year's monsoon. This has, however, proved wrong and the IMD missed its mark on forecasting major droughts and rain-deficits – particularly 2002, 2004 and 2006. The IMD responded by finding new parameters but keeping the technique essentially the same.

Only around 2015 did it start testing a dynamical system. This simulates the weather at a chosen set of locations on a given day – the land and ocean temperature, moisture, windspeeds at various heights, etc. – and computers calculate how these weather variables will change over days, weeks, months. It's able to do this by solving physics equations that show how each of these weather variables is related to each other. Though meteorological agencies around the world are shifting to such techniques, they still aren't considered entirely reliable for forecasting the monsoon. The IMD and several private weather agencies are increasingly relying on more sophisticated and high-resolution computer models to give localised forecasts, or warn farmers of changes in weather 10-15 days ahead. Rather than long-range forecasts that only give a broad tenuous picture of the likely performance of the monsoon, these shorter forecasts are far more reliable and help farmers make decisions about sowing. These models are also useful for anticipating heat-wave or a cold-wave and therefore useful to urban planners and government. The statistical model continues to be the bedrock of the IMD's forecast philosophy but its days are numbered.

**Does the monsoon have a bearing on India's water crisis?**
Yes and no. India's water crisis, according to experts, is due to over-extraction of groundwater resources and not enough storage of rain water and surface water. The Central Water Commission, in its recommendation of how reservoirs should store and release water assumes that reservoirs will be empty on June 1 and gradually refill over the course of the monsoon, and be available for the non-monsoon months. Given that June contributes only 17cm or about 20% of the monsoon rainfall and is known to progress in spurts, farmers have already delayed sowing and relying on crop varieties that grow relatively quickly. Moreover, several farmers plant intensely water-guzzling crops that aren't suited to their climate or prevalent water table. While a July rainfall can temporarily alleviate parched ground, it can't solve the graver crisis of depleting groundwater and insufficiently charged aquifers.

> Though meteorological agencies around the world are shifting to dynamical techniques, they still are not considered entirely reliable for forecasting the monsoon

## CAPSULE

**Strong smell**
It is well known that elephants have a fine sense of smell. An experiment on Asian elephants that controlled for alternative interpretations found that they could differentiate a bucket containing a lot of sunflower seeds from those with far fewer seeds, purely using their sense of smell. This study addresses bias in tests of animal perception and cognition.

**Climate change guide**
Dendrochronology, the analysis of tree rings to infer things about the past, can now be used to understand the future. A study, published in *Nature Communications*, of tree rings of living and dead conifers suggested that slowly growing trees sequester more carbon than fast-growing ones. This finding can inform environmental policies that rely on plantations of fast growing trees to mitigate global warming.

**A fine tuning**
Scientists at Massachusetts Institute of Technology have found a way to convert molecular structures of proteins into audible sounds resembling musical notes. Once the conversion is done, they can alter some of the notes and then reconvert the notes back into proteins to produce proteins that have never been seen in nature. The method translates the 20 types of amino acids into a 20-tone scale.

**Malaria reaching out**
A slight rise in temperature may increase the risk of malaria to hundreds of thousands of people in areas currently too cold for malaria parasites to complete their development, according a study. This is because the parasites develop much faster at these lower temperatures than has been previously estimated, according to the researchers from Penn State University

# IIT Hyderabad fabricates device for early diagnosis of heart attack

### The microfluidic device can detect the biomarker even at low concentrations

R. PRASAD

A cardiac biomarker – cardiac troponin I – that is widely used for early diagnosis of acute heart attack can now be detected in about three minutes and even when present at very low concentration. And the detection can be done at bedside. This has become possible with the development of a microfluidic device by a team of researchers from the Indian Institute of Technology (IIT) Hyderabad.

The heart cells that get damaged during heart attack cause the expression of cardiac muscle proteins such as the biomarker cardiac troponin I, which get released into the blood. Detecting the biomaker in the blood serum helps in early diagnosis of heart attack.

**Early indicator:** Heart cells damaged during heart attack cause the release of the biomarker into the blood. ▪ V. SREENIVASA MURTHY

**Superior performance**
Commercially available assays have limitations in terms of both sensitivity and time taken for detection. These assays cannot detect when the biomarker is present at concentrations below 0.02 nanogram per ml and take a long time for detection. In contrast, the microfluidic device developed by the team led by Renu John from the Department of Biomedical Engineering at IIT Hyderabad can detect the biomarker even when the concentration is as low as 0.005 nanogram per ml.

"Our device can detect the biomarker over a wide range – from 0.005-100 nanogram per ml," says Prof. John. Serum samples from patients were used for testing the device. The results were published in the *Journal of Materials Chemistry B*.

