

# ONE INDIA ONE PEOPLE

Patriotism Redefined



## The Indian Space Saga

It's a 'go'!

ISRO's art of winning

*When students built a satellite*

**FACE TO FACE**

**Dr. Neha Satak**

**KNOW INDIA BETTER**

Hyderabad

chronicles of palaces, forts and culture

MORPARIA'S PAGE



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Major General Rajinder Singh 'Sparrow', MVC and BAR



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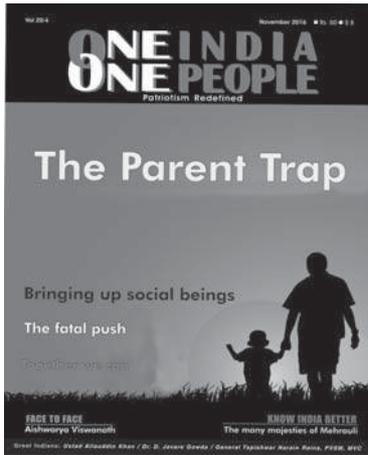
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## LETTER TO THE EDITOR



**“Harassing the common man”**

Unearthing black money by harassing the common man is not a good thing to do. Narendra Modi should realise this. Corruption and black money exists everywhere, even within the Modi government. The ministers in the PM’s

cabinet have more black money than any of us. Our Prime Minister should realise this. Modi is just harassing the common man by banning currency notes of ₹1000 and ₹ 500. Where is the black money that Modi promised to bring back to India from Swiss banks at the time of elections in 2014? The promises made by NaMo at the time of elections seem to be completely forgotten. Narendra Modi

had promised the common man that he would bring down corruption within 100 days of his tenure. But what he is doing is just the opposite. With Narendra Modi as the Prime Minister of India, we Indians are suffering a lot.

What has Narendra Modi done for the country ever since he became the Prime Minister of India? He has banned beef (cow’s meat) from the country which every Christian and Muslim eats. He has also passed a law that those consuming or possessing cow’s meat will be fined heavily and imprisoned too. This clearly states that he does not care for the Christians and the Muslims of the country.

– Jubel D’Cruz, Mumbai

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## WHO AM I?



# From *vadas* to Chandrayaans

*For a society which has so much faith in the planetary orbits and behavior, we need to push the next generation more towards space science, says Nivedita Louis.*

**M**Y earliest memory of space science dates back to those days when grandmother dearest showed me the moon and tried to feed me a handful of curd rice. The rice glided inside as I listened to the description of a grand old lady showing up on the moon every night. She used to make tasty *vadas*, for whom in the moon, no one ever knew. As years flew by, I started confusing astronomy and astrology, promptly comparing the ringed Saturn and Shani, the Bhagwan, who refused to move away from my astrological chart tables. He still sits bang at the middle of any astrological reading, but now I am old enough to understand that He is omnipotent and omnipresent in my astrological profile.

Every time we end up purchasing goodies at the Spar chains, the bill always looks astronomical. Our general knowledge on space and research ends there. We, Indian women, are however, trained astronauts. The *salwar* suits that we don are made up of burn-proof material that roasts us inside, but keeps our skin fair and lovely. The cars we drive are rockets that always fail to park at the designated orbits. Ask a lady to parallel-park a car and you will know why only twenty percent of ISRO's work force is women.

The whole world woke up one fine morning to see a bunch of women clad in *Kanjeevarams*, donning jasmine flowers and eagerly hugging each other and congratulating, on TV. Indian space research had come of age the day this team launched Mangalyaan into space successfully. Till then we were only content with watching *saas-bahu* soaps where dinner plates were launched into wash basins by irate *bahus*. Our Prime Minister happily announced, "A one-km auto rickshaw ride in Ahmedabad cost 10 rupees and India reached Mars at 7 rupees per km." He accepted point blank that our autowallahs actually run their autos on space fuel!

Chandrayaan found water in the moon. I am waiting for the day I would be joining grandma up above the world so high, so I can explain to her that the *vada* frying old lady accidentally kicked her bucket of water and Chandrayaan discovered it! And oh...our scientists took models of Chandrayaan to Tirupati before launch for divine blessing. In addition to propulsion power, we do have the divine power to go that extra mile! Our trucks zoom in the highways on

lemon power, yes, the same lone *nimboo* that dangles in front of the chassis and our rockets launch into space on laddoo power! It is a real joy to learn Sunita Williams takes the Bhagawad Gita on her space flights, and it doesn't matter if she is half Slovenian! She is a true *bhakt!*

Not just rockets and *yaans*, we have multiple satellites to our credit. Our Resource Sat imagery can generate crop estimates months ahead! No cheating, state governments, Big Uncle can see what grows in your state and how much! Ocean Colour Monitors send accurate data on availability of fish, and fishermen receive density of fish in the sea on mobile apps. Here I am, trying to log into my FB account without a hitch for the n<sup>th</sup> time.

Dr. Vikram Sarabhai, Dr. A.P.J. Abdul Kalam, Kalpana Chawla, Rakesh Sharma, Ravish Malhotra, Madhavan Nair, Moon Man Dr. Mayilsamy Annadurai, K. Radhakrishnan, Missile Woman Dr. Tessy Thomas – the list of inspirational space/research scientists of India and their life stories are nothing short of marvels. There are success stories of men and women all around us, who have catapulted Indian space research into fame and thankfully they are not in our textbooks. I dread the day ten-year-olds would read "Rakesh Sharma's Soyuz stories", told Indian text book style and learn it by heart 10 times! Dr. Mayilsamy Annadurai completed his entire education in government schools and colleges, learning in his mother tongue Tamil and so did our Dr. APJ!

We Indians are a confused lot – we pay astronomical sums to our astrologers, but seldom teach space science to our children. I count myself lucky to have laid down on the terrace with my mother and deciphered constellations. In turn, I check constantly for NASA's tweets and show it to my son. As a nation, we still have a long way to go in space research. Still, the skies are not far, if we give a gentle push to our children to search for knowledge, to look up for the stars and someday, to land up on distant planets. ■



**Nivedita Louis is a writer, blogger and social activist by choice. Bitten by the travel bug, and smitten by nature, she loves travelling and cooking. She blogs at [www.cloudninetalks.blogspot.com](http://www.cloudninetalks.blogspot.com).**

# All the way up

*India can take a bow for its largely indigenously built space programme, which is today the country's pride. It is also extremely reliable, and of immense use not just to India, but to other nations too, marvels Dr. Mayank Vahia.*

INDIA's space programme began with one of the great visionaries of India, Vikram Sarabhai. Encouraged by Homi Bhabha who initiated India's nuclear programme and supported by India's first Prime Minister Jawaharlal Nehru, Sarabhai laid the foundation of the programme. Begun originally with US assistance in sending up sounding rockets that barely went about 100 km up, Sarabhai soon realised the need for complete indigenisation of the programme. Today, India's programme owes no credit to any other nation.

### The finest designers of rockets and satellites

In this highly secretive and competitive human endeavour, Indian programme has made its mark with by far the most reliable launch vehicle called PSLV (Polar Satellite Launch Vehicle), and as the finest designers of satellites.

A space programme has two components, rocket, the vehicle that takes the object into space, and the satellite or the payload that goes into space. Rockets are tricky since they have to accelerate an object from rest to about 11 km/s in a matter of a few minutes. Few rocket engines can do it single-handed. So typically, the rocket that we see as a rocket, is typically 3 or 4 rockets sitting on top of each other. The lowest most rocket carries the upper rockets to a certain height and then disengages so that the second rocket can be ignited (switched on) to take the payload further into the space and so on, until the payload or payloads that the rocket may carry, are put into their desired orbit.

Similarly, satellites present a distinct challenge of their own. A satellite must withstand being accelerated from 0 km/s to 11 km/s in a matter of few minutes. It must be packed into an extremely small volume – typically a payload bay is a couple of meters in diameter and height. Once in space, it must generate its own power through solar panels, and withstand the harsh environment of outer space. Once



A PSLV launch

(Photo credit:ISRO)

launched, a satellite, in general, cannot be repaired. So it must also be extremely reliable.

Amongst the rockets, India's work horse, the PSLV, can take a payload into an orbit up to 800 km. Originally designed to put payloads into polar orbit (rotating from North pole to South Pole), it has now been modified for a variety of uses. However, the rocket is not very large and can take a maximum of 2000 kg objects into space. India is now in the final stages of testing and approving a far bigger GSLV (Mark 3) which will carry about 5000 kg into space. We will then be able to launch our own communication satellites, which we currently launch using foreign rockets.

Payloads may be satellites that revolve around the earth or interplanetary missions. They may be used for observing the earth or observing the space, free from interference of the atmosphere. When the satellites observe the earth, it is preferable that they are kept in an orbit that goes from pole to pole so that as they complete their revolution, the Earth, spinning under them, will allow the satellite to see the whole earth with minimal effort. The communications satellites on the Earth should move with the Earth so that they complete one rotation per day, and are also at the Equator so that they

appear stationary to us. These are called geostationary satellites and are used for communication. These satellites need to be at an altitude of about 36,000 km so that their revolution period is 24 hours. Such satellites can be used for communication, weather monitoring etc.

### Nearly self-reliant

The Indian space programme has made India nearly self-reliant in the exploration of space. We not only make and operate our own communication and Earth observing satellites, we also participate in space programmes to explore other worlds. India now also has two kinds of global positioning systems, namely GAGAN, which is used for civilian purposes to help guide aircrafts and ships in their navigation, and a system for Navigation with Indian Constellation (NAVIC) also called Indian Regional Navigation Satellite System (IRNSS). GAGAN sits on the American GPS satellites and improves its accuracy from ten meters to three meters using a series of ground stations and three geostationary satellites (GSAT 8, GSAT 10 and GSAT 15). NAVIC is entirely indigenous and uses a combination of five of our geostationary satellites (IRNSS 1A to 1G). Out of these, IRNSS 1C is geostationary, while others are Geosynchronous, that is, they go around the earth once in 24 hours but are at an inclination to the equator, giving them a slight vertical motion. Using these it can provide highly accurate positioning system for all Indian needs in civilian and defence arena. India also has a vibrant space exploration programme. We have sent one mission each to the Moon and Mars, flown astronomy payloads on several satellites and now have a completely dedicated astronomy satellite. More missions are in the pipeline.

### The Moon mission

Our Chandrayaan-1 Mission was the first satellite of the Moon to provide unequivocal evidence that there is water on moon – soaked in its soil – like water in a sponge. During its nine months of operation, it demonstrated India's ability to use Earth's gravity as an effective sling shot, allowing us to send a mission to the Moon with much less fuel than other missions. Mangalyaan-1, a technology demonstration mission established our ability to send a mission that far, again using Earth gravity as a sling shot. Reaching Mars is like hitting a Re. 1 coin, 1 km away, with a grain of sand moving at 24



**The Chandrayaan-1 Mission** (Photo credit: ISRO)

km/s. We achieved it in our first try. We are now looking forward to Chandrayaan-2 which will allow us to drive a car on the Moon, an Aditya mission to the Sun, as well as Mangalyaan-2. ISRO is providing excellent opportunities to Indian space explorers to explore the universe.

India also has a unique programme called 'Student Sat'. These are small payloads, typically one meter cubes and 10 watt power, which can be designed by students from universities with the help of ISRO. These help students learn the complexities of space programmes. ■



Dr. Mayank Vahia is a professor in the Department of Astronomy and Astrophysics at the Tata Institute of Fundamental Research. He spent thirty years making Indian telescopes for space missions launched by USA, Russia and India, that studied the high energy particles reaching Earth. He has now turned his interest to evolution of science in general, and astronomy in particular, in the Indian subcontinent. He has also been leading India's Astronomy Olympiad Programme.

### The legacy of Aryabhata

*Aryabhata is the name of India's first satellite, named after the great 5<sup>th</sup> century astronomer and mathematician Aryabhata. It was launched by India on 19 April 1975 from Kapustin Yar using a Kosmos-3M launch vehicle. It was built by the Indian Space Research Organisation to gain experience in building and operating a satellite in space. The launch came from an agreement signed in 1972 between India and the Soviet Union. It allowed the USSR to use Indian ports for tracking ships and launching vessels in return for launching Indian satellites. The satellite returned on the Earth's atmosphere on 11 February 1992.*

## THE INDIAN SPACE SAGA

# It's a 'go'!

*The future of India's space agency ISRO is exciting, with many new launches and experiments lined up for the coming year. How did we get to this happy place?*

**Srinivas Laxman** tells us how.

**A**BOUT a fortnight into the new year, if all is a 'go', on 15 January 2017, ISRO (Indian Space Research Organisation) will take the most daring shot in its nearly 50-year-history, never attempted by any space agency in the world. On that day, ISRO will launch 83 satellites in one stroke – most of them from the US, Europe and the UK.

It promises to be a nail-biting mission, and all the satellites, which will be small ones, will be placed in the 580-km sun synchronous orbit. ISRO officials say the major challenge would be to keep

the rocket in the same orbit till all the satellites are placed in their respective slots. The rocket for this much-awaited flight will be the highly-proven, advanced version of the four-stage Polar Satellite Launch Vehicle (PSLV). If this mission succeeds, India's space programme will once again rocket into global history books.

To date, Russia holds the record for launching the largest number of satellites in a single attempt – 37 on 19 June 2014. This was followed by the US which put into orbit 29 satellites in one single shot on 19 November 2013. On 22 June 2016, ISRO put into orbit 20 satellites in one 'go.' The achievement does not end with this. On 26 September 2016, another significant milestone was crossed by our space agency when it placed in orbit eight satellites in two different orbits, in an extremely complex manoeuvre, which was executed flawlessly.

On this day, Prime Minister Narendra Modi tweeted: "Our space scientists keep scripting history. Their innovative zeal



**ISRO had a small beginning at Thumba, a coastal village of Thiruvananthapuram, the capital city of Kerala**

has touched the lives of 125 crore Indians and made India proud worldwide."

And who can forget the ground-breaking Mars Orbiter Mission (MOM) which entered Martian orbit on 24 September 2014, in the very first attempt itself – a feat not achieved by any space-faring nation aiming for the red planet. This accomplishment fetched ISRO a number of international awards.

Remember India's first mission to the moon, Chandrayaan-1, which was launched on 22 October 2008, at the Satish Dhawan Space Centre in Sriharikota, a two-and-a-half-hour drive from Chennai? This mission set a world record by discovering water on the moon.

### **It started from a fishing village**

Interestingly, the story of these achievements did not have a conventional start either in a workshop or laboratory as it is the case in other countries, but in a beautiful church called

St Mary Magdelene Church located at Thumba, not far from Thiruvananthapuram airport. Quite an unconventional, but auspicious launch. Thumba was once a fishing village before the space department took it over with the full backing of the villagers.

In the 60s when the space programme was taking shape, many of the rooms in the church were converted into workshops and offices, and among those who worked at the place was Dr. A.P.J. Abdul Kalam. The conditions were not too advanced, but the scientists and engineers never complained.

The scenario at Thumba was a picture of contrasts. The hi-tech rocket parts were taken in cycles and sometimes even in bullock carts! The church has since been converted into a space museum attracting several visitors.

It was at Thumba that the Indian space programme had its early beginnings, with the design and development of what are known as sounding rockets, which are used for studying the atmosphere. The first sounding rocket was supplied by NASA (National Aeronautics Space Administration), and it was called Nike-Apache and was launched on 21 November 1963. Apart from the US, countries like France and Russia used Thumba to launch their sounding rockets. ISRO started launching indigenous sounding rockets from 1965, and the experience gained was of immense value in mastering solid propellant technology.

Encouraged by the success of the sounding rocket programme, Vikram Sarabhai who headed the space department, called his team and told them that if India had to be truly an independent space-faring nation, it had to develop its own capability to launch satellites.

The scientists wholeheartedly supported the idea and offered their complete support. Thus came the satellite launch vehicle (SLV) programme.

### **The story of our first rocket**

The first one called SLV-3 was India's first experimental satellite launch vehicle. It was all-solid propellant, four-stage rocket, which was capable of carrying into orbit 40 kg class of payloads in the low earth orbit. The first flight in August 1979 failed, but the second one in July 1980 was a thumping success. After this, there were two more launches of this rocket in May 1981 and April 1983.

According to ISRO, the successful culmination of the SLV-3 project paved the way for advanced launch vehicles like

the Augmented Satellite Launch Vehicle (ASLV), the Polar Satellite Launch Vehicle (PSLV), and the Geosynchronous Satellite Launch Vehicle (GSLV).

Following the SLV-3 project was the ASLV. With five stages, it was an all-solid propellant rocket, which was developed to place 150 kg class of satellites into a 400-km circular orbit.

The ASLV project had a mixed bag of success, with only two out of four flights between 1987 and 1994 being successful.

After the ASLV came the 44-metre tall, four-stage PSLV which in every sense proved to be India's super rocket, which has won international acclaim and established itself as one of the world's most reliable launch vehicles. Operating for over two decades, this rocket has the distinction of carrying spacecraft for historical missions, like Chandrayaan-1, the Mars Orbiter Mission, Astrosat, India's first space observatory, the space capsule recovery experiment, and the Indian Regional Navigation Satellite System.



**Dr. Vikram Sarabhai, the father of India's space mission**

According to ISRO, the PSLV is essentially used for carrying remote sensing satellites, and with 11 of them in this category now in orbit, they are one of the largest constellations in the world. These satellites have applications in the field of agriculture, land reforms, fisheries, just to name some of the areas. Their images are also in demand by foreign space agencies. Going by the success rate of the PSLV, foreign countries are in a queue to have their satellites, be it for universities or remote sensing purposes, launched by this rocket. The PSLV has also launched student satellites, and so far, eight have been placed in orbit. The most recent one

is Pratham, a satellite designed by the students of Mumbai IIT.

Following the PSLV, was the three-stage geosynchronous satellite launch vehicle which was once nick named "naughty boy," but has now become a "good boy." It was called a "naughty boy", because of its initial spotty record. Of the nine launches since April 2001, four had failed. The upper stage of this rocket uses the cryogenic engine initially procured from Russia, and subsequently it had indigenous ones having a good success rate.

The GSLV is used for carrying two-tonne class of INSAT-series communication satellites. They are one of the largest domestic communication satellite system in the Asia-Pacific region, with nine of them placed in the geo stationary orbit, which is 36,000 km from the equator. They help in the area of telecommunication, TV broadcasting, weather forecasting, disaster warning, and search and rescue operations.



### India's first private mission to the moon

In the latter half of 2017, probably on 21 September 2017, India's first private mission to the moon by a Bengaluru-based organisation, Team Indus, will be launched. The rocket for this much-awaited historical flight will be the advanced version of ISRO's PSLV-XL.

It is a part of the worldwide Google Lunar X Prize competition, and Team Indus is the sole Indian participant. The competition stipulates that after landing on the moon, the rover which will fly with the mission, has to move about 500 metres on the lunar surface transmitting images and videos to the ground stations. There is no reason why Team Indus should not be the winner.

India wants to launch communication satellites in the four-tonne class. It is therefore developing a rocket called LVM-3. Its first flight was on 18 December 2014, and the second one is slated for January 2017. This rocket will also be used for ISRO's human space flight programme once the green signal is received from the government.

Till LVM-3 becomes operational after a few more test flights, India is launching its four-tonne communication satellites by the European rocket, Ariane-5, operated by Arianespace. The lift off is from European spaceport of Kourou in French Guyana.

All these rockets – the PSLV, GSLV and LVM-3 – are expendable ones. In layman's parlance it simply means that once they fly and put a satellite in orbit, their role ends. This makes the operation pretty expensive.

So, what is the solution? ISRO is therefore, focussing on low cost access to space, which will substantially reduce launch costs. For this it is developing a reusable launch vehicle (RLV) which is a combination of a rocket and an aircraft. It will take off like a rocket and land like an aircraft. The first test flight was on 23 May 2016, and the vehicle landed like an aircraft in the Bay of Bengal, and three more test flights have been scheduled, though no time limit has been fixed.

The first flight met all the objectives. According to ISRO, "The design and development of the RLV was the most technologically challenging endeavours of ISRO."

Quite understandable, considering the somewhat chequered record of similar launch vehicles in other countries – NASA's space shuttle, Russia's Buran and Japan's Hope.

In another significant development, ISRO is working on an air breathing rocket which will inhale oxygen from the atmosphere during the flight. The advantage of this is that it will considerably reduce the amount of propellant needed to place a satellite in orbit. In the bargain, the payload mass can be increased. In plain terms, it means that more instruments can be carried on the spacecraft or the weight of the instruments themselves can be increased. It tested this on 28 August 2016, with what is known as a scramjet engine.