Commercially available assays as well the microfluidic device use the same antibody to bind to the biomarker. But the way the device has been constructed makes the difference in terms of better sensitivity and rapid detection.

**Rapid detection**
The researchers have successfully integrated the microfluidic device with chitosan-coated nickel vanadate nanospheres to enable rapid detection and better sensitivity.

The outer surface of the nanospheres is first coated (functionalised) with the antibody that binds to the biomarker. Since the nanospheres have greater surface area, more antibodies are present on the surface thus increasing the chances and ability to bind to the biomarker. The functionalised nanospheres are then coated on the working electrode that is present in the microfluid device chip.

"The integration of the nanospheres which detect the biomarker with the compact microfluidic device speeds up the detection process," says Nawab Singh from IIT Hyderabad and first author of the paper.

"When the patient's serum is introduced into the microfluidic device, the biomarker present in the serum binds to the antibodies present on the nanospheres. This causes a change in the current flow at a microamphere level," explains Prof. John. "The electrochemical response of the sensor changes in response to a change in the concentration of the troponin I biomarker causing a change in the current flow."

**Bedside device**
Since the microfluidic device can be made tiny, detection of the biomaker can be made right at bedside.

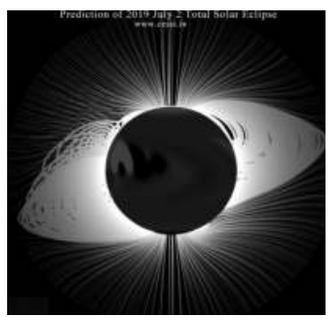
"This is a proof-of-concept work. We have to undertake large trials involving many patient samples before it can be used commercially," says Prof. John.

# IISER Kolkata takes a step towards predicting space weather

### The team has predicted the shape of the Sun's atmosphere that the eclipse will reveal

SHUBASHREE DESIKAN

July 2, this year, is a special day for a team of researchers from the Indian Insititute of Science Education and Research (IISER) Kolkata as a total solar eclipse becomes visible in parts of Chile and Argentina. The team has given out a computer model-based prediction of the shape of the Sun's atmosphere that the eclipse will reveal. Many Indian and international solar physicists will be gathering in Argentina to observe the eclipse and discuss the Sun's influence on our space environment. If the Indian prediction works, it will help us forecast how the Sun's temperament can affect space weather. This, in turn, can help monitor the safety of the electronic sensors in satellites, astronauts' well-being and even the impact on Earth.




**Prediction:** Occulted Sun will show two petal-like formations on either side. ▪ CESSI

**The corona**
The Sun's corona, which is like the Sun's atmosphere, although hotter than its interior, is less dense and therefore emits fewer photons. Therefore, in normal times, the Sun's surface shines so brightly that it obscures the corona. Only when there is a total solar eclipse does the solar disc get 'occulted' by the moon, exposing the corona to our view, albeit using instruments for photographing it.

The Sun's magnetic field lines stretch out from the surface and permeate the corona. Solar plasma wind and storms including flares and coronal mass ejections are born in coronal magnetic field. Emergence of magnetic field from below the Sun's surface and dynamic restructuring in the outer layers changes the shape of the corona. Now a team of researchers from IISER Kolkata, has found a way to predict the shape of the corona well in advance.

**Two-step process**
The team uses a two-step process to predict the shape of the corona. Using a model for the way the magnetic fields emerge as sunspots and evolve on the sun's surface, they first predict what will be the form of the sun's surface magnetic field on the day of the eclipse. Then, they use another model to extrapolate this to reveal what the corona will look like.

The coronal brightness and structure are determined by the magnetic fields of the Sun, which emerge out of the surface and spread out into the corona. "Using computational models, we have predicted the Sun's surface magnetic field on the day of the eclipse. We used this as input to generate the prediction for the coronal field," says Dibyendu Nandi from Center of Excellence in Space Sciences and IISER, Kolkata, who led the research.

Coronal regions which have more intense, closed petal-like loop structures appear brighter because the underlying magnetic fields heat the corona and control its emission. "Observations of these bright and dark structures in the corona during the eclipse can tell us whether our underlying computational models are correct or need more refinement," Prof. Nandi adds.

According to their calculation, the occulted Sun will show two petal-like formations on either side of the corona with extended plume like structures stretching out into the solar system from their tips. It is to be noted that while solar north points upwards on paper, the eastern side is to the left and western side is to the right, unlike the conventions for geographical maps.

The eclipse will last for four minutes and 33 seconds. It will be visible during sunset in parts of Chile and Argentina.