### Small budget, big gains

All this has been achieved by ISRO with a budget of \$ 1.2 billion. Compare this with the budget of NASA which is \$79.27 million. With a frugal budget of \$74 million, ISRO pulled off the Mars Orbiter Mission, grabbing global headlines. Again, in contrast, the budget for NASA's Maven mission to Mars was \$671 million dollars and that of the European Space Agency's Mars Express cost \$ 386 million. India's second mission to Mars called Mars-2 is tentatively slated for launch in 2020.

And finally, the country's second mission to the moon, Chandrayaan-2 with an orbiter, lander and rover, will touch down on the lunar surface in December 2018. All in all it has been an exciting and a thrilling nearly 50-year-old journey for the nation's space programme, from a church to the stars. It is now poised to go further and further. ■

Srinivas Laxman worked with the *Times of India* as a reporter, where his focus was on aviation. He later graduated to the space sector covering numerous launches at Sriharikota. He has visited various NASA centres and the European spaceport of Kourou in French Guyana. He has interacted with well-known luminaries like Neil Armstrong, Buzz Aldrin, Kalpana Chawla, Sunita Williams and Rakesh Sharma. Laxman has written four space-related books – two about India's mission to Mars, one about the Indian moon mission, and a biography of Dr. A.P.J. Abdul Kalam.



### 'Saare jahan se achcha'

Rakesh Sharma, then a 35-year-old squadron leader and pilot with the Indian Air Force embarked on the historic mission in 1984, which made him the first Indian in Space: As part of a joint space programme between the Indian Space Research Organisation and the Soviet Intercosmos space programme, he spent eight days in space aboard the Salyut 7 space station. During the flight, Squadron Leader Sharma conducted multi-spectral photography of northern India in anticipation of the construction of hydroelectric power stations in the Himalayas. The trip made Rakesh Sharma the first Indian in Space, but the event is also remembered for a conversation from Space that he had with then Prime Minister Indira Gandhi. She asked him, 'How does India look from oopar?' His famous reply, borrowed from Allama Iqbal, was, 'Saare jahan se achcha' (better than the whole world)!

# ISRO's art of winning

*The Indian Space Research Organisation (ISRO) has achieved great success with modest means. Using thrift and learning from its mistakes, ISRO has achieved well-deserved acclaim, says **Vithal C. Nadkarni**.*

**S**TARS rather than shoestrings come to mind as metaphors for ISRO's (Indian Space Research Organisation) spectacular success. But both stars and shoestrings or straps, if not stripes, are essential for evaluating ISRO's performance, because ISRO's reach for the stars has truly been powered by a shoestring budget. Two years ago, India's Mars Orbiter Mission (MOM), for example, was successfully launched at one-tenth of the cost of a similar project by the US.

### When MOM met Mars and other stories

On that historic occasion, Prime Minister Narendra Modi said with a twinkle in his eyes, "Mom has met Mars! Mars has met Mom today". Modi also highlighted the odds against such an achievement: "Of the 51 missions, a mere 21 had succeeded, but we have prevailed."

Similarly, in June this year, ISRO launched 20 satellites in one shot – leading to a "twenty for the price of one (*bees ka ek*)" sort of street-smart slogan. Just a month earlier, ISRO had successfully tested the Reusable Launch Vehicle (RLV), which highlighted the principles of thrift and smart recycling of resources even in cutting edge space technologies.

I remember my 'morning after' interview for *The Economic Times* with K. Madhavan Nair, the then ISRO chairman, after the success of their moon mission; "How was it to be on cloud nine?" I had asked. His answer had gently brought me down to Earth: "The feeling was one of getting a boon or a *var* after doing a long penance or *tapasya*", he had replied.

Chandrayaan had become the pet project of the whole organisation he said. But the scientists, technicians and supporting staff were also fully clued into the myriad ways in which the mission could have gone wrong.

"What was gratifying is that none of those things went wrong, Murphy's Law which says if things can go wrong they will, did not come into play and the whole organisation breathed a collective sigh of relief," he said, "when Chandrayaan succeeded."

For all that talk about *tapasya* and long penance, there is no secret *mantra* to ISRO's success: every one of its glittering achievements is neither a fluke nor an accident. This is because



ISRO's 20-satellite launch through PSLV

ISRO has pursued a work culture of openness, which welcomes ideas and inputs from every segment and, most importantly, "We don't go witch-hunting after any failure", the chairman had emphasised.

In fact, the first action was to pinpoint lapses only to learn from them, to ensure

that they were not repeated. ISRO was also forced to develop indigenous solutions to fiendishly complex problems. For all that, the *desi* space agency's success rates (90%) are on par with those of most developed *videshi* countries, notwithstanding the miniscule budget.

In an interesting aside, the ISRO chairman also told this writer that after looking at the images of the Moon sent by the spacecraft, he was no longer able to think of the satellite as a paragon of beauty. As seen by the camera built by ISRO scientists, the pock-marked surface of the Moon appeared more like a dermatologist's nightmare, rather than Waheeda

Rehman's dreamy cheeks (from the movie with the moon in its title: *Chaudavin ka chand*).

### Learning from mistakes

Another illustrious ISRO chairman, K. Kasturirangan, spoke about this 'can-do' spirit of his organisation during our public interview in Mumbai, which was conducted on behalf of a US-based Foundation. "We never put down venturesome 'mistakes'," he said to me. "Instead, we analyse them thoroughly and learn from them. That's the best way to unshackle initiative, to empower people."

Had it been otherwise, ISRO would not have got past its very first launch, which came just ten years after the agency was set up: In August 1979, the SLV-3 rocket instead of soaring proudly into space, went out of control soon after launch, and ended up ignominiously in the Bay of Bengal. But scarcely a year later, all those glitches and gremlins were sorted out and the rocket put the 35-kg Rohini satellite into orbit.

Similarly, ISRO's Augmented Satellite Launch Vehicle (ASLV) had to cope with not one but with two successive failures before scoring a success with the third launch. The Polar Satellite Launch Vehicle (PSLV) also had its own share of vexing teething problems. All these were met head on and resolved: PSLV went on to become a reliable work-horse for a variety of missions.

The legendary tycoon, the late Dhirubhai Ambani, articulated a similar strategy of winnowing golden grain of success by blowing off husks of failure: I had met the iconic businessman at his house during a dinner he had hosted for a visiting Nobel laureate from Japan. What would be his advice for a young girl on the verge of her post-graduation, I'd asked. At first, Dhirubhai tried to laugh off the question by saying he himself was only a matriculate. But he became seriously reflective when I persisted; the advice was for my own daughter. "Tell her to always remember: there are no problems only opportunities. She must also learn to unlearn her own prejudices". He added, "Tell her to keep learning from mistakes without compromising her creative ability to go after opportunities."

ISRO's saga of success has turned out to be a role-model for some pedagogues. At the Stanford Technology Ventures Programme, for example, students are encouraged to write 'failure resumes' too. These are supposed to summarise the

biggest gaffes professional and academic, even personal screw-ups of the wannabe tech entrepreneurs.

But the critical part of the resume comes at the 'What I wish I knew when I was 20' stage, where the aspirant is required to sum up his or her learning experience. Looking at experience through the lens of failure teaches the aspirant to 'own up' their past mistakes and to extract vital lessons for the present and the future perfect!

ISRO's strategy of rescuing success from the jaws of failure is also echoed and endorsed by its counterpart in America, NASA (National Aeronautics Space Administration). The US Space Agency's Chief Knowledge Officer told a three-day Knowledge 2020 conference last year that some of the world's greatest engineering innovations started with a mistake.

But it was also vital to remember that not all mistakes are alike; some belong to the class of careless screw-ups in large necessarily complex projects. Other mistakes are 'exploration failures', which are "inevitable" and "instructive missteps on the journey into the unknown".

Organisations like ISRO or NASA are like Charles Dickens's happy families, they all share certain common features: First, they empower rather than hobble employees into admission of error without fear of reprimand or loss of job. Also, their fault analysis focuses on the process rather than on the individual. This also calls for providing effective leadership and team-building with a "missionary", pun intended, sense of infectious energy and enthusiasm.

But speed and transparency are also important. Identifying issues and fixing them speedily, in a procedural rather than personal manner, is easier said than done. This is a crucial parameter that separates the true-blue 'winners' like the Indian Space Research Organisation from other *chalta-hai* sort of 'sinners' from our public sector. ■

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Vithal C. Nadkarni is a senior consulting editor and columnist with the Times of India Group of Publications. He is also a fellow of the London-based 21st Century Trust and a recipient of the US-based Alfred Friendly Press Fellowship.

# When students built a satellite

*With the launch of the Pratham satellite built by students of the Indian Institute of Technology, Bombay, a new era has indeed dawned on India's space technology sector.*

**Yash Sanghvi** of **Team Pratham** writes about this dream project and what it means for future generations.

**A** Dream. A Journey. A Purpose. Sometimes words fall terribly short when it comes to describing a moment. Sometimes, the very attempt to glorify a moment causes it to lose its shine. Because some moments have a uniqueness of their own, a distinct emotion which cannot be fully re-constructed from the emotions known to humans. Some moments are meant to be experienced, not recorded or observed. A similar moment was witnessed on 26 September 2016, when, with the release of gas fumes from the PSLV (Polar Satellite Launch Vehicle), a few dreams, held patiently for a long time, took flight.



**The current Team Pratham**

### **'Why don't we build a satellite of our own?'**

In 2008, two students of IITB (Indian Institute of Technology, Bombay), Saptarshi Bandopadhyay and Shashank Tamaskar came up with an idea, an idea that was to usher in a new era of space technology in IITB and, to a great extent, the whole of India. The question was simple, "Why don't we build a satellite of our own?" The answer, revolutionary.

The idea generated unprecedented enthusiasm among the students. The concept of building a satellite was appealing enough. All the ingredients were present: challenge, motivation, exploration, pressure, expectations, pride, glory. Consequently, innumerable applications came in whenever the team-recruitments were announced. The applicants were then filtered via a technical written test, a mini-project, and a few months of apprenticeship, before finally being inducted into the team. Over the years, more than 100 students from IITB, from nearly every branch of engineering, have been a part of this project. Pratham became one of the very few interdisciplinary teams in the institute which could boast of a remarkable diversity. Students from both under-graduate and post-graduate programmes have been a part of the project, some of them since their first year, right upto the final year.

### **Objectives of Pratham**

Among the mission objectives of Pratham, empowering the students involved, with the skill set required to develop a satellite through various stages of design, analysis, fabrication and testing is at the forefront. The payload is to measure the Total Electron Count (TEC) in the ionosphere above India and Paris. This data will help in the correction of GPS signals, thereby increasing their accuracy. Also, this data, in very rare cases, can help predict tsunamis.

Along with the scientific objective of Pratham, one of the goals of this project was to share with the society, the knowledge that we have been privileged to acquire, being in one of the premier institutes of the country. The vision in mind was to start a collaboration between various Indian universities interested in contributing to the space sector, and ensuring sharing of knowledge and facilities between them. Pratham was to be the first step towards that goal. To realise that, various workshops and sessions have been conducted by the team in our own institute and other universities as well. This has resulted in successful completion of ground-stations for satellite tracking in quite a few colleges, for example Atharva College of Engineering. We are in

collaboration with a few international universities as well like UCL (University College London) and IPGP (Institut de Physique du Globe de Paris).

For the relevance of our satellite to the student community, we will be transmitting satellite data when the satellite passes over India, so that any interested university with a small ground station will not only be able to detect the beacon signal from our satellite, but will also be able to measure TEC above their ground station.

### The real gains

However, the contribution of Pratham is not limited to this. Quoting Sanyam Mulay, an ex-Project Manager of Pratham, "This one single project has given a lot to the institute in the form of individuals who know how real life is." It's a well-known fact that hands-on projects do exceptionally well when it comes to value-addition to an individual. While a theory course is more 'direct' and convenient when it comes to knowledge transfer, a project is more involved but far more effective, because it trains students the hard way. A project presents to an individual an opportunity to learn skills completely out of the purview of theory courses: networking, presentation, communication, team-building and the list goes on. Pratham, however, has even more to offer. One distinct attribute people develop after working in the team is 'system level understanding'; how the various subsystems interact with each other, how the changes in one subsystem propagate and affect all the subsystems, how one has to think about the larger interests of the project, even if it means some compromise with his own subsystem.

One of the exceptional perks of working with Pratham was the opportunity to interact with ISRO (Indian Space Research Organisation) scientists. Various reviews were conducted over the years, right since the inception of Pratham: Conceptual Design Review, Preliminary Design Review, Critical Design Review, Pre-Shipment Review, Post Launch Review etc. It was amazing to see the amount of time given by the ISRO scientists to our project, in spite of their extremely busy schedules and numerous other projects. ISRO scientists are very humble, polite and down-to-earth people. Any help needed, they were always available. And the technical insights and the ingenious solutions to problems provided to us by the scientists during the reviews were priceless. Space doesn't give a second chance. Hence, it hardly comes as a surprise that tight tolerances were demanded from us. This was a relatively novel thing for engineers, who generally work with liberal tolerances, and made the project even more challenging

and hence, more interesting.

Apart from the review meetings, various tests for the satellite were also conducted at the ISRO Satellite Center (ISAC), Bangalore. These tests brought in their own set of experiences, which are now treasured memories. With some tests running for 48 hours at a stretch and all the team members wide awake during the entire time, debugging problems 30 hours into the test and providing instant solutions, without which the tests could have been postponed for an indefinite period, you can imagine just how intense the atmosphere was during the tests. Calling these tests as little

adventures would perhaps be more apt, since all aspects of an adventure were present: adrenaline rush, pressure, euphoric moments, stress cycles (literally) and what not. The learnings acquired during these tests would have been impossible to find elsewhere in the four years of engineering.

Finally, the last aspect of working with Pratham, without which the article will be incomplete, is the Team. It's very rare that you find a team so dedicated, so well-

bonded and so efficient as Pratham. It wasn't a team; it was a big little family. It comes as no surprise that the alumni of Pratham are still in constant contact with each other, and the current team. Efficient knowledge transfer from one team to another has helped the project a lot. And work was just one of the things we did with the team. There were numerous night-outs, treats, treks and what not. A motivated team was necessary to execute a project of the scale and duration of Pratham, and Pratham was lucky to have one throughout.

Now, after the successful completion of the launch, the current team is busy in the post-launch activities, namely, tracking of the satellite and data-collection. We are also constantly in touch with the students of other universities where ground-stations have been set up for Pratham. A section of the team is involved in the transfer of knowledge to the younger members of the team. After all, if the knowledge gained over so many years doesn't propagate across the batches, it will be a terrible waste, won't it?

Pratham, meanwhile, continues to orbit the globe, inspiring a few students every day to build, to innovate, to explore. It's not for nothing, that we call Pratham as the 'First Step Towards Infinity'. ■



Yash Sanghvi of Team Pratham is a 4<sup>th</sup> year Mechanical Engineering Undergrad at IITB. He is part of the Electrical Subsystem in Pratham and heads the Power Subsystem. He has worked with Team Pratham since September 2013.



# Spaceward Bound!

*NASA Spaceward Bound is a unique collaboration initiated by the US space agency to further the cause of space exploration among the next generation. It brings space scientists, teachers and students together for learning and training, explains **Siddharth Pandey**. This programme has a strong base in India, he says.*



**NASA's Spaceward Bound team in India**

**W**ITH the motivation to bring together space scientists from various space agencies, high school and university teachers and students to a Mars like environment, NASA's (National Aeronautics Space Administration) Spaceward Bound programme aims to inspire the next generation of explorers by training and learning in the field.

Initiated in 2006 at NASA Ames Research Center under Senior Space Scientist Dr. Christopher McKay, the programme has been held regularly in the Mohave Desert region. Along with it, several international versions of the same have been conducted in Atacama Desert (Chile), Namibian Desert, UAE, Australia and New Zealand. Every expedition has its own theme within the realms of Astrobiology and Planetary Geology.

### **Astrobiology and space exploration**

As NASA's Astrobiology Programme has postulated them-

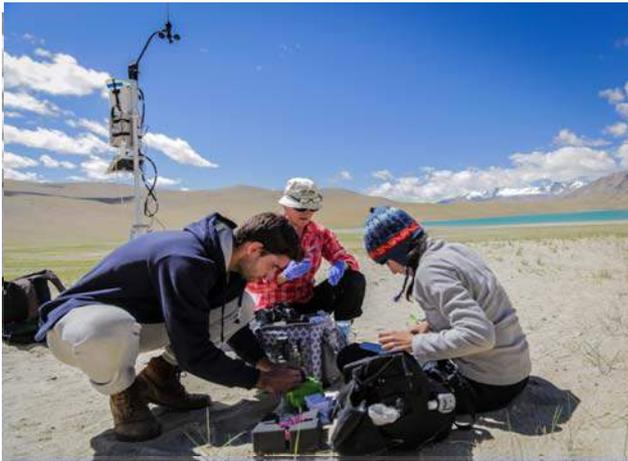
How did life begin and evolve? Is there life beyond Earth and can it be detected? What is the future of life on Earth and in the Universe?

The scientists on the Spaceward Bound team select regions on our planet that help us study the extreme boundaries of temperature, humidity, acidity/alkalinity, salinity, within which all the life as we know it, exists.

How does this help space exploration? Scientists study the sites for microbial diversity, test future Mars systems in relevant environment to help design experiments for future missions on other worlds.

### **The Ladakh expedition**

Ladakh in India offers several distinct 'astrobiologically' relevant regions within proximity of each other. It is a very high (above 3500 m above sea level) cold desert region that has access to glacial passes, salty lakes, permafrost



### The Spaceward Bound team on location at Ladakh

(permanently soil covered ice deposits) and high altitude hot springs. All these regions support microbial life that manages to survive in very harsh conditions. There have been several environment and terrestrial geology studies conducted in the region, but NASA Spaceward Bound India 2016 has been the first astrobiology international field expedition to be conducted in the region. Therefore, to summarise:

- Availability of several astrobio/geologically interesting features within the same region and coverable distances such as; cold high altitude desert soils, hot springs, permafrost, glaciers, saline and palaeo-lakes.
- Low human habitation/intervention, which has resulted in pristine eco-systems, very appropriate for terrestrial analogue studies.
- High altitude environment for conducting human dexterity and performance based tests.
- Remoteness and difficult to access regions simulating the challenges of transportation, resource utilisation and communication of off-Earth human missions.
- High altitude clear night skies for astronomy and astrophotography.
- Utilise the appeal and 'out of this world' landscape to complement the science education promotion goals of this pilot project.

### Objectives of the expedition

The objectives of the expedition were three-fold. First, the team was able to complete a survey of a set of different

hot springs, passes, lakes, to prepare the first documentation report studying the feasibility of Ladakh as a possible location for future detailed astrobiology and Mars surface simulation engineering experiments within India. Second, the programme enabled Indian scientists and students to work alongside international counterparts in the extreme environment, to help train and collaborate on several research projects. Third, and most important, it enabled the Spaceward Bound members to interact with school kids and conduct space science exploration education outreach to help inspire them to work hard and follow their dreams!

After the successful completion of the first such expedition in India, the team is currently analysing the results obtained from the various science experiments conducted on the expedition. The team was able to access all the sites as planned on their mission plan, which is encouraging, as this ensures planning of future trips to the region. Several interesting findings related to the chemical nature of the hot springs and saline lake deposits will be reported in scientific articles and shall pave the way for future work. This would possibly lead to a follow up expedition within the next two years.

The next expedition will invite applications from students across India to participate either remotely or in field for work. If students can come up with relevant science projects to be conducted in the field, their chances of getting selected surely go up. Here is the contact Information:

**Siddharth Pandey**

**spacewardbound@astrobiologyindia.in**

**Website:** <http://spacewardbound.astrobiologyindia.in/home/welcome/>

**Facebook:** <https://www.facebook.com/SBIndia2016> ■

Siddharth Pandey is a PhD student at University of New South Wales, Canberra, Australia. His work is on Understanding Thermal Convection on Martian Surface to aid design of a Mars bound Rover. Previously, he was an Education Associate at NASA Ames Research Center. His work on two successful spaceflight experiments was honoured when his team received the NASA Spaceflight Awareness Team Award in May 2014. He holds a Master's degree in Space Systems Engineering from Delft University of Technology, the Netherlands and a Bachelor's Degree in Aerospace Engineering from Amity University, India.



### The low cost of MOM

*The Mars Orbiter Mission or MOM cost India approximately Rs. 450 crore or US\$73 million. This made it the least expensive Mars mission so far! How did India achieve this feat? The low cost of the mission was ascribed by K. Radhakrishnan, the Chairman of ISRO, to various factors, including a "modular approach", few ground tests and long working days for scientists. Other factors attributed were lower worker costs, home-grown technologies, simpler design, and significantly less complicated payload than other similar missions like NASA's Maven (Mars Atmosphere and Volatile Evolution Mission).*

# Being with the stars

As a journalist writing about space exploration, **Srinivas Laxman** has met and interacted with luminaries from the world of space and astronomy. He writes about some of those encounters, some serious, some whimsical.

**O**NE morning in October 1961, when I was 12, my mom asked me to accompany her to the Mahalakshmi temple junction, not far from our house at Breach Candy in Mumbai, to join the crowds and wave to an important person who would soon drive past us. There was an air of excitement and suspense. Many kids like me had taken a day off from school, of course with the full approval of our parents!

### A tryst that changed me

We waited for some time, and a while later, a convoy of motor cycles, VIP cars and diplomatic vehicles appeared at a distance. As they came closer, I noticed there was among them an open car, from which a person with an extremely cheerful expression was waving to the crowds enthusiastically, with a smile. Mom asked me: "Do you know who that person was to whom you just waved?" I said I had absolutely no idea.

She told me that he was none other than Yuri Gagarin, the first man who flew into space on 12 April 1961. My instant response was a loud "Wow." It was at that very moment at the Mahalakshmi temple junction that my addiction and passion for space exploration began, and of course am extremely grateful to my late mom who showed me the way to the stars. Today, when I pass that junction each day, I recall that October morning with my mom where my journey to space began.

I never had the opportunity to meet Gagarin, but when my dad went to Moscow on Air India's inaugural flight, he got me a number of memorabilia and medals connected with Gagarin.

### The Gagarin connection

But luckily I have had some links with the Gagarin family over the years. One day in November 2012, I got a call from an official of the Russian Centre for Science and Culture at Pedder Road asking me if I could drop in as he had something



**The big three: Neil Armstrong, Michael Collins and Buzz Aldrin, the first humans to fly to the moon**

"interesting" to tell me.

What on earth could it be? Unable to bear the suspense, I walked to his office and met the official. After the usual exchange of pleasantries he said a person who will be of interest to me would be visiting Mumbai soon. He asked me to guess who it could be and honestly I was unable to figure it out. Finally, he told me that Elena, the daughter of Gagarin, would be in Mumbai. "Would you like to meet and interview her for the *Times of India* (TOI)?" he asked. Was I hearing right? Will I be shaking hands with the daughter of the man who was the first to fly to space? I told the official that it seemed like a dream!

Elena and I met inside a Russian consulate car outside the municipal headquarters at CST. She spoke a lot about her dad and added that though she was a jeweller and art lover and not a part of his life professionally, she still had followed his professional trajectory. "Dad used to tell me that he wanted to set foot on Mars," she told me. After the

interview, both of us posed for a photo in front of the statue outside the civic headquarters. The interview was carried prominently by TOI the next day.

Eight years later, I was back at the Mahalaksmi temple junction on a hot Sunday afternoon on October 25, 1969. Once again the scene repeated itself with enormous crowds on the other side of the road. I joined them and with me was the eminent nuclear scientist – the father of India’s nuclear bomb, Raja Ramanna, and his daughter, Nirupa.

### The big three

A few minutes later, a convoy drove past us and in three open cars sat three men who waved to the crowd which had braved the Sunday afternoon heat to greet them. Any guess who they were? They were the first men to fly to the moon in July 1969 – Neil Armstrong, Buzz Aldrin and Michael Collins. There couldn’t be a greater gift because three days earlier, on October 22 was my birthday!

Then, in the early hours of November 11, 1995 – almost a fortnight after my daughter, Rimanika, was born – I was at the customs arrival hall of the Sahar international air terminal waiting for a person who was my idol. At that pre-dawn hour with the arrival of numerous flights there was every chance I would miss him. Passengers were exiting from the customs hall continuously and I was finding it difficult to spot my hero.

Then it happened. A helpful and polite customs officer whom I had met when I had reached the airport, pointed to a person and told me: “Look he is the one you are looking for.” I mustered courage, rushed upto him, introduced myself and requested him to sign on a book, *First On The Moon*, which I was carrying. To all my questions he gave monosyllabic answers. Not-too-hard to guess who he was: Neil Armstrong! When I told a group of girls who were at the airport that he was Neil Armstrong, they responded in a chorus: “You mean to say you met the first man on the moon!” The next day my story hit page one of TOI. At a media briefing at Hotel President the following afternoon, I asked him: “If you had an opportunity will you go back to the moon?” He responded: “Yes, certainly. Would you like to come with me?” “I said I certainly would like to!

Not only the first man on the moon,

but I also met the second man to set first on the lunar surface, Buzz Aldrin.

Aldrin was at the International Astronautical Congress in Jerusalem in October 2015 which I also attended. The organisers had scheduled a media interaction with him which attracted hundreds of journalists, including me, from all over the world. The hall where the press conference took place at the Jerusalem convention centre was jam packed with journalists jostling with each other to grab some space either to sit or stand, and I stood.

Aldrin faced a barrage of questions and when my turn came finally I asked him to comment about India’s ground-breaking Mars Orbiter Mission (MOM- - now officially called Mangalyaan. He was full of praise for it and paid tributes to the Indian scientists who were behind the success of Mangalyaan. “The technology used in Mangalyaan could perhaps be used to solve some day-to-day problems in India,” he said. The report quoting Aldrin was published in TOI. But, the next day when I ran into him and requested his autograph, he rudely brushed me away which many said was typical of Aldrin!!! I did not mind his behaviour.

Apart from the first and second man to set foot on the moon, I also spoke to the last man to have stood on the moon, Eugene Cernan, in May 2001, who in every sense was the opposite of Armstrong. I interviewed him at Mumbai’s domestic airport. For each question, he gave long enthusiastic and informative replies, and to use a newsman’s parlance it made “good” copy. I got his signature on his autobiography *‘Last Man On The Moon*.

**The telephone at the other end rang, and within seconds a girl answered: “Hi, this is Kalpana Chawla here.” I introduced myself and she greeted me. An interview which was to last only 15 minutes, went beyond an hour.**

### The daring girl from Haryana

From the moon to the space shuttle. In the 1990s, the name of a young, daring girl from Haryana was slowly grabbing international headlines. She had a passion for space exploration and her name was Kalpana Chawla.

In November 1997, just prior to her maiden space shuttle, Columbia, mission, I contacted NASA’s Johnson Space Centre at Houston, Texas, and requested for a tele-interview with Kalpana on her return. By then she had become a household word in India and had appeared in Amul ads too! After processing my request, NASA fixed the interview for a December



**Kalpana Chawla, the daring astronaut who met a tragic end**

day at an hour which I think the TOI switchboard operator at CST would never forgive me – 2 a.m!

I reached the office at 1.45 a.m. The third floor editorial department which was bustling with life a few hours ago was now empty and deserted. I asked the operator to connect me to the Johnson Space Centre and gave him the number. The telephone at the other end rang, and within seconds a girl answered: “Hi, this is Kalpana Chawla here.” I introduced myself and she greeted me. An interview which was to last only 15 minutes, went beyond an hour. She answered all my questions politely and patiently, mainly about her space shuttle flight, her future plans and space exploration in general, and vehemently countered all the allegations which had been made against her. We talked, chatted and talked as though we had known each other for years. After more than an hour it was I who signed off, not she. Years later, after the tragic Columbia accident on February 1, 2003, in which she was killed, I met her family in New Delhi and her dad at Karnal where she grew up.

Sunita Williams, the record-breaking Indian-American astronaut, was at the International Astronautical Congress in Hyderabad in September 2007, which I attended. Though I could not meet her, I interacted with her during a media meet. A month later, she was at the Mumbai IIT speaking to the students and the faculty. It was a huge gathering.

Years later when I was doing a story about the 50<sup>th</sup> anniversary of the first human space flight for TOI, I interviewed her over the telephone – she was at the Johnson Space Centre. In detail, she explained the significance of Gagarin’s flight, which she said eventually led to the first manned landing on the moon on July 20 1969.

After a few years I met her at the Nehru Science Centre in Mumbai when she interacted with a large number of school kids. I presented her with a copy of my first book about the Indian Mission to Mars called *Mars Beckons India*. She told me that she was happy that I was following my passion for



**Sunita Williams, the Indian-American astronaut**

space exploration with complete dedication.

### India’s original spaceman

The Hyderabad astronomical meet in September 2007 also saw two world renowned space personalities share the dais and address the audience – Sunita and Rakesh Sharma, the first



**Rakesh Sharma, the first Indian in space**

Indian cosmonaut who participated in the 1984 joint Indo-Soviet manned space mission – a pet project of former Prime Minister Indira Gandhi.

Over the years, I have interacted with Rakesh any number of times, the first one being during a press conference organised in Mumbai by the defence ministry to announce the joint Indo-Soviet manned space flight.

Whenever there is a development with regards to India’s much-delayed human space flight programme, I make it a point to seek his response for a TOI story. On December 18 2014, when ISRO successfully launched for the first time the GSLV mark 3 rocket with the crew module, he was happy that the government was taking a step towards the implementation of the manned space flight programme. He has always told me that if the government sleeps over the manned space flight project, India would lose its position as an emerging global space power.

Some years ago my father and he were jointly felicitated by the Sri Venketeshwara University at Tirupati. He helped my parents to carry a huge idol of Lord Balaji which was given to all the dignataries, on the flight from Tirupati to Chennai. This figure now adorns our sitting room at Breach Candy below the beautiful photo of my late, wonderful parents. ■

Srinivas Laxman worked with the *Times of India* as a reporter, where his focus was on aviation. He later graduated to the space sector covering numerous launches at Sriharikota. He has visited various NASA centres and the European spaceport of Kourou in French Guyana. He has interacted with well-known luminaries like Neil Armstrong, Buzz Aldrin, Kalpana Chawla, Sunita Williams and Rakesh Sharma. Laxman has written four space-related books – two about India’s mission to Mars, one about the Indian moon mission, and a biography of Dr. A.P.J. Abdul Kalam.



# Science for the people

*Science has to belong to the masses, and that's the only way to re-kindle interest of the citizens in astronomical observations and studies, says **Bharat Adur**, who runs the Akash Ganga Centre for Astronomy in Thane near Mumbai.*

**A**S we, the citizen scientists and student members at the Akash Ganga Centre for Astronomy (AGCA), Thane, gazed at the Supermoon on Monday, November 14 2016, when the moon reached its perigee (closest to the Earth) at 4:52 pm, it was a poignant thought that the next Supermoon of this magnitude will happen after 18 years on 25 November 2034.

On 14 November 2016, the moon appeared up to 14 percent bigger and 30 percent brighter than the normal moon, as the moon was closest to the Earth at 1:39 p.m. at a distance of around 350,000 km.

### The significance of AGCA

Today, there is dire need for proper education in astronomy along with practical knowledge. This is especially so for students who have or are pursuing studies in Science, Commerce, Arts or for that matter the professional in engineering, doctors, and other areas. Many of them are interested in astronomy, but unfortunately unaware how they can contribute to Science.

It is pertinent to note that in India, Chandrasekhar Venkata Raman or C.V. Raman, won the Nobel Prize for Physics in 1930 for his pioneering work on scattering of light. Born in Tiruchirapalli on 7 November 1888, he was the first Indian, then Asian, and first non-White to receive any Nobel Prize in the sciences. During those times, a scientific career did not appear to present the best possibilities, and Raman joined the Indian Finance Department in 1907; though the duties of his office took most of his time, Raman found opportunities for carrying on experimental research in the laboratory of the Indian Association for the Cultivation of Science at Calcutta (Kolkata), going on to his brilliant discovery. Before his death on 21 November 1970, Raman told his students, "Do not allow the journals of the Academy to die, for they are the sensitive indicators of the quality of Science being done in the country and whether science is taking root in it or

not." Though today we have prime institutions in the country, we have not managed to win a single Nobel Prize for the sciences.

### The evolution of AGCA

It is with these thoughts, that the Akash Ganga Centre for Astronomy was founded in 2004, which has today evolved from the needs of several amateur astronomers' groups, planetaria, and astronomical institutes in the country. We felt that basic observational astronomy has taken a back seat. Astronomy is taught at a very preliminary level at school, and thereafter, there is no formal teaching in astronomy education using observation as a learning tool.

AGCA is an open platform for its members from any subject be it arts, science, medicine, engineering or any other faculty. The basic criteria for admission as its member is that one has to be 12<sup>th</sup> standard pass. Registered members are encouraged to participate and work in the following programmes:

**Meteors & Meteorites Study Group (M&MSG):** Regular meteor observations train observers round the year in visual, radio and spectral observational programmes. A Meteoritic Lab has already been developed for analysing the so-called meteorites, impactites, breccia, shatter cones and tektites.

Standard meteoritic kit is available for calibration. Meteor/Meteorite software is available for any analyses. Radio Meteor Studies have been started from December 2008; radio antenna is already ready for testing, analysis and reduction. Regular meteor studies are conducted by its members. All-Sky Meteor Camera is proposed to be set up soon, and will be made available for day time/night time observations.

Studies on Jaganath Meteorite, Sudsudia, Odisha, and Lonar Crater, Buldana, Maharashtra, have been conducted since 2005, detailed work on the samples is being conducted by student members along with their teachers, and is ongoing.



**Dr. C.V. Raman: Why has India not won more Nobels in the sciences?**



**A group session of AGCA**

**Telescope making:** Courses on telescope making are being conducted regularly. Advanced courses in telescope making are conducted on request. Efforts are made to develop GOTO drive and develop telescope software. Effort is also made to bring fibre optics, Fabry-Perot, interferometer, spectrometer techniques for planetary work.

**Planetary Section (PLANSEC):** Studies of Inner/Outer planets are planned from the coming season. This will be done with its own Celestron 130mm Maksutov- Advanced GT, along with its accessories. CCD camera is used for this observation.

**Asteroid/Comet Section (ASCOSEC):** Initially, the brighter asteroids are to be studied especially their shape, magnitude and their rotation. Later, their spectral identification will also be required. With a larger telescope, AGCA hopes to start its Near Earth Asteroid Programme (NEAP).

**Solar Section (SOLSEC):** Transit of Mercury on the surface of

the Sun on 9 May 2016 was observed from Luna village, and was conducted in collaboration with Indira Gandhi Planetarium/ Astronomy Dept., Lucknow, Uttar Pradesh. A Solar Coelostat 8" is being planned next. It is clear that the interest amongst students has gone up, yet a sense of commitment and dedication is still needed.

For many citizen scientists, it is a new way of studying science. Many try to look upon it as "Midnight star party". For some citizen scientists and students, it is still a novel idea. But they are happy that there is some non-formal teaching centre for them. ■



Bharat Adur is Director, Akash Ganga Centre for Astronomy (AGCA), Badlapur, since 2003. He worked at Nehru Planetarium, Mumbai, as Senior Scientist for 27 years. He has worked at several observatories in India and abroad. He has been writing articles in science magazines like *Science Today*, *Science Age* and other newspapers.

# Karnataka Power Corporation Limited

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- **The on going projects of KPCL are 2x800MW Yeramarus Thermal Power Station and Munirabad 1x10 MW which is proposed to be commissioned during 2016-17.**
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KPCL, for the first time, implementing **2x800 MW** Thermal Project at Godhna, Chhattisgarh State for which a Memorandum of Understanding (MoU) is entered into with Government of Chhattisgarh.

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# HYDERABAD

*chronicles of palaces, forts and culture*

*The city of Hyderabad is a warren of narrow lanes, juxtaposed with its modern avatar of high rises and gleaming ambition. But somewhere between the bustle of the streets of the old city, and the assembly line traffic around the well-lined skyscrapers, you experience the way of life of one of the most culturally vibrant cities in India, the city of Nizams. Hyderabad is like the old banyan tree that grows and flourishes for centuries, giving shelter and life to those who care to tarry a while under its shade. And if you care to become a permanent resident, it welcomes you equally with warmth and grace.*

**Text & Photos: Ishma Raina**



The city of Hyderabad from the Bhongir Fort

**H**ISTORICALLY, Hyderabad has seen a wide range of reigns from the mighty Mauryans, the Chalukyas, the Kakatiyas, the Qutb Shahi dynasty, the Mughals and finally, the Nizams of the Asaf Jahi dynasty, the descendants of which are the unsaid patrons of various places of heritage in Hyderabad.

Hyderabad has everything you would want in a place – a perfect mix of the ancient and the contemporary, and an efficient public transport system that shuttles you between the old and the new like a time machine. While Charminar, Golconda Fort and the delicious *biryani* have become synonymous with the identity of the city, there is a lot more to Hyderabad, quietly waiting to be found and spoken about, if one truly wishes to explore. It becomes necessary to talk about the hidden Hyderabad, which breathes and lives right next to the Hyderabad everyone knows of. How can this city be seen differently? As a student away from home, I found my own favourites in the city, and realised that the truest exploration can happen only when one dissociates from the sense of alienation that engulfs us when we visit a city for the first time, though this is easier said than done. Every place we visit is a feeling – we accept it, it accepts us, and thereby begins a wondrous saga.

The generic notion leads to the belief that the Nizams have been the only initiators of cultural development in the city, but architectural work in Hyderabad has been dated back to the Kakatiyas, who ruled over the then kingdom of Golconda

and were the builders of the fort *du jour* – Golconda Fort. The natural elevation of the city due to the rocky Deccan Plateau was nothing but an advantage to build impregnable and invincible forts to protect the city. A popular legend states that there exists a secret underground pathway starting from the Golconda Fort and extending to a distance of almost 50 km, the end point of which is the Bhongir Fort, though any practical trace of this pathway has not been found till date.

### The Bhongir Fort

In a city where there is no dearth of heritage, there is a competitive clamour for recognition and immortality – a clamour that holds the power to drown out the bid of those places which were not established in the heart of the city. One such place lies on the present day Hyderabad-Warangal Expressway, well within the radius of the city, in a small town called Bhongir.

The Bhongir Fort (or the Bhuvangiri Fort), was built by and named after the Chalukya ruler Tribhuvanmalla Vikramaditya VI in the 10<sup>th</sup> century CE. Spread over an area of fifty acres, this fort stands at a height of 610 metres above sea level and is said to have witnessed its period of glory during the reign of Kakatiya Queen Rudramadevi, and her grandson Prataprudra II. What distinguishes this fort from the rest amongst its clique is the way the main balcony of the fort has been structured over a huge monolith that can be spotted from kilometres away. This main balcony is encircled by the typical fort walls as one would find in the Rajputana architecture. The walls of



### The Bhongir Fort

the fort lead to a Hanuman temple and platforms where lie heavy metallic cannons that were most likely used to attack invaders.

It is from here that the real ascend up to the balcony starts. Once this monolith is scaled, you can feel what is known as 'being on top of the world'. The view that the fort offers is majestic – panoramic and pretty much aerial. The only difference is that you are not flying, but then, you are not even on the ground. The monoliths do not have any railings whatsoever, and one can literally lean over to see where the steep slope of the monolith could lead to. (This also does enable a lot of thrilling visuals in one's imagination). Various black patches are visible from top to bottom on the monolith at regular intervals, and it is assumed that these marks are a result of pouring of tonnes of litres of boiling oil to hinder the path of the invaders. The inundations in the monolith are home to small ponds, around which there is a vast expanse of grassland, which provides for a very tranquil spot to unwind.

The Bhongir Fort does not find place under the list of monuments protected by the Archaeological Survey of India, which is also evident enough in the present condition of the fort. The balcony stands half dilapidated, and more than the carvings of construction, what is visible are the engravings of

destruction. Access to this once invincible fort has been reduced to all of three rupees! It was imperative to ask the administration the reason behind such low rates. Surprisingly, they confessed their desire to let the fort remain in oblivion rather than watch

fame play havoc with it. What I wondered was if oblivion had proved to be any better! Adventurers' clubs within the city are trying to increase awareness about the Bhongir Fort since it is also an appropriate site for adventure activities like rock climbing and rappelling. Travelling to the fort by public transport is not a headache either, so it really is not remote as one would associate small towns lying en route an expressway with.

The fall of the Kakatiyas paved way for the Islamic rulers in Hyderabad and with them arrived the presently predominant Islamic cultural life. The kingdom of Golconda rose to prominence under the Bahmani Sultanate, after the disintegration of which (1538 CE), Sultan Quli Qutb-ul-Mulk was able to establish an independent dynasty in Golconda. The Qutb

Shahi Dynasty shifted its capital to the present city of Hyderabad, and this is where they were laid to rest.