# Nipah virus: Experimental antiviral drug shows promise

### Remdesivir drug used for Ebola treatment can stop Nipah virus from making new copies of its genome

ASWATHI PACHA

In a new study published last month, researchers from the National Institutes of Health, U.S., have shown that Remdesivir was able to treat four African green monkeys which were given a lethal dose of Nipah virus.

Remdesivir is a broad-spectrum antiviral drug which is currently in phase 2 clinical trial for the treatment of Ebola.

Eight monkeys were inoculated with a lethal dose of Nipah virus Bangladesh strain, and, 24 hours later, four of them were treated intravenously with the drug for 12 consecutive days.

**Response in monkeys**
The ones that did not receive the drug developed respiratory problems with the disease rapidly progressing in about a week. Two of these were sacrificed on day seven due to disease severity, and the remaining two were sacrificed on the eighth day when they reached the humane endpoint criteria (when the experimental animal is in pain and/or distress and the experiment is terminated).

**Connection:** The virus that caused Nipah in India belongs to the same genotype as that from Bangladesh used i n the study. ▪ G. RAMAKRISHNA

The four animals which were treated with the drug survived. They did not show any clinical signs up to 92 days and the experiment was terminated.

Though parameters such as body weight and temperature remained unchanged in the two groups, an increased respiration rate and decreased oxygen saturation (oxygen-saturated haemoglobin versus total haemoglobin in the blood) were seen in the non-drug group.

When asked if these results hold true for Indian Nipah strain, Emmie de Wit, the first author of the study said in an email to *The Hindu:* "The Nipah virus that caused the outbreak in India belongs to the same genotype as the Nipah virus from Bangladesh that we used in our study. So although there are some small genetic differences between the two viruses they are very similar. It is always good to confirm, but we are confident that the drug will be effective against Indian Nipah viruses as well."

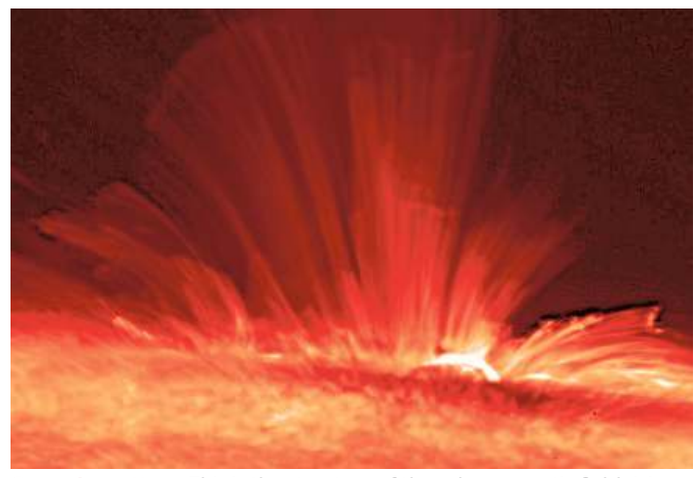
> **It is always good to confirm, but we are confident that the drug will be effective against Indian Nipah viruses as well.**
>
> EMMIE DE WIT
> National Institute of Health

During the course of the study, the researchers found that one of the drug-treated animals exhibited inflammation of the brain tissues.

Dr. de Wit explains, "We know from patients with Nipah virus that they also often develop this disease of the brain when they are infected. There are also patients in Malaysia who were infected with Nipah virus, survived and then got encephalitis caused by Nipah virus several months or years later." This is most likely because the Nipah virus easily enters the brain and then slowly replicates until it causes disease. "In the animal treated with the drug that had histologic evidence of meningoencephalitis, we did not observe any signs of neurological disease at the time the experiment ended, so we were very surprised to see this meningoencephalitis in a small part of the brain," she adds.

**Mode of action**
When asked about the mode of action of the drug, Dr. de Wit writes "Remdesivir can stop the virus from making new copies of its genome. Because the genome is an essential part of the virus, the virus cannot replicate itself very well in the presence of the drug, and there is less damage to organs and thus less severe disease."

"Right now, there are two promising antiviral treatments against Nipah virus that could be used in humans soon. The first is a monoclonal antibody developed by Chris Broder and colleagues at the Uniformed Services University in the U.S. The second promising treatment is Remdesivir. Both treatments are available as clinical grade material and have been safety tested in humans. These two treatments could thus be tested in Nipah virus patients in the context of a clinical trial," explains Dr de Wit.