### The Qutb Shahi Tombs

The Qutb Shahi Tomb complex (also known as the Seven

**The Bhongir Fort does not find place under the list of monuments protected by the Archaeological Survey of India, which is also evident enough in the present condition of the fort.**



**The Qutb Shahi Tomb Complex, which houses thirty tombs and mosques**

Tombs) is a vast mausoleum complex that houses thirty tombs, mosques and a mortuary bath, and is the perfect example of a dynastic necropolis, probably even better preserved and documented than any Mughal cemetery. The complex has seven most prominent tombs that are visible atop the Golconda Fort, and that is how the name ‘Seven Tombs’ came into being. The entry to the tombs looks like a poetic imagery, with a long straight road surrounded by trees on all sides, and a distant view of a tomb peeping through the gaps in the leaves. Near the entry is also a *dargah* of Hazrat Hussain Shah Wali, the revered Sufi saint to whom the construction of the Hussain Sagar Lake is attributed. This *dargah* often resonates with the sounds of *qawwali* performances in praise of the saint and the Lord. Some of the tombs are two-storied, which indicate greater prominence of the ruler in the pages of history.

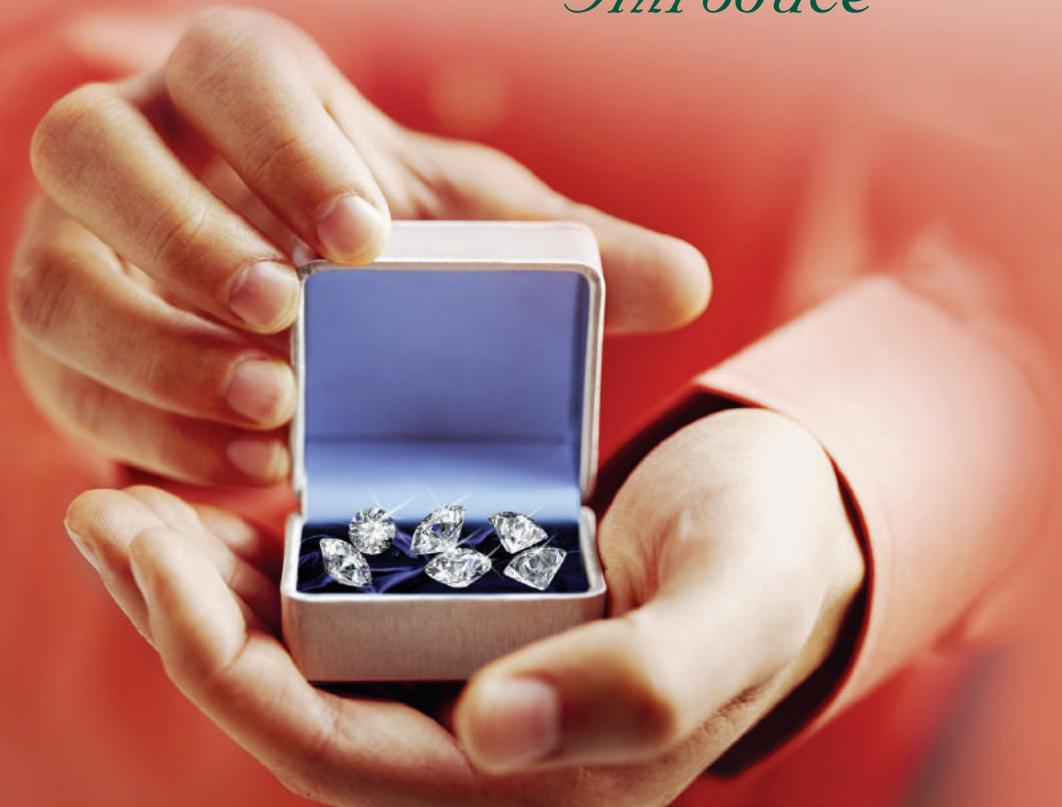
Six out of seven rulers of the Qutb Shahi dynasty rest in the main tombs. Other tombs are that of their wives, children, members of the royal family, and other nobles who devoted their lives towards loyalty to the Qutb Shahi kings. The last of the Qutb Shahi kings, Sultan Abul Hasan Qutb Shah, was taken as a prisoner by the Mughals under Aurangzeb, and was imprisoned in the Daulatabad Fort, where he died. He was not buried alongside his ancestors in this tomb complex, but was buried instead in a modest grave at Khaludabad.

Most of these tombs look alike in terms of architecture,



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**The Qutb Shahi tombs are revered by the people of Hyderabad**

and all the artwork and tile-work done on these tombs weathered off considerably owing to the fact that these tombs lay in complete negligence until Sir Salar Jung III ordered for their restoration. Ironically, the most famous ruler of the dynasty, Sultan Quli Qutb Mulk, has the humblest tomb, while the

grandest tomb is said to be that of Muhammed Quli Qutb Shah. His tomb is in a vault below a massive terrace of area sixty five metres square. This tomb is so grand that it bears resemblance to the Taj Mahal. Why then, does this necropolis not find many takers inspite of being the resting ground of one of the most powerful and influential dynasties in medieval India?

The most fascinating thing about these tombs however, is that not all the major tombs belong to men. The tomb of Fatima Sultan is near the entrance of the tomb garden, and houses several other graves. Hayat Baskhi Begum was the daughter of the fifth sultan, Muhammed Quli Qutb Shah, and the Masjid within the complex is named after her. There are also tombs that have been left unfinished, and while they might not be able to compete with the architectural marvels that the other tombs are, they do stand out, in their own imperfect way, and shine on, brick by brick – bricks to which the rest of the tombs are gradually reducing.

Many in Hyderabad still treat these tombs as a sanctum sanctorum, and revere these kings only next to God. These tombs have different meanings for different people. For some, they are places of historical significance, and for others, these are places of personal significance. The emotion that the people visiting these tombs attach to their kings is something so unseen and unheard of, that it can only be understood if witnessed firsthand. The tomb garden is becoming a site for heritage



**Inside the Tomb Complex**



### The magnificent Chowmohalla Palace

walks and storytelling sessions within the city. The essence of the seven tombs must not be reduced to a mere bird's eye view of the domes popping out of the trees from the top of the Golconda Fort.

Hyderabad was annexed by the Mughals during the reign of Aurangzeb, but after the gradual decline of the Mughal Empire, its hold on the city weakened and the governors gained autonomy from Delhi. Chin Quilich Khan Asaf Jah I established the Asaf Jahi dyansty in 1724 CE, which ruled over Hyderabad until a year after India's independence from Britain. The Asaf Jahis are now based in London, but that does not dim the glory of their ancestors and the effect they had on the daily life in the old Hyderabad city.

#### Chowmohalla Palace

A few lanes away from the shimmer of pearls, the aroma of *ittars*, the call of the *Azaan* and the Charminar at the heart of it all, stands the magnificent Chowmohalla Palace, resting quietly within close, guarded walls, separated from the world outside. The Chowmohalla Palace served as the residence of the Asaf Jahis, and the moment you enter the gates of the palace premises, you can see the clock rewind

and stand still in the past. Entrance to the Chowmohalla Palace is like the gate to Narnia – an entry into a completely different parallel world that you did not know existed all this while. Once you are in, all you can see is a vast expanse of beautiful royalty, a number of people at work to preserve and maintain the beauty of the palace, and the noise of the city fades somewhere in the background.

The word Chowmohalla or Chowmahall literally means 'four palaces', and it has been named so because of the four main palaces that adorn the oldest southern courtyard of the palace – Afzal Mahal, Aftab Mahal, Mahtab Mahal and Tahniyat Mahal. The construction of the palace began in 1750, and was completed by the reign of Asaf Jah V, between 1857 and 1869. The palace has two main courtyards, within which symmetrical gardens, pools and fountains have been designed. The clock on the main gate of the palace is called the Khiwat Clock, which has been ticking away for the last two centuries, keeping pace with the changing times.

Unlike most conventional Indian palaces, the Chowmohalla Palace has a very neoclassical style of architecture, unlike the Indo-Islamic domes and curvatures.

A few lanes away from the shimmer of pearls, the aroma of *ittars*, the call of the *Azaan* and the Charminar at the heart of it all, stands the magnificent Chowmohalla Palace, resting quietly within close, guarded walls, separated from the world outside.

# JAMNALAL BAJAJ FOUNDATION



Jamnalal Bajaj  
(1889 - 1942)

The 'Merchant Prince' who lived a lower middle class life, the humble spirit who gave himself completely to the freedom movement - mind, body and soul. Jamnalalji was adopted by Gandhiji as his 'fifth son'.



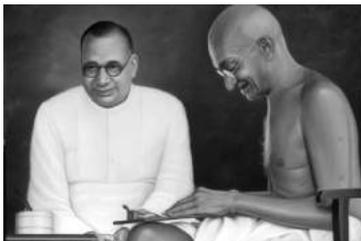
Jankidevi Bajaj  
(1893 - 1979)

She followed in husband Jamnalalji's footsteps. She discarded orthodox customs like 'purdah' and untouchability and worked all her life for promoting Gandhian values.



Rahul Bajaj  
Chairman, Jamnalal Bajaj Foundation

"Jamnalal Bajaj Foundation is essentially looking for exemplars who pursue the common good, 'sarvodaya' and it is very heartening to find so many of them."



"Whenever I wrote of wealthy men becoming trustees of their wealth for the common good, I always had this merchant prince principally in mind."  
- Mahatma Gandhi in Harijan, 14-3-1942



Inauguration of the Foundation (4-11-1977):  
(L-r) Justice M. Hidayatullah, Ramkrishna Bajaj, Morarji Desai, Acharya Kripalani & Dr. Srimannarayan



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Dr. Nelson Mandela receiving the Citation from Jyoti Basu, Chief Minister - West Bengal

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(1923 - 1994)

Jamnalalji's second son who continued to keep alive the memory of Jamnalalji as a social worker par excellence. Set up, on behalf of the family, Jamnalal Bajaj Foundation to fulfil the ideals for which Jamnalalji had dedicated his life.



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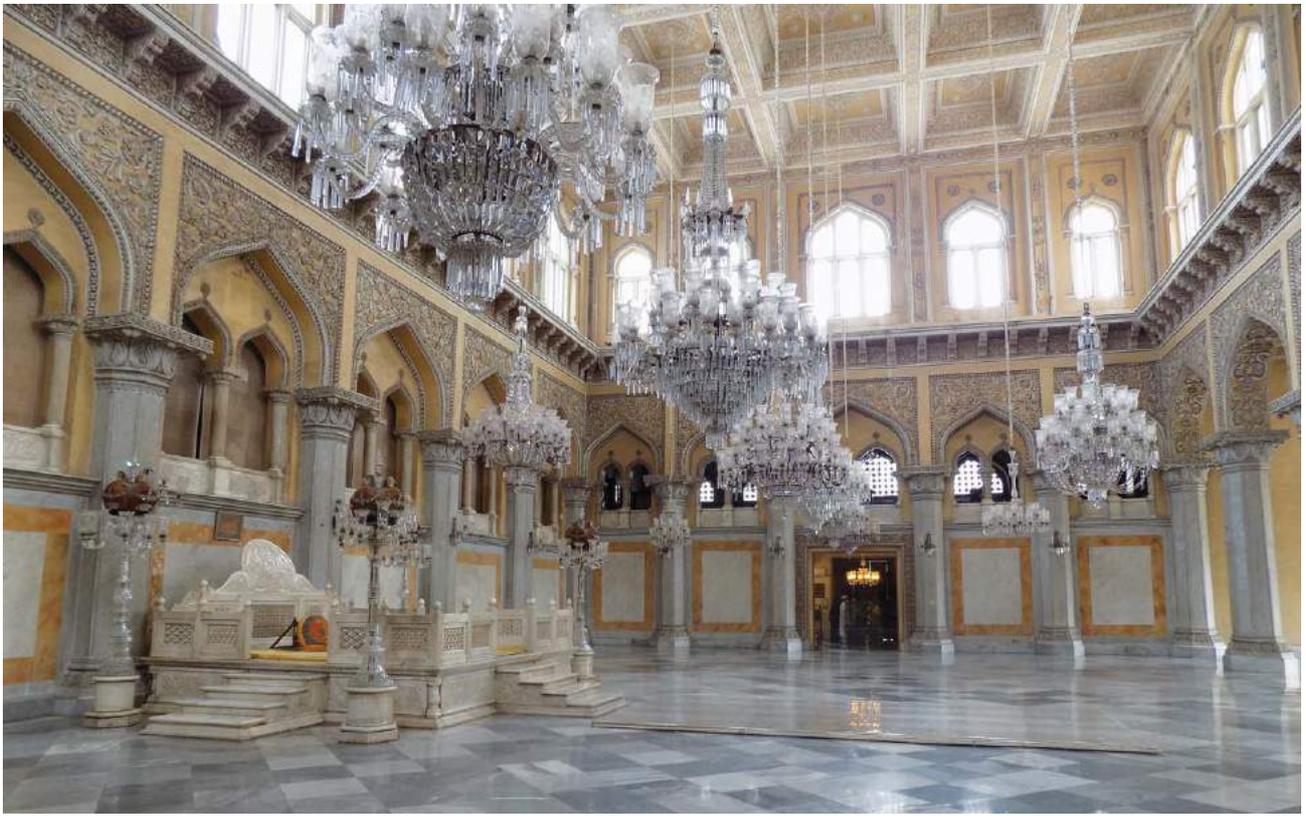
Award for Promoting Gandhian Values Outside India



(L-R) Minal Bajaj (Hon. Director, Jamnalal Bajaj Foundation), Dhirubhai Mehta (Chairman, Constructive Work Award), Dr. Chanda Nimbkar (received in absence of BonBehari Nimbkar), Dr. Mariamma Varghese (Chairperson, Development and Welfare of Women and Children Award), Dr. N Manga Devi, Mohan Hirabai Hiralal, Rahul Bajaj (Chairman, Jamnalal Bajaj Foundation), Chief Guest Dr. Justice C. S. Dharmadhikari (Chairman, Council of Advisors), Sheikh Rached Ghannouchi, Dr. R. A. Mashelkar (Chairman, Application of Science and Technology for Rural Development Award) and Madhur Bajaj (Trustee, Jamnalal Bajaj Foundation).

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**The splendid Royal Darbar at the Chowmohalla Palace**

Open air corridors are lined with heavy metallic cupboards, and rooms have become galleries for the possessions of the Asaf Jahis. Snippets from the past have been displayed in the form of huge art portraits and pictures signifying landmark moments during the reign of the Asaf Jahis. The Nizami collection ranges right from the richest collection of clothes from all over the country to weaponry, furniture, crockery, automobiles and buggies that have been owned by the Nizams through the years. This vast display in itself has the power to make you feel royal, let alone the thought of being able to access it. In spite of such opulent and priceless antiques, the Chowmohalla Palace has not been able to gain as much prominence as the Salar Jung Museum. One reason for this is the fact that the Chowmohalla Palace was a closed residence, which was opened to the public only on the orders of the present Nizam Barkat Ali Khan Mukarram Jah in 2005, while the Salar Jung Museum has been open to the public since 1951.

One of the most beautiful sights in the palace is the Royal Darbar, where the daily proceedings of the court were said to have taken place. This *darbar* is sculpted with beautiful artwork and tile-work, and lined with nineteen chandeliers at regular intervals. In the centre of the *darbar* is the seat of the Asaf Jahis – a pristine white marble throne called Takht-e-Nishan, which is decorated so immaculately as though it awaits the arrival of the Nizam in the next few

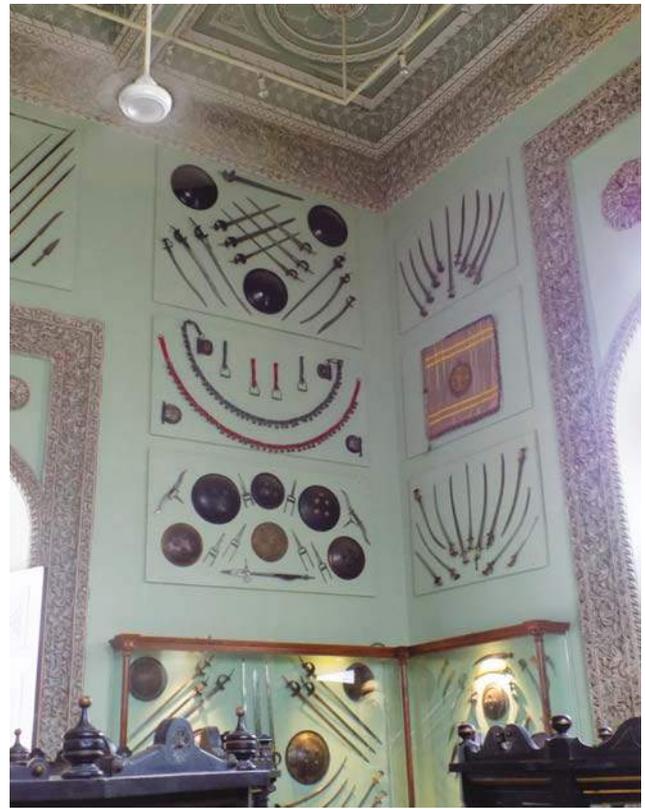
minutes. The *darbar* hall has grand pillars that hold balconies on top of them, most likely for the royal women to watch the proceedings as they happened. The Asaf Jahis have made sure to stick to their roots and do visit the palace time and again. The caretaker of the room of weaponries excitedly spoke about how the Nizam showers him and the rest of the staff with gifts for their services even today. The absence of the Nizam in the palace has not dented their loyalty towards him and his family.

**One of the most beautiful sights in the palace is the Royal Darbar, where the daily proceedings of the court were said to have taken place. This *darbar* is sculpted with beautiful artwork and tile-work and lined with nineteen chandeliers at regular intervals.**

Another contribution of the Asaf Jahis was their peaceful dialogue with the British during the colonial rule. During the same time, the aristocratic nobility of Hyderabad saw the rise of one of the most well-known families, who have gained equal, if not more recognition than the Nizams themselves – the Paigah nobles. The bond between the Paigah nobles and the Nizams strengthened with time, and they helped the Nizams in establishing western institutions in the Hyderabad State. Through this, they were able to amalgamate the oriental with the western way of life. The Paigah nobles were known for having rich personal collections of artefacts, antiques and manuscripts, which contributed to the heritage in more ways than one.

### **The State Central Library**

The bridge over the Musi River heads straight to one of



**The immaculately maintained furniture and weaponry at the Chowmohalla Palace**

the busiest bus stations in Hyderabad – the Afzalgunj Bus Terminus. Amidst the hullabaloo of buses going to and fro, stands the State Central Library, well hidden by fenced trees, as stoic as it can be. There is a bus stop right outside the premises of the library, and so there is a perennial presence of people. Yet, only a miniscule is actually seen going inside the big black gate which leads to the most fascinating collection of books and manuscripts that you can find anywhere in Hyderabad. The State Central Library is the perfect place to be for avid readers or enthusiasts of any particular genre of reading. This library functions twelve hours a day, and has very neo-classical features to it. The library was established in 1891 with the efforts of Nawab Maad-ul-Mulk, whose personal library formed its initial foundation. Back then, this library was known by the name Asafia Library. In 1955 it was declared as the State Central Library.

The first thing that any bibliophile is greeted with while climbing the main staircase of the library is the smell of old pages and hard bind. It looks like a planetary system of books – books wherever you go, in every nook and corner, including the sides of the high walled ceilings. The administration there claims that most visitors there (which are only a handful), come there mainly for preparatory purposes, and not out of the sheer love for books. The library does not believe in offering wi-fi, and insists on silence of both the visitors as well as

**The bridge over the Musi River heads straight to one of the busiest bus stations in Hyderabad – the Afzalgunj Bus Terminus. Amidst the hullabaloo of buses going to and fro, stands the State Central Library, well hidden by fenced trees, as stoic as it can be.**

their phones. There are drawers of innumerable postcards issued to various members of the library that date back to the 1920s, people who might have spent unending hours in the corridors of this library.

The library has a collection of more than five thousand books in all Indian vernacular languages, English, Arabic, Persian, French, Italian, Russian, German, to name a few. The collection ranges from manuscripts to encyclopaedias to novels to archives

of Readers' Digest and newspapers dating to decades back. Some racks are all about Karl Marx, some are talking Tagore and Gulzar. The creaking wooden staircases lead to corridors that have pathways and more pathways within them, most of them locked and lying under layers of dust. They are like the room of requirement – right in front of your eyes, but you see only them if you seek. If you are lucky enough, you can also have an Indiana Jones experience by sneaking into the restricted section of the library, and you will not want to come out of that place, ever. Three storeys of unregistered books lined across eight racks on each floor, with just one window for illumination – talk about oblivion here! At this moment, you are so completely hypnotised by the sight of having unearthed treasure more valuable than those of the Nizams,

you do not worry about all the dust on your clothes from picking out books from the racks. The thrill however, does not last for more than a few minutes when you realise the gross under



**The State Central Library, which is indeed a treasure house of books**

utilisation of these books. They are hidden away from the eyes of the visitors, and that is nothing but a sad waste of the core collection of the library. Near the library is the first outlet of the most famous and celebrated bakers in Hyderabad – the Karachi Bakery. That ensures a sumptuous bite and a warm coffee after a nice read.