**Coronal eruptions:** This is the structure of the solar magnetic field rising vertically from a sunspot, into the solar atmosphere. ▪ AP/NASA

# Indian scientist to be Co-I for NASA's PUNCH mission

### The mission will study the Sun using four suitcase-sized microsats

SHUBASHREE DESIKAN

NASA has selected Texas-based Southwest Research Institute to lead its PUNCH mission which will image the Sun. This is a landmark mission that will image regions beyond the Sun's outer corona. Dipankar Banerjee, solar physicist from Indian Institute of Astrophysics is also a Co-Investigator of the PUNCH mission. PUNCH, which stands for "Polarimeter to Unify the Corona and Heliosphere," is focused on understanding the transition of particles from the Sun's outer corona to the solar wind that fills interplanetary space.

"The Sun and the solar wind are one interconnected system, but [these] have until recently been studied using entirely different technologies and scientific approaches," explains Prof. Banerjee in an email to *The Hindu*.

**Focus on polar regions**
Commenting on his role as Co-Investigator in the PUNCH mission, Prof. Banerjee said, "I will be working to study how the solar wind is accelerated. I will focus on the polar regions of the Sun." The team also plans to observe the Sun using joint observations from PUNCH and Indian mission Aditya, which is underway.

India is planning to send up its own satellite Aditya-L1, a mission to study the Sun's corona, and Prof. Banerjee is the co-Chair of the Science Working Group. "We expect co-ordinated observations of Aditya and PUNCH in order to understand our space weather environment," he says.

**Constellation of satellites**
PUNCH will consist of a 'constellation' of four suitcase-sized microsats that will orbit the Earth in formation and study how the corona, which is the atmosphere of the Sun, connects with the interplanetary medium. The mission is expected to be launched in 2022.

The mission will image and track the solar wind and also the coronal mass ejections - which are huge masses of plasma that get thrown out of the Sun's atmosphere. The coronal mass ejections can affect and drive space weather events near the Earth.

**Other probes**
Other missions such as NASA's Parker Solar Probe and the ESA-NASA joint project, Solar Orbiter, which is due to be launched in 2020, can study the structures of the Sun's atmosphere. The PUNCH mission enhances these by tracking these structures in real time. Since the Sun's corona is much fainter than its surface layers, it cannot be viewed by the instruments directly. So PUNCH will block out the light from the Sun to view its corona and the structures in it.

# New approach proposed for post-stroke rehabilitation

### Existing methods ignore diversity of lesions and variability of individual responses

PRESS TRUST OF INDIA

The existing approach for brain stimulation to rehabilitate patients after a stroke does not take into account the diversity of lesions and the individual characteristics of patients' brains, a study has found.

In recent decades, non-invasive neuromodulation methods such as electric and magnetic stimulation of various parts of the nervous system have been increasingly used to rehabilitate patients after a stroke.

Stimulation selectively affects different parts of the brain, which allows you to functionally enhance activity in some areas while suppressing unwanted processes in others that impede the restoration of brain functions.

This is a promising mean of rehabilitation after a stroke. However, its results in patients remain highly variable.

Authors of the study, which was published in the journal *Frontiers in Neurology,* argued that the main reason for the lack of effectiveness in neuromodulation approaches after a stroke is an inadequate selection of patients for the application of a particular brain stimulation technique.

They said the existing approach does not take into account the diversity of lesions after a stroke and the variability of individual responses to brain stimulation as a whole.

The researchers have proposed two criteria for selecting the optimal brain stimulation strategy.

The first is an analysis of the interactions between the hemispheres.

Now, all patients, regardless of the severity of injury after a stroke, are offered a relatively standard treatment regimen. This approach relies on the idea of interhemispheric competition.

"For a long time, it was believed that when one hemisphere is bad, the second, instead of helping it, suppresses it even more," said Maria Nazarova, researcher at the HSE Institute of Cognitive Neurosciences.

"In this regard, the suppression of the activity of the 'unaffected' hemisphere should help restore the affected side of the brain. However, the fact is that this particular scheme does not work in many patients after a stroke. Each time it is necessary to check what the impact of the unaffected hemisphere is - whether it is suppressive or activating," she said.

According to the researchers, the second criterion is the neuronal phenotype.

This is an individual characteristic of the activity of the brain, which is 'unique to each person like their fingerprints'

Such a phenotype is determined, firstly, by the ability of the brain to build effective structural and functional connections between different areas (connectivity).

Secondly, the individual characteristics of neuronal dynamics, including its ability to reach a critical state. This is the state of the neuronal system in which it is the most plastic and capable of change.