In spite of being in the heart of the city, the library does not attract many visitors. People are unable to guide you to the spot even though it is right there on one of the busiest roads of the city.

### **The hidden Hyderabad**

Be it the forts, tombs or the library, all of them are in competition with the Charminar and Golconda Fort in the race against time, and what is most painful is that you can see them lagging behind. More than preservation by the State, these places need attention of the people they were preserved for in the first place. These are the places that tell the tale of time better than anything on Google, and to wait for them to crumble into dust before their significance can be realised, is a



**The silent halls and aisles of the State Central Library, waiting for patrons**



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**The famous Charminar of Hyderabad**

loss of national treasure.

Hyderabad is one of the friendliest places in the country, and this quality of the city should be taken into consideration while exploring it. The city and the people welcome you with open arms, and before you know it, you have become a part of the city too. All that is required is to break the ice and try and know the city better, try and see places that others do not see, try and know the secrets that the city is waiting to tell. Map the ruins and spread the word of these places. It is important to go to the forts that have existed over years either under threat, or abandonment; it is important to go to the tombs of those kings who probably feared oblivion all their lives; and it is important to go to the libraries where books are engulfed in darkness, waiting to be dusted and breathed open again. It is in times like these that you ponder upon the lesser known

towns, what they might have in store, what is known of them, and what amongst them is perishing. If the biggest cities of the country can have lesser known places of historical significance, what about the lesser known towns? The answer lies in knocking on doors that seem closed, and letting the spirit of the city or town or even a village, stir the soul. ■



Ishma Raina is a student at the Tata Institute of Social Sciences with a special fascination for Indian History. Her introduction to the diversity in India began right from her schooling days. Avid reading and travels across different parts of the world like Russia, UK and Japan have only strengthened her quest to know and showcase India better.

## Our Last Six Issues

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*“Our internet solution from space will not only solve connectivity problems for India, but also most developing countries worldwide”.*



Dr. Neha Satak of Astrome Technologies with co-founder Prasad Bhat

Astrome Technologies is one of its kind start-up which has plans for internet delivery from space, especially addressing the developing nations. **Dr. Neha Satak**, co-founder & CEO, Astrome Technologies, has

co-founded two space companies, Scientific Preparatory Academy of Cosmic Explorers and Experimental Center for Applied Physical Systems. In a chat with **Hiren Kumar Bose**, Dr. Satak spoke about solving connectivity problems for India, its proprietary MM Wave technology, and developing internet transponder technology with 12 times more capacity compared to One Web.

**How did the idea of a start-up, Astrome, come about?**

Astrome is founded by two serial entrepreneurs and researchers, namely, Dr. Prasad H.L. Bhat and I, Dr. Neha Satak. Our idea was simple. We wanted to use space as the means to solve problems on Earth, specifically in fast-developing nations such as India. We explored a number of problems that could be solved using space. One such problem that we were exploring was internet delivery from space. We knew that satellite based internet is the quickest means of reaching the remotest locations, but what is more amazing is that we found that satellite based internet works out to be significantly less expensive to set up the infrastructure, than ground-based fibre and tower internet delivery mechanism. This realisation

immediately concretised our plans. The internet is the single most important platform that can help deliver good quality education, health care and governance to the remotest parts of our country. The internet is also the means through which rural and urban economies can truly unite. Through the growth of e-commerce in the country and the availability of internet everywhere, entrepreneurs will be created not only in urban India, but also in rural India. Our internet solution from space will not only solve connectivity problems for India, but also most developing countries worldwide. We have received seed investments from Angels and the Indian Institute of Science.

**Do tell us about your patented MM wave technology?**

The current telecommunication infrastructure has not penetrated deep enough to provide internet service to all. This penetration will take a considerable amount of time and money if done by conventional methods. Instead, we propose a space route that will need less investment and less time to reach all.

A number of companies globally are aspiring to launch constellations of satellites around the Earth to provide internet connectivity to all. What they lack are high bandwidth transponders as currently, only speeds of 8Gbps are possible per transponder. For each transponder that is launched in space, anywhere between \$3 million to \$30 million is spent to manufacture and launch the satellite that carries it. Therefore, more the speeds you can get per transponder, cheaper is the per Gbps connectivity from space. Using our patented millimeter wave technology, we are developing space transponders that will deliver 100Gbps capacity that is 12 times the capacity of the existing transponders in the market.

**How does Astrome differ from One Web, Space X, and Boeing, which also have plans to launch a constellation of satellites in low earth orbit for the purpose of providing internet connectivity to remote areas?**

We differ from them in several ways. First of all, the number of satellites SpaceX, Boeing and One Web are planning to launch are in thousands, whereas we plan to launch only 150 satellites. They plan to cover the whole globe while we plan to cover the developing countries' belt which includes South-Asia, South-east Asia, Australia, Africa, South America, parts of North America and Arab countries. The internet user growth is mostly concentrated in this belt, and moreover, it is the developing countries that lack the ground infrastructure to provide internet connectivity to all.

This was about the difference between their plan and our plan, but there is a more fundamental thing that differentiates us from them. We are a startup which is banking on developing cutting-edge technology to stay ahead in the game. We are developing internet transponder technology that will provide 12 times more capacity to each of our microsattellites as compared to One Web. Boeing and SpaceX have not disclosed the capacity of their proposed satellites, therefore, we cannot

compare with them. However, considering the frequency spectrum that they plan to use, we can confidently say that our transponders will have much higher capacity than theirs.

**What I gather is that while the big companies are concentrating on business innovation, Astrome is focused on technology? Am I right? Please elaborate.**

Yes, you're right. We are taking this stage-wise. We are extremely focused on developing our millimeter wave technology now and plan to test it soon.

**How do you plan to go about raising funds as Astrome is unlike others, a space tech company?**

We are currently raising more funds. Our plan is to raise money in stages and have tangible monetisable outputs at the end of each stage.

**Astrome has been around for just two years, when do you think your maiden products would be ready?**

Our first technology demonstrator will be ready in June 2017. From there, we will do our first space test in 2018.

**Do tell us about your background and your core team members?**

We are two founders, eight engineers (apart from founders), and 10 advisors as of today. Our core team members have Masters degrees in relevant areas, and 3-15 years of industry experience. We have a diverse set of advisors from industry and academia.

Regarding the two founders, I am from Rajasthan, and Prasad is from Karnataka. ■

**Till very recently, Hiren Kumar Bose was the editor of several luxury magazines, and was prolific on and about watches. (check [www.watchworld.co.in](http://www.watchworld.co.in)) He has co-authored a privately published but widely circulated book on fine watchmaking. He considers himself 'at home' when tending the soil, as turmeric shoots thrust from the earth; playing malhar to his amrapalli mangoes during late summer evenings so that they fruit well; and marvelling at the team work of the honey bees while farming on weekends at his riverside plot in Badlapur. You can read more about his antics on his blog: <http://sundayfarmer.wordpress.com>.**



**This realisation immediately concretised our plans. The internet is the single most important platform that can help deliver good quality education, health care and governance to the remotest parts of our country. The internet is also the means through which rural and urban economies can truly unite.**

## ***“Unlike most scientists, Sarabhai was possessed of a vision that transcended scientific discovery.”***

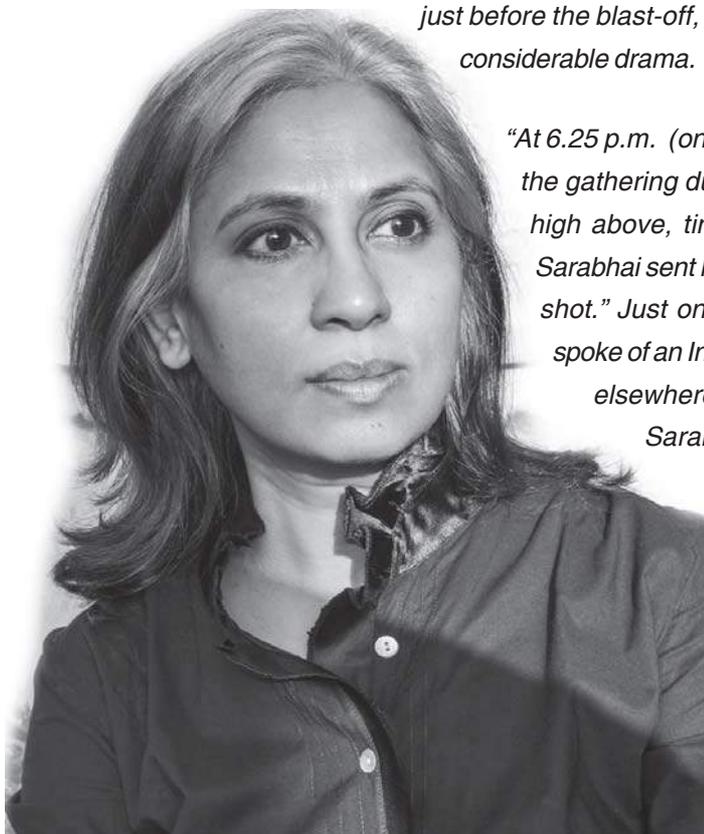
*It is perhaps unparalleled in world history that a new democracy emerging from centuries of subjugation should have the scientific ambition and political will to embark on a space programme. That country was India, and the man embodying that rather audacious ambition was Dr. Vikram Sarabhai, arguably India’s greatest institution builder, in the late 1950s and early 1960s.*

*In her definitive biography of Dr. Sarabhai (1919 -1971), journalist and writer **Amrita Shah** says, “When exactly Vikram came up with the notion of a space programme for India is not known. R. G. Rastogi, his former student, claims to have heard him talk prophetically of setting up a rocket-launching programme “by 1963” as far back as in the 1950s. Praful Bhavsar, who had taken a leave of absence from PRL (the Physical research Laboratory in Ahmedabad) to do a post-doctorate work at the University of Minnesota, recalls Vikram telling him something similar in 1959, and adding that he would want him to return to India to help.”*

*To think that in barely 12 years after the emergence of a deeply impoverished but free India, one man should think in terms of setting up a space programme was quite extraordinary. Shah’s 2007 book *Vikram Sarabhai: A Life* describes in some dramatic details the uncertainties that attended the launch of the Nike-Apache rocket supplied by the National Aeronautics and Space Administration (NASA). From a leak developing in the hydraulic system of the crane moving the rocket, to a student discovering a worker still fiddling with the launcher controls just before the blast-off, India’s nascent space programme was attended by considerable drama.*

*“At 6.25 p.m. (on November 21, 1963), the rocket streaked away into the gathering dusk. Minutes later, a sodium vapour cloud emerged high above, tinged orange by the setting sun,” Shah writes. Dr. Sarabhai sent home a telegram that said ‘Gee whiz wonderful rocket shot.’ Just one day after the Nike-Apache launch, Dr. Sarabhai spoke of an Indian satellite launch vehicle. Unlike space programme elsewhere, where the dominant purpose was militaristic, Dr. Sarabhai had a development-oriented, even education-focused vision. His multi-layered vision included the use of space programme for purposes such as weather forecasting.*

*In an email interview with **Mayank Chhaya**, Shah talks about Sarabhai’s motivation for his space endeavours, the means through which he had found a way of meeting both his social and scientific goals.*



**We are approaching the 63<sup>rd</sup> anniversary of the first rocket launch by India on November 21, 1963. Why do you think India's space programme, pioneered by Dr. Vikram Sarabhai has not found a comprehensive chronicle?**

Much of modern Indian history remains to be written. That said, some good books have been written on the space programme, Gopal Raj's *Reach for the Stars: The Evolution of India's Rocket Programme*, for example.

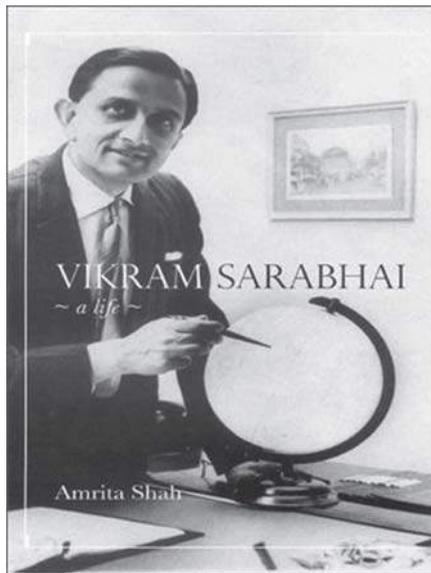
**In your biography of Dr. Sarabhai, you capture in some detail the excitement of that day and the challenges that the project faced. What do you think motivated Dr. Sarabhai to think of space programme barely a decade and half after independence?**

Space was an extension of Vikram Sarabhai's scientific interest in studying cosmic rays. Unlike most scientists, Sarabhai was possessed of a vision that transcended scientific discovery. He wanted to use science for social upliftment and in space technology he saw an opportunity to achieve this goal. It is true that space programmes were generally initiated for military purposes and the Indian space programme struck a pioneering path. Sarabhai believed that as a poor, underdeveloped country, India needed to prioritise literacy and economic progress. One can trace his strong identification with the national interest to his family's deep involvement in the freedom struggle; many members of his family, including his sister Mridula had been jailed and taken great risks. His aunt Ansuya had founded a union of textile labourers. The family's closeness to Mahatma Gandhi may also have had an impact in shaping his commitment.

Why the Indian government under Nehru and Indira Gandhi supported his idea of a space programme is not as clear. Both leaders had great faith in science and its potential role in national development. They may have trusted Homi Bhabha and Sarabhai as specialists who knew what they were doing.

**At the core of his vision was the idea of leapfrogging development using technology in defiance of the more popular approach of incremental steps. How do you explain that sense of defiance?**

Both Bhabha and Sarabhai believed in using the western experience to leapfrog, i.e., make rapid strides. I would say it was one view, and at a time when so many things were beginning and taking shape for the first time in a newly free country, I don't



**The biography of Dr. Sarabhai authored by Amrita Shah**

know if it was necessarily radical.

**Would you say that for someone who created an inordinately diverse number of institutions, unlike any other Indian of any generation before or since, that space was Dr. Sarabhai's core calling?**

No. Sarabhai had a complex vision in which all his activities were interconnected. The SITE (Satellite Instructional Television Experiment) which involved taking television to remote villages for example, called upon managerial capabilities, software development, feedback etc., – you can see that building a management college, a market research agency, the community science centre etc., (all of Sarabhai's initiatives) were all a piece with this vision.

Yes, space did have a very special place in his heart, and it was the means through which he had found a way of meeting both his social and scientific goals.

**This is perhaps talking in the abstract, but do you think there would have been a space programme in India without Dr. Sarabhai?**

Yes. I believe at some point there would have been a space programme. It might have gone the disappointing way of many of India's scientific institutions; it might have been more military – a wing of DRDO (Defence Research and Development Organisation) maybe. Sarabhai's vision, his ability to inspire, and to combine the idealistic with the practical, and of course his stature, gave the space programme a foundation and a profile. Dr. Kasturi Rangan, former head of ISRO told me that the space programme was still realising Sarabhai's vision 30 years after his death, which testifies to his far sightedness. ■

Mayank Chhaya is a respected journalist and writer with three and a half decades of reporting out of India, Pakistan, Sri Lanka and the United States. He has reported all major news stories out of India since 1982. He is a widely published commentator on global affairs but in particular on South Asian and Sino-Tibetan affairs.



He is also an authorised biographer of the Dalai Lama whose book *Man, Monk, Mystic* has been published in 24 languages around the world, including in America by Random House. Chhaya recently completed a feature-length documentary titled *Gandhi's Song* which is now going through international distribution. He is currently working on three more books, one documentary, one feature film and one television show.

Chhaya is also a painter whose works have begun to sell across the world.

# Orange is in!

*The 45<sup>th</sup> US Presidential elections saw the victory of Donald Trump, who is now, unbelievably, the President-elect. The shock victory has stunned everyone, but the signs were always there, says **Dr. P.M. Kamath**. He analyses the results.*

**T**HE United States (US) has completed its quadrennial presidential elections to elect the 45<sup>th</sup> President on Tuesday, the 8 November 2016. The Democratic Party had Hillary Clinton as its candidate while the Republican Party had Donald J. Trump. Hillary Clinton, as the wife of Bill Clinton, had a long exposure to politics, first, when Mr. Clinton was the Governor of Arkansas state, and later for eight years (1993-2001) as President of the US; she was the first lady in the Governor's office and the White House, respectively. She was also a Senator from New York for two terms between 2000 and 2012.

On the other hand, Mr. Trump had extremely limited exposure to politics. He was earlier a registered Democrat, but later switched his political affiliation to the Republican Party. Many establishment Republicans thought of him as a Democrat in Republican clothing! At a meeting of journalists in Washington, DC in 2011, he had expressed his ambition to run on the Republican ticket. Though Trump had boasted of his presidential ambitions on quite a few occasions, none took him seriously in the US. Hence, Hillary Clinton's defeat in the election was a stunning event in American electoral politics, and victory of Mr. Trump too is an equally surprising outcome in many respects.

## Why stunning?

Pre-election opinion polls had shown almost continuously a rising trend of Mrs. Clinton's popular acceptance. She



**Donald Trump's victory has stunned everyone**

was leading over her Republican rival. There were ups in the lead-percentage; Trump was bridging gaps occasionally in the poll prediction-percentages between the two candidates. But no significant polling agency had predicted a victory to Donald Trump – may be with the exception of Chennai-based Chanakya – (see *Times of India*, 8/11/2016) a fish, which had predicted Trump's triumph! Even on the day of the elections, CNN had predicted a victory of Hillary Clinton with, a three percentage points. If that had happened it would have been the first ever election of a female politician to the highest executive position in the US – the first in the American history after women were enfranchised in 1928.

Trump is a businessman totally without any political experience – in the sense of contesting local or state elections, let alone holding of any elective positions at the federal level. Once he entered Republican primaries in different states, he defeated one by

one 17 Republican politicians – the largest ever number of candidates trying their luck for Republican Presidential nomination in the American history so far – like Ted Cruz, Texas Senator, Jeb Bush, Governor of Florida, Bobby Jindal, Retiring Governor of Louisiana, Mike Huckabee, former Governor of Arkansas, George Pataki, former Governor of New York, and so on.

## Hillary's defeat

How does one explain Hillary's defeat? First, in retrospect, none of the un-American statements made by Trump, either helped Mrs. Clinton or harmed Trump. Liberal media thought that these factors might help Hillary, negatively affecting Trump's success. A few of such critical utterances of Trump are highlighted here. He made a preposterous suggestion to build a wall on the US border with Mexico to prevent illegal immigration. He called Mexican immigrants "rapists." Hispanics, rationally known to vote Democrat,

didn't see Clinton as a better choice, however. She only got 65 percent of their votes compared to 71 percent of Obama in 2012. Trump received 29 percent of their votes!

His anti-Muslim statements, his proposed policy of banning entry of Muslim immigrants invited rebuke from liberals. In an American society made of immigrants that has seen immigration as an economically beneficial factor, it was expected to influence minorities like Latinos or Blacks to massively vote for the Democratic candidate. American experts have pointed out that that has not happened in crucial swing-states like Michigan, Ohio and Pennsylvania. In a closely contested election, for a winning candidate, success in these three states was crucial. But Clinton didn't get the support of minorities as much as what Obama had received in 2012; hence she lost the swing states.

Trump's anti-trade pact pronouncements promised to bring back American jobs home from countries like China or Mexico, rattled multinational corporations. While Hillary got corporate donations for her election fund, it alienated traditional Democrats' votes as these voters were angry at loss of well-paying jobs, contributing to her defeat.

Second, despite Trump's contemptuous references to women, Hillary didn't win women's votes as much as Obama in 2012.

Third, it is evident that Hillary ignored some crucial states which have traditionally voted Democrat like Wisconsin. She didn't campaign even once in that state which had voted with Democrats 16 times in the past. Had she also given equal attention to that state, possibly, in hindsight, victory could have been hers.

Fourth, Clinton could not overcome negative impact of breach of protocol in using her private email id while she was Secretary of State in Obama

administration's first term. While campaign was in its last phase, additional emails were released. The fact of Clinton's indiscretion and the contents of disclosure were used by Trump fully to discredit her. When the FBI (Federal Bureau of Investigation) Director, gave her a clean chit on the issue, Trump challenged the FBI's ability to read such a huge number of emails in such a short time! Fifth, in the Democratic Primaries, the last one to survive to challenge Hillary Clinton, was Bernie Sanders, a popular and powerful Senator. Though while retiring from his challenge to Mrs. Clinton, he had promised full and united support to her, his hardcore supporters did not accept her as their candidate too. Hence, the Bernie factor in her defeat cannot be ignored at all.