**Wrong approach:** Now, all patients, regardless of the severity of injury after a stroke, are offered a relatively standard treatment regimen. ▪ AFP


# Post-retirement blues, paths

BETTY KURIYAN

Come the 60th birthday, sometimes even a few years earlier, it is mandatory to retire from regular service, though it's usual for the cranium contents to function well and intelligently for a good many years ahead.

But as Charles Lamb so succinctly put it, "I'm retired leisure." The encomiums by my juniors have stopped reverberating, the garlands have faded, and the gifts lavishly given no doubt, are consigned to the cupboards – for how many pieces of glassware or crystal or plaques can be put on display?

Now it takes me awhile to remember not to jump out of bed at daybreak to get the household organised before I leave for work. It matters little if the maid turns up an hour late for I have time by the bushel to potter around, make a steaming hot cup of coffee and to listen to the koel on the mango tree warbling its paeans for existence. And I leisurely can glance through the newspaper, beyond the headlines.

Still my feet yearn to saunter to my erstwhile workplace of endeavour of 30 years, the files and friendships that once matured into affection.

I walk into the department, now bustling yet quiet as my younger colleagues are now on the treadmill. They greet me with smiles of concern. They inquire about my health as though I've been an invalid all my life and forgetting that I bid farewell to them officially only a couple of years ago. Most of them hurriedly pick up their files, to attend seminars or workshops, and say "we must meet soon". Maybe some deadline or a way of saying sayonara.

Some small talk comes from those who remain. I feel aloof because the chain of interaction is now lost as rookies fumble with their newfound status and work.

So I stroll out, glad to be out before I become too mawkish for my own good. I stroll calmly through the precincts with its potted plants and colourful bushes, realising that they too will have their retirement date when their leaves fall. I sit for a while under the shade of a spreading tree, and revive my mood.

Back home, there are many books to be read, music to listen to, movies to watch, let me see beauty with new eyes, and the hope and everyday joy that retired life cannot destroy.

I've decided to live each day as it comes, rain or shine, as I hum to myself the opening lines of the theme song from *Dr. Zhivago* – there will be songs to sing, I'm now venturing into learning Japanese, calligraphy or Yiddish. The untravelled world gleams from afar for me, so tomorrow to fresh woods and pastures new.

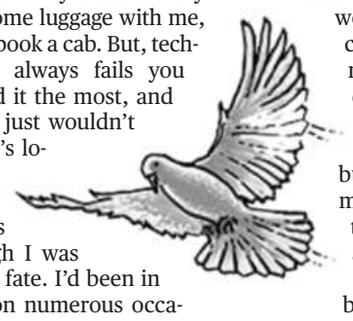
*bkuriyan@gmail.com*

# Friends across borders of acrimony

## Traditions that live, a language that connects, a history that will tie us together

VRINDA LOHIA

It was a rainy evening in Paris, as usual. I'd just arrived at the Nord station and was trying to get to my university, located in the suburbs and almost a lifetime away from the city centre. I had some luggage with me, so I decided to book a cab. But, technology almost always fails you when you need it the most, and my phone app just wouldn't load the driver's location.



I dialled the driver's number, though I was resigned to my fate. I'd been in this situation on numerous occasions earlier. I'd already played out the sequence of events in my head. The driver would receive the message. Then I'd ask him if he spoke some English. He'd refuse and hang up. After a few minutes my ride would be cancelled and I'd be charged a fee by the app for not arriving at the indicated meeting point on time. I felt frustrated even dialling the number.

But, then again, things never happen the same way over and over again. Fate surprises you when you least expect it. I was greeted by a familiar accent on the other side. A voice that sounded like home, in that suddenly alien city. The driver heard the panic in my voice, asked me to calm down, figured where exactly I was, from what I blabbered in my flustered state, and arrived.

As I sat in the car, he looked at me and asked if I spoke Hindi. I excitedly nodded, and asked him if he was from India. He replied in Urdu, albeit shyly, that he was actually from Pakistan. Needless to say, it was the best cab ride I had in Paris.

Studying in Paris, I made a lot of friends. Some were close, others not so much. There were a few, however, who made the unfamiliarity of the city easier to deal with. There was no need to be diplomatic or politically correct around them. There was no need to consciously avoid using any Indian references or 'Hindi' words around them. We could listen to Bollywood numbers together, discuss cricket (even though I'm not particularly fond of the sport), and relish butter naan. While yes, most of them were Indian, there was a Pakistani among them too.

They say friendship begins with a 'me too'. And, we had so many of them. We'd long for home together, we'd bond over a shared sense of ambition, discuss how our cultures were similar, how we'd been taught to hate each other, how our countries were happy and miserable in similar ways. She'd say she had met very few people who were so similar to her, not just in habits and ways of life, but in beliefs and values too. Even though we spent only a few days together, it's uncanny how much we resonated.

But life does go on, time flies and all we're left with is a quintessential 'so close, yet so far' kind of wonderment. In a land where the dividing border isn't just a line, but years of misunderstanding and insecurities leading to wars, hatred trumps love. Warmth, compassion and a shared culture feign as individuals begin to relive atrocities and disregard acts of kindness. We forget that civilians everywhere are the same. They care about their families, decent means of income and leading a peaceful life. We start labelling an entire population based on the acts of a few extremists. We stop trying to understand and start trying to distance ourselves. Yes, we have indeed spent more than 70 years in a state of cold war that continues and reigns. Generations have grown up around media and leaders that falsify events, exaggerate violence and conceal peace efforts. And yet, we can't run away from the fact that we've also spent more than 700 years living together, building traditions together, writing our history together. Traditions that still live, a language that still connects (even halfway across the globe) and history that still does and will always tie us together.

Sitting in those artsy Parisian cafes, surrounded by Italians and Germans and a gazillion other European nationals, I'd often wonder what kept them together, despite the years of war, despite the cultural differences. I'd wonder how many years of despising thy neighbour would it take to finally erase the centuries that were spent being friends.

I know what you're thinking. How can we forget all the lives that have been lost, all the sacrifices that have been made? But that's the thing. Nobody wants you to forget any of that.

We just need to recognise, we've been counting it wrong all this while. In these 70 years, we haven't just lost our friends on this side, but those across the border too.

*vrindalohia@gmail.com*

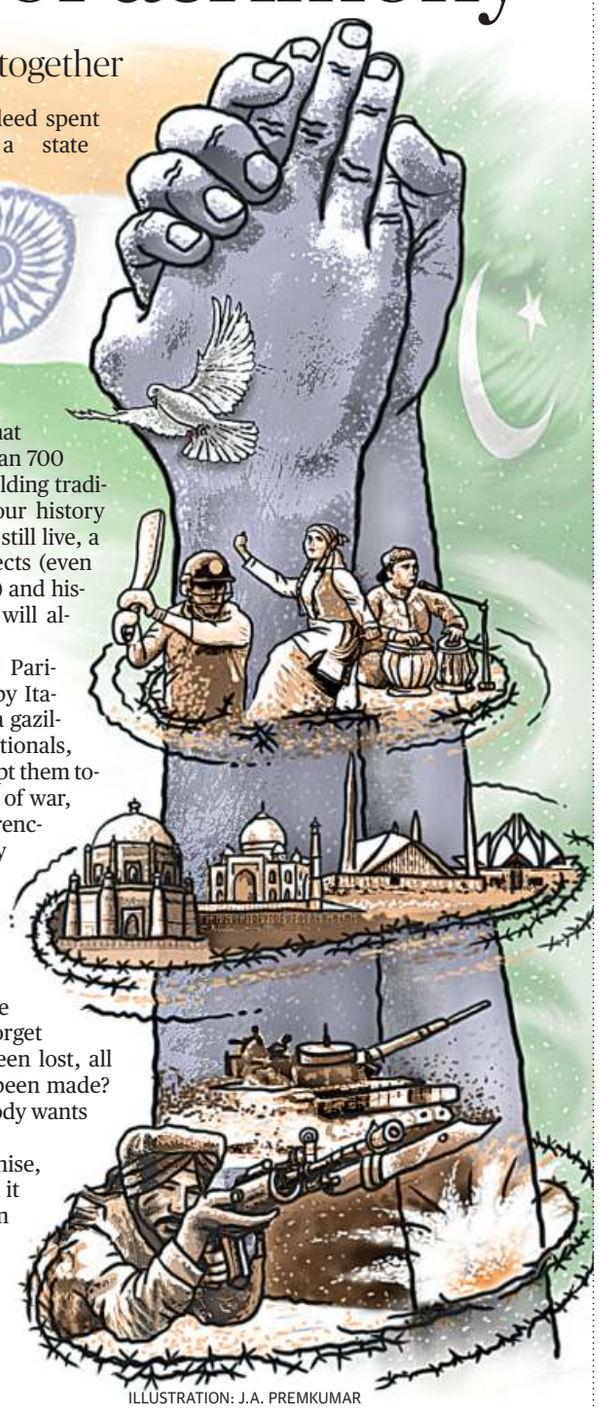


ILLUSTRATION: J.A. PREMKUMAR

# Introvert's journey

SHELLY SIMON

I got into a bus, to a place far away. It isn't the destination that matters, though; it's the journey. I sat on one of the rear seats. It wasn't long before I regretted my choice, as I was tossed about whenever the bus hit a pothole. Ouch! I sat alone, with people all around me.