**Though while retiring from his challenge to Mrs. Clinton, he had promised full and united support to her, his hardcore supporters did not accept her as their candidate too. Hence, the Bernie factor in her defeat cannot be ignored at all.**

Sixth, Hillary faced formidable negative factors which were beyond her control. Thus, for instance, in the post-World War period American polity has cultivated a healthy democratic trend that normally has not elected a president from the same party for more than two terms, with the exception of George T.W. Bush who was elected after Republican Party's Ronald Reagan enjoyed two terms in the White House. But despite his claimed success in Iraq

War in 1991 that forced Saddam out from Kuwait, he was not re-elected for the second term in 1992. Finally, constitutional lacunae also contributed to Trump's victory. She got more popular votes than Trump in the indirect election of President, because he got more Electoral College votes mainly because of 'winner takes all' system. This is not the first time that this kind of anomalous situation occurred in American political system. In the 2000 elections, Democratic candidate, Al Gore received more popular votes than his rival George W. Bush.

### **Trump's success explained**

Be that as it may, now that Trump is elected President, Pundits are finding out reasons for his success. He could accurately read the pulse of different sections of the society and correctly read their concerns. To that extent his opponents in the Republican Party and Democrats were not able to understand that. This has been admirably summarised by Bernie Sanders in his recent opinion article in *New York Times*, in which he said that Trump reflected his programmes like, affordable childcare, health insurance, quality education and housing. But he asks: "Will he have courage to implement the change demanded by the majority of voters, or go as other Republicans elected since Ronald Reagan to satisfy corporate greed"? ■

**Dr. Kamath, former professor of Politics, Mumbai University is currently, chairman and Hon. Director, VPM's Centre for International Studies (Regd.), had American Government and Politics as an area for specialisation for research and teaching while in the University. With his**



**12 visits to the United States, he has continued his interest in the subject and written on various aspects of American Government and Politics.**

# A phantom strike

*There are many lessons to be learnt from our surgical strike on terrorist camps in Pakistan in response to their instigated attack on Uri. We must now push our agenda at the international level, without 'gloating' over our success, says Dr. P.M. Kamath.*

**E**VEN before the wounds of terror attacks on Pathankot Airbase inflicted by Jaishe-e-Mohammad (JeM) in January 2016 had healed, a new terror attack came on 29 September at Uri Army Command. Earlier, the Indian Prime Minister (PM), Narendra Modi, the security establishment and the core public had taken a charitable approach to our neighbour's misdeeds. Modi had even paid a surprise visit to Pakistani PM Nawaz Sharif's residence a few days prior to Pathankot. By now it is a well known fact that major foreign policy issues like nuclear weapons, relations with the United States (US), major powers like Russia, China and an anti-India policy are firmly controlled by Pakistan's Military Establishment (PME).

Hence, despite grave provocation, South Asia experts had glossed over the dastardly attack on the Pathankot Airbase, by stating that it was an act of those in the PME who wanted to scuttle the India-Pakistan growing bonhomie; and any step on India's part to retaliate might result in playing into the hands of spoilers. Despite that, the anti-India elements within the PME succeeded in organising terror attacks against Uri, killing 19 young soldiers in their sleep.

## The surgical strike

Our retaliation came in the form of a surgical strike when it was executed by the Indian Special Force on 29 September. The story of the Uri attack and a successful Indian surgical strike are similar to an incident in 1962 in



**Prime Minister Narendra Modi with his Pakistani counterpart Nawaz Sharif in Pakistan, when he attended the latter's grand-daughter's wedding**

the Cold War period called the Cuban Missile Crisis – which is now discussed in every text book on American foreign policy of the post World War II period. If the Uri attack is similar to the Soviets stealthily keeping missiles in Cuba, and President Kennedy's response was one of risking a nuclear war to get rid of the missiles or willing to face a nuclear war, the Indian response too has been one of boldly going for a surgical strike to punish the terrorists, and to nudge Pakistan to move away from using terrorism as an instrument of foreign policy.

Be that as it may, what do we mean by surgical strike? A surgical strike is a phrase used in military science to indicate a military strike carried out against a target in a foreign country with limited weapons to achieve a specific result of removing an irritant/constant

problem faced by the body-politic. As much as the fact that a surgery is used only when there is a crisis causing critical pain in the human body, similarly, in the field of military/strategic studies, when an irritant in international relations becomes unbearable, a surgical strike is resorted to do away with the irritant!

## The gains

The first gain is that this surgical strike has helped India to make Pakistan raise its threshold of tolerance in the use of nuclear weapons! Ever since it went publicly nuclear in May 1998, Pakistan has advertised how its nuclear threshold of tolerance is very low! During the eyeball to eyeball confrontation after former PM Vajpayee mobilised Indian forces on the India-Pakistan border in December 2001, post the terror attack on Parliament, Musharraf had claimed

that he had conveyed to Vajpayee that if Indian troops “moved a single step across the international border or the Line of Control”, he can be expected to use nuclear weapons. One may recall Munir Akram’s boast in UN Security Council on the same fact soon after 1998.

Even three days before the Indian surgical strikes, Pakistan’s Defence Minister, Khawaja Muhammad Asif had threatened to use tactical nuclear weapons as he said: “We haven’t kept the devices as showpieces. But if our safety is threatened, we will annihilate them.” A similar threat was made by him one day before the Uri attack as well!

This nuclear-trigger happiness of Pakistan was taken theoretically as a given input in policymaking by the Indian leaders, till the surgical strike of 29 September. The Indian surgical strike has for once at least now called off the Pakistani nuclear bluff! Pakistan’s High Commissioner, Abdul Basit, who had also echoed his superiors on the subject of their low threshold of tolerance on the use of nuclear weapons, post-surgical strike said that “to even think” of nuclear attack, “is suicidal.”

As an offshoot of it, Pakistan’s calculated response to India has been to deny occurrence of any such surgical strike inside its territory! This has helped to deescalate the crisis. This might help policymakers and academics to ponder whether to consider Pakistan as a rational actor in international politics. Of course, any such admission would have jeopardised Pakistan’s position nationally and internationally that it doesn’t have terror-training-camps on its soil! Nationally it would have come under domestic pressure to retaliate against the Indian surgical strike; internationally, it would have amounted to Pakistan’s admission that such terrorist training camps do exist within its territory or territory controlled by it.

Second, Indian surgical strikes

against Pakistan has helped India to drive the point that terrorist attacks against Indian assets are no longer risk-free; it involves a cost. Third, the surgical strike has implicitly accepted two interrelated facts: One, Jammu & Kashmir is an integral part of India, she has a right to enter into any part of the territory. And two, India has asserted its right to pre-emptive strike if it has information on terrorists preparing for infiltration from training camps. Fourth, it has also to be noted that this act of Indian surgical strike has initiated an intense internal debate in Pakistan between its all powerful Army-ISI and

**As an offshoot of it, Pakistan’s calculated response to India has been to deny occurrence of any such surgical strike inside its territory! This has helped to deescalate the crisis.**

civil-politically elected government on the need to control/eliminate all terrorist groups. The first salvo was launched by PM Sharif himself, who has reportedly urged upon the need to control terrorist groups. But military pressure on the civilian government prevailed, and the PM denied any such statement. But in a well-coordinated move, the US first made a clear and unambiguous statement asking Pakistan to act; it threatened, the US would act on its own. Such a threat on the part of the US could not be ignored by the PME in the light of the US action in May 2011 to eliminate its most wanted terrorist, Osama bin Laden. A small action was

initiated with the freezing of JeM’s accounts.

## Conclusion

Pakistan’s civil government led by PM Sharif does find it extremely difficult to control terrorism unleashed by PME-controlled terrorist groups commanded by Hafiz Saeed or Masood Azhar. After all, former General Musharraf had called army of terrorists as the ‘first line of defence’ of Pakistan! But democratic-minded politicians and people without considering factors like political affiliation or religion should welcome Indian contribution to their efforts in maintaining fragile democracy in Pakistan by helping them to dismount from the tiger on which it has been riding ever since the creation of Pakistan. There seems also to be a method in the madness in PME. While Congress was in power, Pakistan used LeT for the Mumbai terror attacks of 26/11(2008), while during the BJP tenures during Vajpayee it used JeM for the hijack of the Indian Airlines flight in December 1999, as also in the case of Pathankot and Uri!

Finally, PM Modi had clearly mentioned that Indian policymakers should not gloat over surgical strikes. While it apparently has been generally followed, I think, it is incorrect for the Defence Minister to say that Pakistan after the surgical strike has gone into a coma! There is also a lesson to Pakistan: whether to match India in every respect and face eventual disintegration, or to decide to end its confrontational politics and reinvigorate regional cooperation. ■



**Dr. P. M. Kamath** is currently Chairman and Director, VPM’s Centre for International Studies (Regd.); formerly he was Professor of Politics, University of Mumbai.

# Afternoon Loneliness

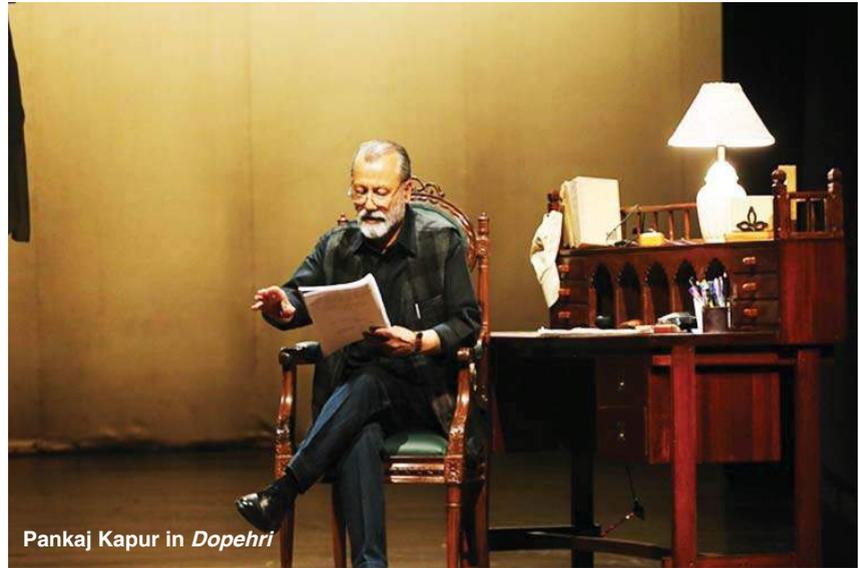
*The play, **Dopehri**, which is written and produced by acclaimed actor Pankaj Kapur, touches upon the very real problem of elderly loneliness. It's a poignant story, supported by brilliant performances and good production, says Prof. Avinash Kolhe.*

**P**ANKAJ Kapur (born 1954), is a well-known face in the world of cinema and some acclaimed TV serials like *Neem ka Ped*, *Karamachand* and *Office Office*. But his first love is theatre. He became a student of NSD (National School of Drama) when he was only 19.

He has now returned to the stage with his one-act play in Hindustani *Dopehri*, based on his own novella written some 20 years ago. The show lasts for about 90 minutes but audiences do not leave the theatre even for a nano second while Pankaj Kapur narrates the story of Amma Bi.

Pankaj Kapur and his wife Supriya Pathak, both are alumni of NSD. Their love for theatre is well-known. To return to this love, they recently started a drama group 'Theatron' under which *Dopehri* is produced, their first production. What is *Dopehri*? It is an afternoon time. Pankaj Kapur mentioned in an interview, 'I wanted to write about an elderly woman, neglected and lonely, especially in the afternoons, as I found this to be the plight of many a grandmother in today's times. I wanted to get across the thought that we should give women like her a chance to have their own identities, and not just as mothers and grandmothers. Every human being has some abilities, some individual worth which she should be aware of'.

*Dopehri* is a story of Amma Bi, a 65-year-old matriarch and is narrated in first person by Kapur. Amma Bi is living alone in 'Laal Haveli' in the Nawabi city Lucknow. She has only two people around, her servant young Jumman, and her late husband's friend, the elderly Dr.



Pankaj Kapur in *Dopehri*

Saxena. The play talks about Amma Bi's journey from a full life, to today's utter loneliness, to self-discovery. Half-way through the play enters Saheba, a young girl (representing a new generation, new possibilities of life), who soon becomes part of Amma Bi's haveli. Finally, through Saheba, Amma Bi gets her real identity – Mumtaz Siddique – that she herself had forgotten years ago.

## The brilliance of Pankaj Kapur

The story is peopled by about a half-dozen characters. It is Pankaj Kapur's brilliant performance that holds the audiences spellbound for the entire duration of the play. Let us first talk about other stage elements before we talk about the main performance. The stage design, done by Kapur himself, is extremely elegant. It was not easy to create a feeling of a two-storied Nawabi haveli in Lucknow. Amma Bi came to this huge mansion as a bride and now the same haveli is in ruins, representing

her life. There is dust all over the haveli, and a leafless tree where one can see abandoned kites hanging. The tree was located at one extreme of the stage, while at the other extreme was a beautiful lamp, symbolising new life. And in the middle was a rocking chair. When the play begins, the stage too communicates the mundane life of Amma Bi. Like this apt stage-design, the lighting (by Hidayat Sami) and the background music too adds value to the impact of *Dopehri*. The perfect lighting and the background music bathes the stage according to the varying moods of the story.

Now about the performance and the narrative of the play. At first, it appeared that the title *Dopehri* is a misnomer because its protagonist Amma Bi's life is not sunny anymore, and there is no happiness in her life. It is also more than clear that her best days are behind her. And yet, when Pankaj Kapur starts reading her story in his

(Continued on page 47)

# Cakes, carols and conviviality

*Some festivals are pan-culture, like Christmas, which is celebrated by almost everyone around the globe. It's a festival for gifts, cakes, family time, and a lot of bonhomie and cheer, says Shoma A. Chatterji.*

**C**HRISTMAS is not just a festival; it is a cross-cultural and global celebration, which has gained in popularity across the world. Though there are cultural variants, certain customs are common such as the custom of exchanging gifts, never mind how big or small; or, the custom of exchanging Christmas cards with members of the family, friends and relatives. This sending of cards is a kind of reaching out to close people living in distant lands, and letting them know you remember and you care. Another attractive practice is that of feasting with turkey and the plum pudding taking top place in the rankings. Christmas is one of the most favourite festivals for children because for them, it personifies the arrival of Santa Claus with his bag of gifts, one for each child.

## An ancient custom

The custom of giving gifts to relatives and friends on a special winter day probably began in ancient Rome and northern Europe. It is said that in ancient Rome, employers gave apprentice workers money gifts in small boxes, and this custom could be traced back to this practice. By 1100, St. Nicholas had become a popular symbol of gift giving in many countries. Legend says that he brought presents for children on the eve of his feast day, which fell on December 6. Non-religious figures replaced St. Nicholas in certain countries, and December 25 became the day for exchanging gifts. Today, Santa Claus brings presents to children in USA, Australia and Canada. Other countries have their own versions of



**The much-awaited Christmas cake**

Santa Claus such as Father Christmas in the British Isles, Pere Noel in France and Weihnachtsmann in Germany. St. Nicholas still brings gifts for children in the Netherlands, Austria, Belgium and parts of Germany. The custom of hanging stockings by the fireplace probably evolved from the tradition of children filling shoes with straw and carrots for Santa's horse (at that time, the legend went that he came on a horse-drawn chariot and not on a reindeer-drawn sleigh) and placing them in front of the fireplace. In Australia, the British Isles, New Zealand and parts of Canada, people exchange presents on Christmas day and on Boxing Day, the day following Christmas.

The first ever John Calcott Horsley, an English illustrator, created Christmas card in 1843. The message on the card which looked very much like an ordinary postcard, said, "Merry Christmas and a Happy New Year to You", showing a large

family enjoying a Christmas celebration. A thousand copies of the card were sold out soon after it hit the market. By 1860, the custom of exchanging Christmas cards had spread throughout Great Britain. Louis Prang, a German-born painter who lived in Boston, USA, manufactured the first Christmas cards in the US in 1875. Today, the Christmas card is 'father' to all variants in cards expressing emotions that perhaps might not be possible to convey in person.

## The origin of carols and 'hot punch'

The word 'carol' came from a Greek dance called *choraulein*, which would be accompanied by music, played on the flute. This dance later spread right across Europe and became especially popular among the French who replaced the music on the flute with singing. By the 1600s, carols evolved into songs alone and the dance disappeared into history. Christmas turned into the main

event for the singing of these carols. Most of the carols sung today were originally composed in the 1700s and 1800s. An Austrian priest named Joseph Mohr on Christmas Eve in 1818 wrote "Silent Night, Holy Night," one of the most popular carols to this day. Franz Gruber, the organist of Mohr's church, composed the music the same night and the carol was sung at midnight Mass. "O Holy Night", another famous carol, was introduced at midnight Mass in 1847. Adolphe Adam, a French composer, wrote the music. Popular non-religious carols include "Jingle Bells" and "White Christmas." In England, during the days preceding Christmas, children or groups of adults go from house to house singing Christmas carols. Children ask for money for themselves, which they generally use to burn "the old man" for the current year, and welcome the New Year, but adults usually ask for money for charitable purposes. Churches have their own carol-singing groups and they invite donations to the church charity. This tradition began many years ago when visitors sang carols in return for a drink from the 'wassail bowl.' This bowl contained a hot punch made from ale, apples, sugar, eggs and spices.

A traditional Christmas dinner includes stuffed turkey, mashed potatoes,

cranberry sauce, and a variety of other dishes. All Christian women go in for a heavy binge of baking and steaming and kneading of dough for all kinds of cakes, sweets and savouries, weeks before Christmas is to begin. Some families prefer roasted goose to turkey. Favourite desserts include a mince pie or a pumpkin pie, plum pudding and a fruitcake. Eggnog is a popular beverage though now most prefer hard drinks like scotch. But most people in England still drink punch today made up of wine, other alcoholic beverages, fruit and spices.

In Mexico, celebrations begin nine days before Christmas. These days are called *posadas*, which mean inns or lodgings. On each of these nine days, Mexicans re-enact Mary's and Joseph's search for lodgings on the first Christmas Eve. After each *posada* ceremony, they feast and celebrate. Children enjoy by trying to break the *pinata*, a brightly decorated paper or clay figure containing candy and small gifts. Shaped like an animal, an elf, a star or some other object, it is hung from the ceiling and children take turns trying to hit it with a stick blindfolded. When a child breaks the *piñata*, the gifts and the candy scatter across the floor and the children scramble for their share of the booty. In Venezuela, people have a late supper

after returning from midnight Mass on Christmas Eve. The meal consists of *hallacas*, which are corn meal pies stuffed with chicken, pork, beef and spices. In Argentina, a favourite Christmas dish is called *ninos envultos* (wrapped children) that are slices of rolled beef filled with seasoned mincemeat. In the Philippines, people attend *Misas de Gallo* (Masses of the Cock) celebrated early each morning on the nine days before Christmas. On Christmas Eve, they carry colourful, star-shaped lanterns called 'paroles' and parade the streets holding these aloft, which are later displayed in the windows of most Filipino homes. Christians in Asian countries too are often found to display similar lanterns at their windows, which Indians also do during Diwali. ■

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## Afternoon Loneliness

(Continued from page 45)

baritone voice, things start coming to life and one gets drawn into her story. Amma Bi's husband is no more and her US-based son with his family is not in a mood to return to India. Today Amma Bi's life is nothing but a big, long, and lonely journey. The 1935 Austin car she brought with herself as a bride is now lying outside the haveli, gathering dust. The symbol of the car lying unused outside the haveli, is a favourite symbol to communicate a dying culture. Mahesh Elkunchwar has used a rusting tractor equally

effectively in his *Wada Chirebandi*.

The play picks up life when Saheba becomes part of Laal Haveli. When Amma Bi finds Saheba in distress, she takes over the situation and then there is a different Amma Bi, totally in control of the situation. One snap of her fingers, and Amma Bi has tailors and artisans scurrying to her door just to rescue Saheba, a paying guest from her *majyake* town of Jaunpur. Suddenly Amma Bi has a purpose to her life and her life starts reverberating with enthusiasm the haveli has not seen in years. The play ends on a highly emotional note and audiences leave the hall with misty eyes.

Many symbols highlight the loneliness of Amma Bi. The tattered kites clinging to the bare branches of the tree, reflect Amma Bi's loneliness. As Pankaj Kapur starts narrating the story, one forgets Kapur and characters in the story take over the stage. In short, *Dopehri* gives a top-class theatrical experience. ■



**Prof. Avinash Kolhe is Asst. Professor in Political Science at D.G. Ruparel College, Mumbai.**

# Smoggy, smoggy nights, Paint your palette black and grey...!

*It's been an annual winter ritual in New Delhi - foggy, low visibility mornings. But in recent years, Delhi has also been smothered with heavy smog, which clogs airways and hampers breathing. Is this here to stay? asks Chandani Bhattacharjee.*

I love my Bharat, but I lament at the state of the environment that we have begun to accept today. The capital city of New Delhi, every year is engulfed in fog, much worsened this year with the rising particulate matter, and extensive carbon presence in the air, making the air unbreatheable. The figures provided by the various agencies that matter have indicated an air quality index of 497 (*Times of India*, 6 November 2016), and a visibility of less than 500 meters for 13 hours at the Indira Gandhi International Airport (*Times of India*, 6 November 2016).

The media highlighted how the residents have been exposed to equivalent of 20 cigarette sticks per day. Unthinkable, how we survive in cities of modern Bharat. The Central Pollution Control Board has created a new set of Indian National Air Quality Standards (INAQS) for 12 parameters – carbon monoxide (CO) nitrogen dioxide (NO<sub>2</sub>), sulphur dioxide (SO<sub>2</sub>), particulate matter (PM) of less than 2.5 microns size (PM<sub>2.5</sub>), PM of less than 10 microns size (PM<sub>10</sub>), Ozone (O<sub>3</sub>), Lead (Pb), Ammonia (NH<sub>3</sub>), Benzo(a) Pyrene (BaP), Benzene (C<sub>6</sub>H<sub>6</sub>), Arsenic (As), and Nickel (Ni)]. The air quality index is drawn from them. The present count of the AQI in Delhi falls in the severe category, and warrants some stringent measures to be adopted by the governments and the civic bodies. (See Table)



**School children in Delhi wore pollution masks to avoid the worst of Delhi's pollution**

**There are a few requisite measures that have been lined up to handle the health emergency of the capital city. Vehicular restrictions, wet mechanised vacuum sweeping of the roads, reservations against the brick kilns, municipal garbage burning alerts, stopping constructions and demolition activities temporarily to be adopted as an immediate measure to curb the emissions.**

There are a few requisite measures that have been lined up to handle the health emergency of the capital city. Vehicular restrictions, wet mechanised vacuum sweeping of the roads, reservations against the brick kilns, municipal garbage burning alerts, stopping constructions and demolition activities temporarily to be adopted as an immediate measure to curb the emissions.

### **Long term measures**

A series of long term measures to tackle the problem have been outlined, such as installation of a remote sensor based PUC system, green vehicles, relining roads to avoid dust and biomethanisation of the dump yards. Interestingly, Delhi has always been foggy in the winter mornings, and flight delays have been a recurring feature

for an early morning entry or an exit from the city. It is a meteorological condition and unavoidable. To manage the existing fog, some of the older, planned and colonial Delhi flaunts a lush, green foliage. However, the increased instances of heavy polluted trapped smog are increasingly becoming a problem for the city and the country as a whole.

The reason for this dense smog emanates from the rampant and unplanned urban development, and a genuine lack of vision by the planners to foresee the population needs. There is a mix of pollution from human and natural causes which may be responsible for the magnitude of the phenomena. Vehicular emissions, construction work, both domestic and commercial, resident fuel burning and municipal waste burnings to name a few. Delhi has the highest municipal waste collected in India, and the disposal area may emit or ignite pollutants occasionally. Another important contributor of the pollution has also been the winds from west – Afghanistan and Pakistan – which pick up as they move over the densely urbanised regions of Punjab and Haryana where farmers burn the straw in their fields, and this pollutes Delhi. Natural reason for Delhi's fog too needs to be taken into account, as the western disturbances may lead to a sudden reversal of winds from dry and cold to humid easterlies causing the fog.

Let's not forget, as per Census 2011, Delhi has a population of 1.68 crores, an increase from a figure of 1.39 crore as per 2001 census. The number of vehicles has increased manifold and the size of the NCR (National Capital Region) is on the increase. All this paints a grim picture of the future of a city with distinct political and historical roots. The governments both state and central have long passed the responsibility

**Table showing various categories of Air Quality Index and its repercussions. New Delhi falls in the 'severe' category:**

AQI Category	Status	Health Statements for AQI Categories (INAQS)
Good	0–50	Minimal impact
Satisfactory	51–100	May cause minor breathing discomfort to sensitive people
Moderate	101–200	May cause breathing discomfort to people with lung disease such as asthma and discomfort to people with heart disease, children and older adults
Poor	201–300	May cause breathing discomfort to people on prolonged exposure and discomfort to people with heart disease with short exposure
Very Poor	301–400	May cause respiratory illness on prolonged exposure. Effect may be more pronounced in people with lung and heart diseases
Severe	401–500	May cause respiratory effects even in healthy people and serious health impacts on people with lung/heart diseases. The health impacts may be experienced even during light physical activity

Source: CPCB

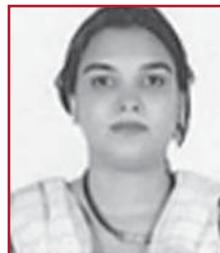
and the people have shrugged their own livable status. Delhi has been systematically pushed to the 'limits' of urbanisation with no one willing to muster the courage to change the course towards sustainability. Citizen responsibility in restricting the polluting festivals, consumptions and pushing for accountability of the civic bodies would perhaps ensure that phases like these don't make the city despicable. At the heart of all development is the rights of the people to live and breathe just as there are rights to clean air and water. Long forgotten are the picture perfect urban colonies that were a legacy of the British and what has emerged are the colonies of misery and ill health. The limits to growth, as the famous essay of environmentalism has re-sounded would need to apply to cities bursting at the seams with the pressure of development. The hope to see cleaner cities still linger as the

following lines would impress:

"The last thought we wish to offer is that man must explore himself – his goals and values – as much as the world he seeks to change. The dedication to both tasks must be unending. The crux of the matter is not only whether the human species will survive, but even more whether it can survive without falling into a state of worthless existence":

*Essay on Limits to Growth, Club of Rome (an international think-tank) 1968. ■*

**Chandani Bhattacharje** is an academican, environmentalist and a naturalist. She is currently working as an Assistant Professor at H.R.College of Commerce and Economics, Mumbai. Her core areas of research include water pollution, solid waste management and environmental ethics.



# Hair raising!

*There was a time when I had ‘hair’. Now I only have ‘hairs’, says the irrepressible A. Radhakrishnan, as he dwells on the saga of hair today, gone tomorrow!*

**H**AIR is simple in structure, but it has an important role in social functioning. No one likes to lose a good tuft of hair. Hair grows at different rates in different people; the average rate is around one-half inch per month. Hair colour is created by pigment cells producing melanin in the hair follicle. With aging, pigment cells die, and hair turns gray.

Writer and blogger Cristen Conger writes, “Many men spend more than a month out of their lives just shaving their beards”.

According to *The Economist*, ‘Grooming your body hair can seem like cutting the grass in the summertime. You devote an afternoon to the chore, and the next thing you know, the grass has shot up and you’re hauling the lawn mower outside again. When landscaping your body, there are eyebrows to tweeze, moustaches to trim and coiffures to condition daily.

Women hunch over their legs with a razor in hand for hundreds of hours to meticulously strip away thousands

of unwanted hairs.’But human body hair doesn’t grow indefinitely. Instead, individual hairs go through active and resting phases.

Hair growth occurs in cycles/phases: *Anagen* (growth): Most hair is growing at any given time. Each hair spends several years in this phase.

*Catagen* (transitional): Over a few weeks, hair growth slows and the hair follicle shrinks.

*Telogen* (resting): Over months, hair growth stops and the old hair detaches from the hair follicle. A new hair begins the growth phase, pushing the old hair out. Blood vessels nourish the cells and deliver hormones that modify hair growth and structure at different times of life.

Differences in growth phases, hair follicle size and shaft density also define the different types —of human body hair. In the womb, fetuses are covered in tiny hairs called lanugo. Shortly after birth, babies grow vellus, or fine, unpigmented hairs, across the body. When puberty hits, vellus hairs



**The bald truth!**

give way to coarser terminal hairs in places such as the underarms and genitals. The longer, thicker hairs on your scalp, eyebrows and eyelashes are also terminal.

If one were to tally those body hair categories on the average person, it adds up to around 5 million individual hairs. *Wouldn't life be simpler if you were just bare everywhere?*

## Most hairless among primates

Compared to most mammals, humans are relatively bald, perhaps the most hairless of the primates. Only a handful of other mammals are as sparsely covered with body hair, like elephants and rhinoceroses, but they have thicker skin to prevent too much heat from escaping their bodies.

### A hairy joke!

There once was a woman who woke up one morning, looked in the mirror, and noticed she had only three hairs on her head.

“Well,” she said, “I think I’ll braid my hair today.” So she did and she had a wonderful day.

The next day she woke up, looked in the mirror and saw that she had only two hairs on her head. “Hmmm,” she said, “I think I’ll part my hair down the middle today.” So she did and she had a grand day.

The next day she woke up, looked in the mirror and noticed that she had only one hair on her head. “Well,” she said, “Today I’m going to wear my hair in a pony tail.” So she did and she had a fun, fun day.

The next day she woke up, looked in the mirror and noticed that there wasn’t a single hair on her head.... “YEAH!” she exclaimed, “I don’t have to fix my hair today!”

So cool it. What if you lose hair? You won’t pull at it!

Next to a chimpanzee, our closest genetic relative, the man's body appears much more exposed, opines the National Human Genome Research Institute.

Barlow, an expert, points out that rather than having fewer hairs, the distinguishing factor is the size of them. In fact, humans have around the same density of hair follicles across the body as other primates. The two species also share the same hairless body parts: the lips, palms and soles of the feet. Yet, human body hair is finer and shorter than chimpanzee hair.

So at some point during the course of human evolution, thick hair must have become more of a burden than an asset. One theory is that early man was a water-dwelling ape, and less hair was better suited to his aqueous environment. Another explains it as an adaptation to prevent the spread of parasites, since they thrive in thicker fur. Yet others point to the milestone of bipedalism that occurred around two million years ago. By standing erect instead of on all fours, humans expose only one-third of their bodies to direct sunlight. With that posture, a full fur covering wouldn't be necessary for protection from the sun.

The sum of those adaptations has left humans with sporadic body hair patterns. Our heads, underarms and genitals have thicker patches, while

places like the back generally have sparse coverings.

Tired of having to shave regularly? Then consider how much maintenance you'd have to perform if you had hypertrichosis, or the werewolf syndrome? It is characterised by excessive body hair in abnormal places. Women can also develop hirsutism, or body hair growth in places where men usually grow it, like a beard or chest hair. The condition is typically caused by a female having an abnormal amount of male hormones.

It is said that bald men are attractive to women. Baldness is the complete lack of hair, or partial hair on your head. It can also be called thinning. The majority of males do suffer with at least a slight loss of hair as they age, but it can start as early as their twenties. It looks hilarious when some, in their desperation, even like to comb their last bit of hair over the top of their head as a 'comb over'!

Hair being a social necessity, many bald men hence go in for artificial hair weaving. Hair stylist Janice Johnson explains that there are two kinds of hair extensions that can be purchased: the cheaper synthetic hair extensions, and the costlier human hair extensions.

While it is known to hold styles remarkably well, synthetic hair extensions can be dangerous. Unlike human hair, it has little resistance to heat. It will burn or melt, easily meshing with your natural hair and cause major damage to your hair and scalp. A scalp that is always moist can become a good breeding ground for fungus and bacteria to grow.

It can also become matted, easily



**Different generations, different hair styles!**

loses its silky, smooth look after a few washings, and cannot be dyed, and hence there is less versatility when it comes to styling. It can feel a bit rough to the touch in comparison to human hair extensions.

Furthermore, other heating tools like flat irons, curling irons, heated hooded hair dryers, and even those created specifically for hairstyling will have to be avoided. Hence, a safer choice would be human hair extensions. It will also last much longer and looks better than synthetic hair.

The modern trend is to go in for hair transplants which are a permanent solution to hair loss. The transplanted hairs grow naturally, and if they fall out, are replaced by healthy hairs. If balding continues, it is other natural hairs that fall out, not the transplanted hairs. ■



**A. Radhakrishnan is a Pune based freelance journalist, poet, short story writer who loves to make friends and make people laugh.**

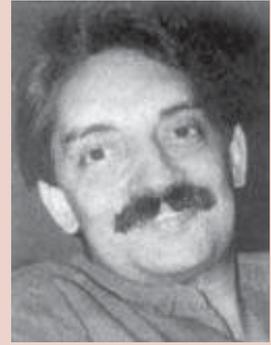
There are three ways a man wears his hair – parted, unparted or departed.

—○—

A guy walks in to the Barbershop.  
Barber says, "What will it be today?"  
Guy says, "well, I want it going with my waves on top, faded on one side, plug the other, and just make it all out of shape and messed up."  
Barber says, "Now why in the world do you want your hair cut like that."  
Guy says, "That's how you cut it last time"

# The singer and the song

*It is adults who are the exploiters of our precious natural world, while children all over are trying the path of conservation. When will adults wake up and face the truth of what they are doing to their environment in the name of material wealth and consumerism?*



**Bittu Sahgal**  
Editor, Sanctuary magazine

**Y**OUNG children are making their voices heard. For years now, Kids for Tigers, the Sanctuary Tiger Programme, has taught millions of rural and urban Indians the value of wild nature and the connection between human happiness and ecological harmony. With help from educationists and thousands of proactive parents, *Sanctuary* has taken great care to instill in these innocents the value of being direct and firm, yet polite and respectful – particularly in dealing with elders who do not always practice what they preach.

With all the purity at their command, the children choose to attend nature workshops, write poems, sing songs of hope, draw and paint, hold silent rallies in cities and villages, gather signatures (literally millions of signatures), seek appointments with Prime Ministers, Chief Ministers and Governors and, of course, pledge to save the tiger and all of nature to their last breath.

Sensitive to the core, they believe that urban India owes local communities living around Protected Areas dignity, self-sufficiency and respect. They ask that such communities be the first recipients of any incomes and benefits that flow from conservation, and through livelihoods that protect the forest and its wild species, rather than exploit its resources to feed urban demands.

A significant number of our Kids for Tigers live near tiger habitats, and they have taken it upon themselves to communicate the rationale for nature conservation to their elders. Rural or urban, the children ask that tigers be provided inviolate spaces away from human impacts. They point out that protecting forests and natural ecosystems is the only way India can safeguard its water security... the only way we can hope to overcome the climate crisis that is upon us.

Unfortunately, adults today are caught in a trap of political and financial ambition that blinds them to the reality, that they have replaced the British as the colonisers of today. The British implemented a strategy of geographical colonisation.

Our leaders and so many insensitive businessmen are engaged in intergenerational colonisation. They are wiping out the future of their own children by poisoning their rivers, destroying their forests, damaging their coasts and, of course, by destabilising the climate of our planet, which could end up killing more humans than the sum total of all the wars ever fought in the past 1,000 years.

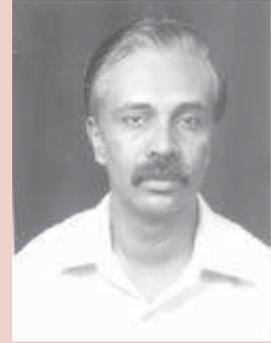
The dilemma facing humanity is encapsulated in the poignant words of a song sung by the incomparable Roger Whitaker. Whether we adults gift our children freedom in a safe world, or leave them forever asking “why”, is a decision those who sing songs of development, at the cost of the earth, must make today.

## WHY?

Something's going wrong  
 With the singer and the song  
 And the music isn't gentle anymore  
 There's a mist across the moon  
 And the sun's too hot at noon  
 And the house is dark behind the broken door  
 Where the flowers used to grow  
 Now their leaves are hanging low  
 And a constant shadow lies across the floor  
 There's a strange and empty sky  
 Where the wild birds used to fly  
 And I never tasted bitter rain before.  
 And will the grass be gone from underneath the sky?  
 Will the golden flower wither soon and die?  
 Will the fire burn out the land,  
 And the sea fill-up with sand?  
 Will the last word ever spoken be why?  
 Will the last word ever spoken be why? ■

# Media under threat

*How free is the fourth estate in India? Does the one-day ban on NDTV's Hindi channel show the central government's real mindset?*



**C. V. Aravind**

is a Bangalore-based freelance journalist.

**T**HE media, both print and visual, and the governments in power share a symbiotic relationship and feed off each other. The bonhomie remains as long as an attitude of 'you scratch my back and I scratch yours' abides, and the government of the day confers favours on media houses in the form of advertisements, all expenses paid for junkets to exotic locations abroad for top-flight journalists and so on, while the media in a *quid pro quo* deal highlights the achievements of the government, while conveniently turning a Nelson's eye to its short comings.

But fortunately for the country and the fourth estate as well, this is not the norm and there are sections of the media that prefer to call a spade a spade and maintain the highest standards of journalistic ethics, refusing to kowtow to the government *diktats*, and this is where the friction begins. The media has long shed its subjective cloak and has been aggressive in critiquing the actions of the government, especially those which are not people friendly and in the eyes of the media, erroneous.

Governments in the past have been pilloried by the media for their acts of omission and commission, but restraints have never been placed on the press and it has been allowed enough elbow room to do its work in peace. This was the norm when the Congress party was in power for decades, and even when the Atal Bihari Vajpayee led NDA government ruled the country. Only for a brief period during the infamous emergency, the media was muzzled totally, news critical of the government was censured, and journalists and newspaper owners were hounded and some were even jailed.

The present NDA government at the centre however, appears to be totally averse to criticism of any kind or to the media crossing the *Lakshman rekha* prescribed by it which allows them very little leeway to express their

opinions honestly. Sections of the media that upbraid the government are often branded as being anti-national. It is common knowledge that the advent of the visual media has totally changed the concept of journalism and debates on channels, both English and vernacular, are usually no-holds-barred and conflicting viewpoints are aired on various subjects. But not all views are palatable to the government, and the party spokespersons go the whole hog condemning panelists who flay the government and even tend to shout them down.

But so far, the media has never been under any serious threat, and censorship if any, has been subtle and has not hurt media freedom much. But the government's decision to order a Hindi news channel NDTV (India) to stay off the air for one full day as a penalty for its reportage on the attack on an army camp by terrorists in Pathankot on the grounds that the coverage endangered lives of security personnel and civilians, has revealed the government's mindset. Though the penalty has been put on hold at the time of writing and the channel has also approached the courts, an apprehension has set in that the media might be in for trouble unless it is able to guard its flanks and exercise extreme caution before venturing into airing events involving security issues.

The government should however allow the media to self-regulate, and use its wisdom to steer clear of controversies, especially while handling sensitive issues. As far as the government is concerned, it has a lot to gain from a benign fourth estate in the form of wide publicity for its various schemes, and little to benefit from a hostile press that could turn into a thorn in its flesh. But for democracy to thrive in a country like ours, a free press is a *sine qua non*, and this is something that even the government is fully aware of. ■



## SPOTLIGHT

## Here lives Santa Claus!

**E**IGHT kilometres north of Rovaniemi, the capital of Finnish Lapland, is the self-proclaimed hometown of Father Christmas. The village was established in 1985. Its main attractions are a post office, a snow theatre and thematic parks.

Santa's post office is decorated in a fairy-tale style. It works like a normal post office, selling stamps and envelopes. You can buy a Christmas card free of cost and post it to a friend. You can also read the letters sent to Santa from children the world over. The post office is manned entirely by Santa's elves.

Santa Park is an underground Disneyesque re-creation of St Nicholas' abode. Here you can meet Santa and take photographs with him. The park is specially designed for small children, and offers many rides like the Magic Sleigh Ride, with Santa's reindeer. Rudolph's Run is a popular ride, the red-nosed reindeer being everyone's favourite.

Snowland is also popular with kids as they can try their hand at ice sculpting, wander about the snow mazes or take a ride in a snow mobile. The Arctic Snow Theatre has a Snow Show, where colossal works of art sculpted out of ice and snow, are displayed.

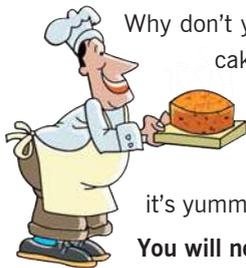
Although Santa Claus visits the village every day, he does not live there. He lives with his wife and hundreds of elves in his secret getaway in the East of Lapland, on the 483-metre-high Korvatunturi Fell, a secluded hill shaped like a ear, on Finland's border with Russia.

You, too, can write to Santa at: Santa Claus, FIN-96930, Arctic Circle, Finland. Only, don't be disappointed if you don't receive a reply immediately! After all it's a busy time for Santa!



## DO IT YOURSELF

## The Refrigerator Cake



Why don't you surprise your mom by making a cake this Christmas? Here's an easy recipe, so easy that you don't require an oven, and you can make it entirely by yourself. And it's yummy! Try it!

### You will need:

A vanilla ice cream pack, a packet of Marie Biscuits, coffee decoction made by mixing one tea spoon instant coffee powder in half a cup of water, walnuts, raisins and glazed cherries.