In front of me was a girl, a silent onlooker. She viewed the outside world with a mixture of wonderment and curiosity. Behind me sat a trio, chatting and giggling the whole time. They didn't seem my type, so I didn't bother to make conversation.

I was interested in the music playing in my ears. I hummed along and watched everything happening outside and inside.

My thoughts kept returning to the girl in front. She seemed like an older version of myself; quiet, though people her age, and presumably in her class by the looks of their uniform, were talking on the seats beside her. Just like me. Thoughts ran through her mind, while music flowed through mine.

I wanted to talk to her, maybe about our mutual reluctance to socialise, or anything else we had in common. But something stopped me. Soon she leaned her head on the window and tried to take a nap. I wanted to get to know her. But she seemed at peace with herself, and I didn't want to disturb her. We reached our destination. She got off, I followed. She went her way, I went mine, wondering how the whole ride might've been had I talked to her. I guess that's how we introverts work!

*shellysimon07@gmail.co*

# How the pursuit of perfection could drive you

## And in doing so, we could forget to enjoy the journey rather than focus on the goal ahead

CHITRA SRIKRISHNA

"I want my presentation to be perfect," my daughter says on the phone. She is on her way to work on a Monday morning. "What if I make mistakes? What if my team doesn't like it?" As I try to quell her fears over the phone, I wonder what would have happened if I hadn't listened to my own advice sometime back.

With a great deal of trepidation my husband and I had followed our daughter to a small midwestern town in the U.S. when she began her undergraduate education a few years earlier. All I knew about my new hometown was that it had long and brutal winters and was crazy about American football, a sport I knew nothing about. Moving to a new town came with its own set of challenges, and 'what-if' scenarios began swirling in my head – what if I wasn't able to make enough friends? What if I didn't find something to do?

ILLUSTRATION: SATWIK GADE

A week after we had finally settled in a quiet neighbourhood, we met one of our neighbours, a middle-aged couple who lived across the street.

One thing led to another and they became our best friends in town. Over a meal at home as they wolfed down samosas and parathas, they spoke about their newfound passion, a speakers' club. "We meet twice a month and improve our speaking skills in a non-competitive, friendly environment" they explained. "Why don't you attend a meeting and just check us out?"

"I'm not speaking. I'll not be speaking," I remember muttering all the way as my husband dragged me to a quaint cafe where the meeting was being held. "At least we'll get to meet some people!" he argued.

Having been a professional musician all my adult life, you would think I was comfortable in front of strangers. But I had never spoken during any of my concerts and was often tongue-tied when I met people for the first time. I was used to criticism as a performer not just in private but also in public. "You need to get better!" This was the *mantra* that was dinned into me by family and teachers. Thus began my search for perfection – an elusive goal. And the pressure never ceased.

I recall that first speakers' meeting I attended, as though it was yesterday. Within a few minutes of our arrival, my husband seemed to be at home talking to strangers as though he had reconnected with long-lost friends. Meanwhile, I looked for a corner seat in the very last row.

There was a motley crew seated in a room at the back of the cafe – a rabble-rouser of a grey-haired professor, a theatre-loving couple, a dyed-in-the-wool musician, student secularists, fiction writers, and others. I was reminded of John Steinbeck's description of Cannery Row in the eponymous book: "a poem, a stink, a grating noise, a quality of light, a tone, a habit, a nostalgia, a dream."

**It's time to reevaluate what 'perfection' means to us**

Over the next few weeks, the speeches I heard at the club became the topic of conversation at our dinner table every night. I heard personal testimonies of overcoming grief and disability to camping adventures and kitchen disasters. I watched speakers fumble and mumble their way through their speeches and then asked myself, "Why not take the plunge?"

My new club friends showed me a way to improvise without the pressure. I shared anecdotal experiences, some funny, often reflective. And after each one I received feedback that was encouraging and energising. The watershed moment came when I demonstrated at one of our meetings how to wear a sari in six simple steps. My speech may have been imperfect, not unlike the pleats in my sari. But I was filled with an immense sense of contentment. In the pursuit of perfection I realised how I had forgotten to enjoy the journey rather than focus on the goal.

We live in a society where children are pulled up by parents for not scoring perfect grades in every test. It's time to reevaluate what 'perfection' means to us. I took the first step that day, just as my daughter was about to hang up, by reminding her of Leo Tolstoy's words, "If you look for perfection, you'll never be content."

*chitra_sri@yahoo.com*

# The long and short of a desired name

## Nomenclature toss-about, and finally a seeming resolution of the issue

S.R. NAMBIAR

My parents' marriage was a union of two families from different milieus. A reflection of this can be seen in the names and the numbers of their siblings. My dad's eight siblings have names that are at least 10 letters or more in length – Ramakrishnan, Kunhiraman, Kamalakshi, and so on. In contrast, my mom's four siblings have briefer names, such as Vishnu and Girija.

So, when Uma and Ramakrishnan got married one might have expected serious negotiations to take place when the time came to name their offspring. But mom's independent streak and a difference in the respective cultural rituals precluded this – while on mom's side a newborn is by tradition named at the 28th day ceremony, on dad's side this is done along with the rice-feeding ceremony held when the child is five months old.


ILLUSTRATION: SREEJITH R. KUMAR

When the time came to hold the 28th day ceremony of the first-born of my parents, in the presence of relatives from both sides, the son, lovingly called Appu, was formally named 'Prakash' – a name mom liked but dad did not disapprove. Mom did not feel the need to confer with anyone over the issue of naming her son.

As was to be expected, the relatives from dad's side were taken by surprise, though no one overtly disagreed with the name, except my paternal grandmother. She was upset and quite vocal about her disappointment. For many years to come she chided mom for denying her the right to name her grandson, which she held was the prerogative of the child's father's side. She indicated she would have preferred a more traditional name such as 'Ramachandran', to go with 'Jayachandran', which was what she had named another of her grandsons.

Mom always made light of the issue, but little did she know how fate would intervene in the matter of her son's name.

When Appu was old enough to go to school, in Mumbai where dad was employed, the school insisted on adding the father's surname to his name. In the matrilineal society of the Malabar region to which my parents belonged, the norm is that the children take the mother's surname. Mom was disappointed at this development, though not as much as Appu himself, who hated being allotted Roll No. 1, given the alphabetical slot the name brought in all lists, with all its attendant disadvantages and anxiety – for, in the school records Appu ended up as 'Aaliyot Prakash Ramakrishnan'.

Appu persevered through the 'Roll No. 1' years, till finally, when he was in Class 10, due to some administrative mix-up or other reason, the school decided that 'Aaliyot P. Ramakrishnan' suited him better. Mom had had enough of the obscuring of the name she chose for her favourite son, and dad was coaxed to head to court to get the anomaly fixed legally – to retrieve 'Prakash' from the oblivion of being reduced to a mere initial. Thanks to dad's efforts, when Appu passed his SSLC examination with flying colours, while dad smiled looking at the list of marks, mom smiled even more looking at the name printed in bold which read 'Prakash Ramakrishnan'.

Freed from the performance anxiety of being Roll Number 1 maybe, Appu soon afterwards cracked the National Defence Academy test and became an officer in the Indian Army – a first in the family. Mom and dad were proud of his achievements. When invited for Appu's commissioning ceremony at the Indian Military Academy, they were overjoyed to see him in full formal military regalia for the first time.

But something rained on mom's parade – right there, on her favourite son's broad chest, was a shiny name tag that read 'P. Ramakrishnan'. And worse, as if to remind mom of her mother-in-law's disappointment over the naming, Appu's army-mates just called him 'Rama'!

Mom grudgingly resigned herself to this situation. But never one to easily admit defeat, she was keen to add to the ranks of people who called her first-born by the name she had given him. So when my parents successfully found a suitable bride for Appu, the only demand mom made of his future in-laws was that they call him by the name that she had chosen for him.

So, unlike many other wives who have special names of endearment for their husbands, mom's dutiful daughter-in-law always calls her husband 'Prakash'.

*nombiar@gmail.com*

## More on the Web

thehindu.com/opinion/open-page

### Go, reconnect with life

Let's just raise our heads above those screens and observe and interact with the world around us

SAAVI SRIVASTAVA

### The universal genius

Why it is just impossible that Leonardo da Vinci had disabilities such as ADHD

J.V. YAKHMI

### A mirror unto oneself

So, can we at all live without those window-dressing exercises?

S. SIVARAMAN

Contributions to this page may be emailed to **openpage@thehindu.co.in** to a length of up to 700 words. Please provide the postal address and a brief description of the writer. An email id that is provided could be considered for publication. Certify in writing that it is original material; *The Hindu* views plagiarism as a serious issue. Also confirm that the submission is exclusive to this page. Taking into account the volume of material being received, we regret our inability to acknowledge receipt, or to entertain telephonic or other queries on the status of a submission. If a submission is not published within eight weeks, consider it to be out of the reckoning – in most cases owing to dearth of space. The publication of an article is not to be seen as *The Hindu* endorsing the viewpoint in any way.