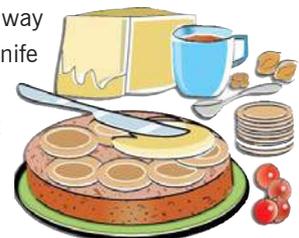
### To make the cake:

1. Divide the ice cream into three portions. Beat up one portion of the ice cream and spread it thickly at the bottom of a cake tin with a detachable bottom.
2. Divide the Marie biscuits into two parts. Dip one half

of the biscuits, one by one, in the coffee decoction, and arrange them neatly over the layer of ice cream.

3. Spread the second portion of the ice cream over the biscuits.
4. Dip the remaining biscuits in the coffee decoction and spread them over the ice cream layer.
5. Top the biscuit layer with the remaining ice cream.
6. Decorate with walnuts, raisins and cherries and keep in the freezer to set.

At the time of serving, place the cake tin over a shallow, wide glass dish. Detach the bottom, sliding it out carefully. Then lift out the tin. An easy way to do this is to dip a butter knife in hot water and run it through the sides of the tin and then lift it out.



## The demon's share



One day a demon came to see a farmer who was working in his field. "These fields belonged to my father's father," said the demon. "I will take half of whatever you grow in these fields."

The farmer was frightened but he kept his wits about him.

"You can take whatever grows above the ground, your Excellency," he said. The demon agreed and went away.

That year the farmer grew potatoes in his field. When the demon came for his share he got the stems and leaves of the plant but not a single potato since it grows underground.

"Next time I'll take whatever grows above the ground!" he growled.

When he came again some months later the farmer was harvesting corn. He had planted wheat and had got a bumper harvest. "Where's my share?" screamed the demon.

"Your share is under the ground, your Excellency," said the farmer. You can take the roots away whenever you want."

The demon, ashamed at being outwitted by a farmer, turned

around without another word and walked away. The farmer never saw him again.



### CURIOSITY

## What is 4-D?



The term 4-D (sometimes 5-D) is used for movies that make use of physical effects inside the theatre, which occur in synchronisation with the 3-D movie. These include seats which vibrate, tilt, sway, drop down and rotate; different kinds of smells to suit what's happening on screen, for example, burning rubber in a car chase; rain, smoke, wind; strobe lights, water sprays and jets and even mechanical ticklers for the legs and arms!

A 4-D experience can be had only in special theatres which are built to produce the effects. There are movie theatres like these in many countries including India (Chennai, Mumbai, Delhi etc.)

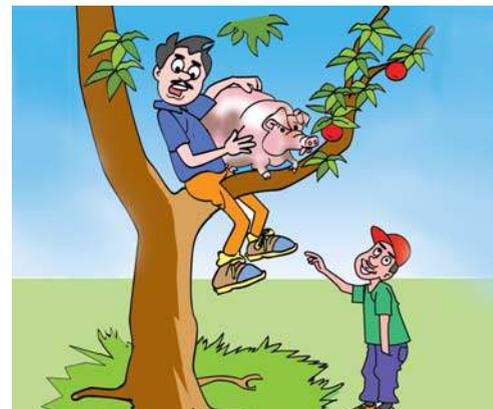
Many movies, including Avatar, Kung-fu Panda and the third sequel to the Pirates of the Caribbean have additional 4-D effects.

### HA!

A man visiting a farm was surprised to see the manner in which the farmer was feeding his pigs. He would carry a pig to an apple tree and hold it up so that it could eat an apple.

"Why don't you shake the apples off the tree and let your pigs feed on the fallen fruit? It would save so much time!" he said to the farmer.

"Time?" replied the farmer, puzzled. "Why would a pig want to save time?"



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## **MAJOR GENERAL RAJINDER SINGH 'SPARROW', MVC AND BAR**

Valiant soldier (1911-1994)

**M**AJOR General Rajinder Singh, nicknamed 'Sparrow', was born on 3 October 1911. He joined the Indian army as a soldier on 3 October 1932, and was selected for a commission. He underwent training at the Indian Military Academy, Dehradun, where he earned blues in hockey and cricket. He was commissioned into the unattached list on 1 February 1938, and posted to 7 Light Cavalry on 24 February 1939. He saw service in World War II and took over the command of the Regiment in September 1947.

The unit moved to Jammu in the 1947-48 war and one squadron was sent to Srinagar on 4 November 1947. It took part in the battle at Shalateng, where the enemy was routed. The situation in Jammu sector was critical with the loss of Jhangar on 24 December. A mobile column called Cheetah Force, under Rajinder Singh, destroyed the enemy base in Asar-Kandala area. In subsequent operations, Jhangar was retaken on 18 March 1948. He was awarded MVC for outstanding leadership.

In the northern sector, Gilgit had fallen into the hands of the enemy through treachery by some troops of the State Army and the British Resident. Kargil, Dras and Zoji La Pass were also in their hands. The capture of Zoji La Pass before winter was vital for India to ensure relief for Leh. A frontal attack on Zoji La by the infantry failed, and the Indian army suffered heavy casualties. Major General (later General) Thimayya decided to use tanks, and one squadron of 7 Light Cavalry was ordered to move from Akhnur to Srinagar, a distance of 445 kms. To ensure secrecy, Lt. Col. Rajinder Singh, the commanding officer, moved the tanks in a dismantled condition. All movement was at night, and during the day the tanks were covered by sheets. The squadron was concentrated in Baltal by 15 October, and it was decided to launch the operation on 20 October. Two field companies of Madras Sappers had worked day and night to improve the mule track from Baltal to Zoji La and on to Gumri, for

movement of tanks. The operation had to be postponed to 1 November due to heavy snow. Tanks followed by infantry commenced the advance to Gumri and attack from the rear, while the infantry was to put in frontal attack. It was snowing that day too, and the Air Force could not be employed. The operation commenced as planned with heavy bombardment by the two regiments of 25 pounder guns and one regiment of 3.7 inch mortars. Major General Thimayya rode in the leading tank. Low visibility due to snow was an advantage as there was no interference from the enemy.

The column reached Gumri by 1400 hours.

The appearance of tanks was a complete surprise to the enemy, and they fled in panic. The battle had taken place under severe conditions of difficult terrain and low temperature. It was the first time that tanks had been employed at such heights.

In 1965, infiltration by a large number of militants and attack by Pakistan in Akhnur sector led to a general war between the two countries. The 1 Armoured Division under command of Major General Rajinder Singh Sparrow was assigned the task of capture of Phillora and Pagiwal in the Sialkot sector. The enemy had two regiments of armour in the area. The attack on 11 September resulted in

the biggest tank battle since the Second World War. Lt. Col. Tarapore, commanding officer, 17 Horse, displayed outstanding leadership and was awarded PVC. Sixty nine Pakistani tanks were destroyed against nine of our own. Phillora was cleared by 16 September. Major General Sparrow had led his formation to win against a better equipped and numerically superior enemy. He was awarded MVC again.

He retired in September 1966 and joined politics. He was a minister in the short-lived ministry of Gurnam Singh in 1967. Later, he was twice elected to Lok Sabha in 1980 and 1985 on a Congress ticket. He passed away in May 1994. ■

– Brigadier Suresh Chandra Sharma (retd)



# K.G. SUBRAMANYAN

A multi-faceted artist (1924-2016)

**K**ALPATHI Ganpathy Subramanyan, who passed away recently in Vadodara at the age of 92, was one of India's most celebrated artists and one of the earliest pioneers who revolutionised Indian art and left an indelible imprint on the cultural ethos of the country. Born in Koothuparambu in Kerala in a Tamil Brahmin family, Subramanyan completed his graduation in Economics from the Presidency College, Madras.

In those heady days of the freedom struggle, a young Subramanyan, considerably influenced by the Gandhian ideology, played his part as a student leader, and also courted imprisonment for a brief while.

His interest in art was spurred on after he enrolled in Shantiniketan to study at the Kala Bhavan, the art faculty of Viswabharathi University. He was greatly influenced by eminent artists like Nandalal Bose, Benode Bihari Mukherjee and Ramkinkar Bajaj. Under their tutelage Subramanyan developed a fascination for various art forms and this also inculcated in him a desire to dabble in several diverse disciplines like painting, sculpture, print making and also in creating murals. A short stint at the Slade School of Art in London on a British Council scholarship followed by another one in New York as a Rockefeller Fellow, enabled him to hone his talents further.

Eventually, he returned to Shantiniketan and his alma mater Kala Bhavan, where he took up an assignment as professor and served till his retirement in 1989, after which he was nominated as a Professor Emeritus in Vishwabharathi. He also served as Deputy Director of the All India Handloom Board, a Government of India Undertaking at Mumbai.

The famous artist was also an accomplished writer of children's literature, specialising in creating and retelling fables, and he also inevitably illustrated all his books. As a versatile artist he also took keen interest in researching and adapting folk art and also in cubism and creating motifs from various artistic traditions of the past. Subramanyam was also prolific in penning books on Indian art and was hailed by

his contemporaries for his sheer versatility as a pedagogue, theorist and scholar. He tried his hand at weaving and toy making as well, and often opined that he perceived no real difference between artists and artisans, as both of them shared a common bond of creativity in their pursuits.

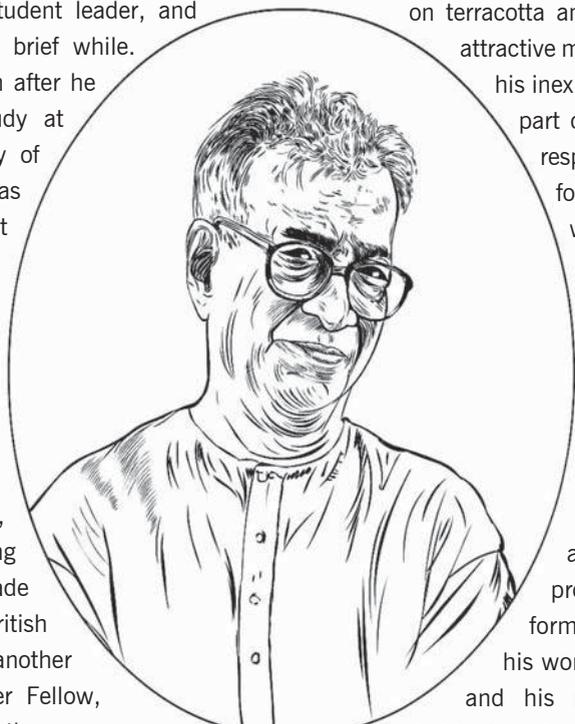
Apart from the enduring influence of his native Mahe, he also gained inspiration from a variety of other sources including images from contemporary cinema, ad campaigns and also from his keen observation of human lives as they unfolded before his artistic eyes. The artist also worked on terracotta and on painting on glass to create attractive murals. His razor sharp memory and

his inexhaustible range always remained a part of his personality and as a highly respected teacher he was responsible for shaping the careers of all those who came in contact with him. The Baroda School of which he was a pioneer, became a repository of artistic talent and produced a number of brilliant artists and scholars over the years.

Subramanyan also served as a visiting professor to several universities in India and abroad and utilised all opportunities to propagate Indian art in its myriad forms. A number of retrospectives of his work that clearly reflected his genius and his multifaceted talents have been held at various exhibitions around the world.

Subramanyam was also the recipient of a number of honours during his lifetime including the Padma Shri in 1975, the Padma Bhushan in 2006 and India's second highest national honour, the Padma Vibhushan, by the Central government in 2012. The world of contemporary art also took cognisance of his achievements and Subramanyan was awarded the prestigious Kalidas Samman in 1981, the Sironmani Puraskar by the government of West Bengal in 1994, and the Raja Ravi Varma Award instituted by the government of Kerala in 2001. The Academy of Fine Arts also honoured K.G. Subramanyan with a Lifetime Achievement Award. ■

– C. V. Aravind is a Bangalore-based freelance journalist.



# BANDA VASUDEV RAO

Father of Indian poultry farming (1935-1996)

**B**ANDA Vasudev Rao or B.V.Rao was an Indian agriculturist and poultry farmer, considered the Father of poultry farming in India. Born in 1935 at Chanchalguda, Hyderabad, Andhra Pradesh, he died in 1996. He received the Padmashree in 1990 as the architect of Indian poultry industry's growth and modernisation.

In the early 1960s, as a child, he loved being among the chickens at his home, watching them for hours, as they brooded over their eggs. After chasing many jobs, he finally found his vocation among birds.

A training programme in dairy and poultry farming offered by the Rajendranagar Agricultural University fetched him his first challenge as an entrepreneur from an American named Moore, who gave him 500 birds to tend to. Rao proved to be his star pupil, and learnt everything about poultry rearing.

Soon, Rao dreamt of his own poultry farm, but lacked the finance. Uttaradevi, his wife, sold her jewellery and with the help of her husband's friends collected capital for his venture without his knowledge, and invested in a seven acre plot.

In 1971, Rao started Venkateshwara Hatcheries Ltd., near Pune with a friend, and within a year, had secured 70 percent of the country's market share. It went on to become one of the largest and most integrated poultry groups in the world, and soon he established a chain of hatcheries in more than nine states, with interests in poultry, processed food, animal vaccines and pharmaceuticals, with offices and production facilities in 17 countries.

With the poultry industry still in a fledgling state, immunisation of the chicks was a major issue. Bugbear vaccines were not only expensive, but had to be imported and were often unsatisfactory, due to poor storage during transport. Further, there were too many formalities included in the lists of allowable imports. He lobbied with the government and finally got the vaccine included.

He gathered expertise from various vaccine institutes in the US and then convinced the government of the need

for collaboration. Production finally began in 1978 at the vaccine plant he established, and later two more companies - Ventri Biologicals and Srimi Biologicals - were also set up.

Rao set up a 40,000 strong layer farm and a 5,000 per week broiler farm as the best available training ground for students who received hands-on training. He also set up a mother lab, where all problems connected with all birds were tackled.

The National Egg Coordination Committee (NECC), as it exists today, was the result of Rao's hard work and foresight. The egg movement began when a few farmers wanted to form a cooperative for egg marketing on the lines of Dr. Verghese Kurien's milk co-operative. Motivated by Rao, they travelled across the country, organising over 300 meetings with groups, individuals, and traders, to help unite poultry farmers and take control of their own destiny.

His clarion call '*My Egg, My Price, My Life*', helped them realise their objective. On 14 May 1982, NECC was formally registered as a Trust under the Societies Registration Act and started deciding egg prices across the country.

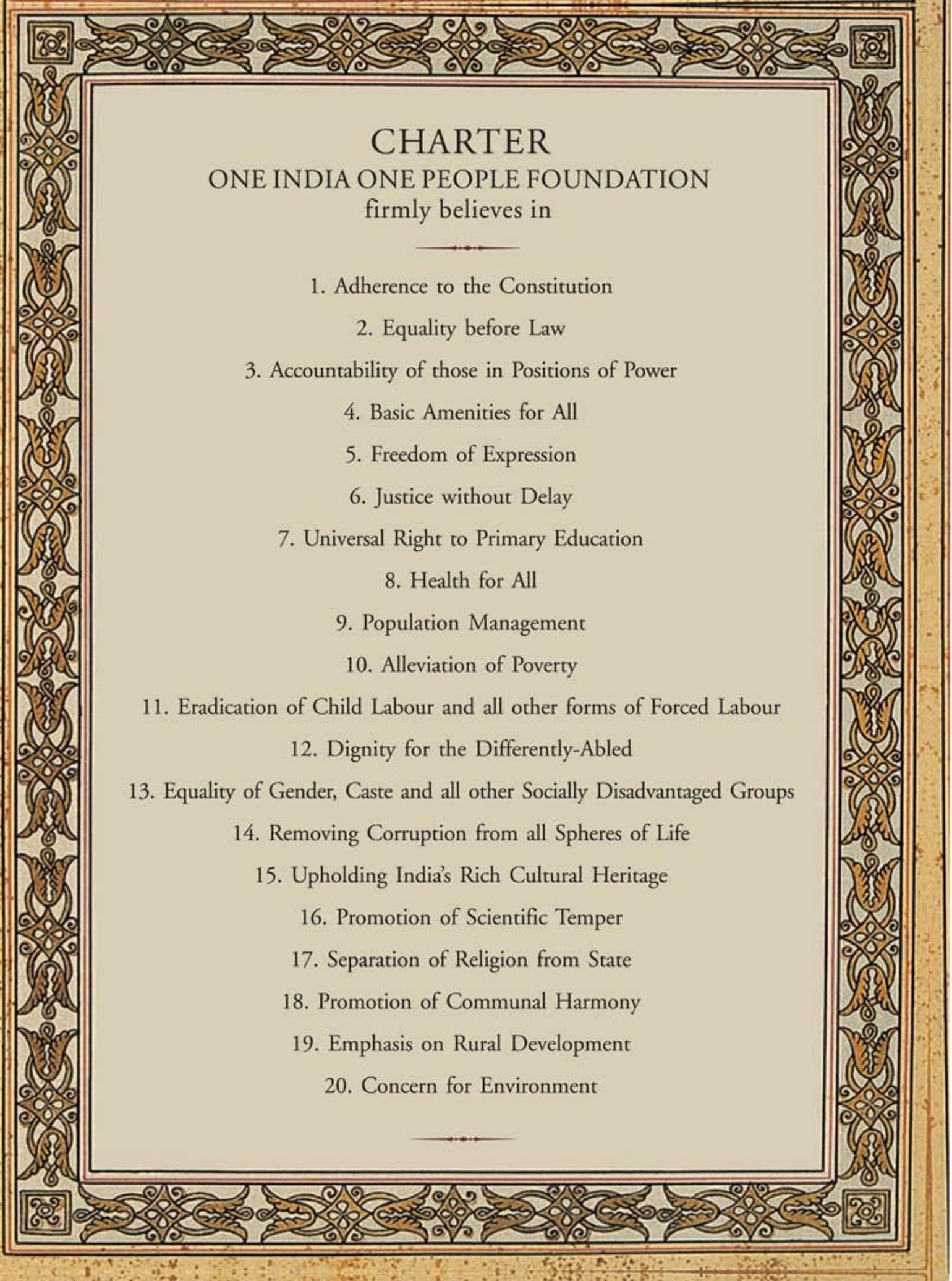
Rao was also the President of WPSA (World Poultry Science Association), India, from 1993 to 1996 and Distinguished Poultry Scientist at the International Poultry Hall of Fame in Istanbul, Turkey on 11 June 2004.

Rao devoted his life towards the growth and modernisation of Indian poultry production, transforming it from a backyard activity into a vibrant industry. Driven by science and technology, the poultry industry is today one of the most powerful engines for growth of rural economy in India, supporting the livelihood of over two million people. He is a role model for development workers across the country. His name continues to have a profound impact on the industry. ■

– A. Radhakrishnan is a Pune based freelance journalist, short story writer and poet.

(Sketches of Great Indians by C.D. Rane)





CHARTER  
ONE INDIA ONE PEOPLE FOUNDATION  
firmly believes in

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1. Adherence to the Constitution
  2. Equality before Law
  3. Accountability of those in Positions of Power
  4. Basic Amenities for All
  5. Freedom of Expression
  6. Justice without Delay
  7. Universal Right to Primary Education
  8. Health for All
  9. Population Management
  10. Alleviation of Poverty
  11. Eradication of Child Labour and all other forms of Forced Labour
  12. Dignity for the Differently-Abled
  13. Equality of Gender, Caste and all other Socially Disadvantaged Groups
  14. Removing Corruption from all Spheres of Life
  15. Upholding India's Rich Cultural Heritage
  16. Promotion of Scientific Temper
  17. Separation of Religion from State
  18. Promotion of Communal Harmony
  19. Emphasis on Rural Development
  20. Concern for Environment
-

# WHO AM I?

- Am I a Hindu first or an Indian first?*  
*Am I a Muslim first or an Indian first?*  
*Am I a Christian first or an Indian first?*  
*Am I a Buddhist first or an Indian first?*  
*Am I a Brahmin first or an Indian first?*  
*Am I a Dalit first or an Indian first?*  
*Am I a South Indian first or an Indian first?*  
*Am I a North Indian first or an Indian first?*  
*Am I the President of India first or an Indian first?*  
*Am I the Prime Minister of India first or an Indian first?*  
*Am I the Commander-in-Chief first or an Indian first?*  
*Am I a supporter of any 'ism' first or an Indian first?*  
*Am I a white-collar/blue collar worker first or an Indian first?*  
*Am I a youth/senior citizen first or an Indian first?*

*In all cases you are Indian First, Last and Always.  
Be a Proud Indian. Make this country Great, Strong and United.*



Sadanand A. Shetty, Founder Editor

(October 9<sup>th</sup>, 1930 – February 23<sup>rd</sup>, 2007)

ONE INDIA ONE PEOPLE