सुरभि

कला साहित्य पत्रिका

भारतीय अंतरिक्ष विज्ञान एवं प्रौद्योगिकी संस्थान की अर्धवार्षिक पत्रिका

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(जून 2019)

SURABHI

Journal of Arts and Literature

The Bi-annual Journal of Indian Institute of Space Science and Technology

Vol.11 No. 1
(June 2019)

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वलियमला, तिरुवनंतपुरम Valiamala, Thiruvananthapuram

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Editorial Office
Indian Institute of Space Science and Technology
Department of Space
Valiamala, Thiruvananthapuram.

Printed and Published at
Reprographic Facility, Library
Indian Institute of Space Science and Technology
Department of Space
Valiamala, Thiruvananthapuram.

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From the Editor's Desk

This time Surabhi is back with a bang. IIST has won several laurels in the last six months. It's with a sense of pride and great pleasure we present June 2019 issue of Surabhi before the readers.

One of our alumni Mr. Jitendra Kumar Dayama (SC08B010, B Tech Avionics 2008 batch) has secured 512th Rank in Indian Civil Services Examination 2018. Yes, IIST is sculpting space scientists, engineers, entrepreneurs and public officials too.

IIST proudly participated in the PSLV launch with its Advanced Retarding potential analyser for Ionospheric Studies (ARIS) which was launched on PS4 stage in SLV C45 mission on 1st April 9.30 am from SatishDhawan Space Centre (SDSC), Sriharikota Range (SHAR).

Yes Surabhi marches along with IIST. We measure our Success with an Emersonian technique

To laugh often and much;

To win the respect of intelligent people and the affection of children;

To earn the appreciation of honest critics and endure the betrayal of false friends;

To appreciate beauty,

To find the best in others, . . .

(What is Success? Ralph Waldo Emerson)

Contents

Still a moment	1
How Deep Are You?	2
ARIS onboard PSLV C-45	5
Can Stories Transform Our Mind?	14
Painting	17
Photography	18
Memories of Childhood	20
Continuity Equation & Life	22
Double Trouble and Triple Terrible	24
Painting	27

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Still a moment...

"What have you seen in the past five years?"
If asked, what would I say...
Golden glow of the morning Sun
And peaceful aura of the day.

Perusing the evening sky
In its dazzling splendor,
The wide and open pallet
Merging shapes and the color

Gently moving breeze
Among the swaying trees,
A floating butterfly
And the birds perched up high

The night sky star Rigel
And extraordinarily amazing people,
With thousands of memories
Then, a hundred cherished glories.

"What will you miss further then?"
If asked, what would I say...
Need `still a moment',
To take along the beauty around
Nothing much to miss
Except the lessons and peace!

How Deep Are You? The Freediving Experience!

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Flowing lucidly, Weightless and that unique calmness, transcending to an out of this world experience. Yeah, that pretty much summarizes Freediving. To begin with let's understand how Freediving is different from SCUBA diving. Well for starters, SCUBA stands for Self Contained Underwater Breathing Apparatus. SCUBA diving takes us to the depths of the ocean at about 30 meters or so comfortably. Then you enthral yourself into the ocean and unfortunately start bubbling air out of your regulator, disturbing and scaring away marine fauna. Moreover SCUBA is very heavy on the pocket. One dive can set you back by about 6K. There is no need to know swimming, to go SCUBA diving with an experienced guide. Freediving on the other hand is, well, almost free! But then its more demanding as I would go on to explain the requirements, to be able to freedive.

In freediving, there are no air cylinders. One relies on the air stored in one's lungs. It is breath hold diving. It requires excellent level of confidence in swimming. And knowledge of some yogic breathing techniques to lower the heart rate and conserve the air in our lungs while freediving. In the diving community there is a saying "You SCUBA dive to look around, and you Freedive to look within yourself."

It is interesting to note that the amniotic fluid in which the fetus grows is very similar in composition to that of the ocean water. And on birth, the baby if immersed in water, can intuitively swim in breast-stroke and hold its breath for around 40 seconds. And this ability remains with the baby till it learns to walk. All life started in the waters and slowly by evolution we have become what we are now. But the human physiology has even now not forgotten its roots. Mere wetting of the face of humans with water starts up physiological changes in the body, which result in conserving oxygen and redirecting it to one's heart and brain, thus increasing the immersion time. Simply put, you can hold your breath longer when you are immersed in water, compared to that on land.

Though Freediving is in its very nascent stages of development in India, it's a fast catching up sport around the world. There are four basic disciplines in freediving as a sport.

1. Static Apnea: It is floating face down in the water, fully at rest, holding your breath. The time you are able to hold your breath is recorded.
2. Dynamic Apnea: It is swimming horizontally inside a pool while

holding your breath. Here distance one can swim is recorded

3. Free Immersion: It is descending and ascending by pulling oneself down and up avertical line. Here depth of your dive is recorded.
4. Constant Weight Freediving: It is descending & ascending vertically, swimming along a line. Here too depth is recorded.

As with any adventure sport, safety is a paramount issue. So I decided to get into a training programme for freediving. PADI (Professional Association of Diving Instructors) has four levels of training as in Basic Freediver, Freediver, Advanced Freediverand Master Freediver. I decided to do the PADI FREEDIVER course at Auroville, Pondicherry. The Freediver course costs around 10K and is spanned out for about 3-5 days. The basic skill that one must demonstrate to be a part of the course is by swimming 200 meter non-stop in pool. My batch had 3 other people (allforeigners). My instructor AurociciSercomanens is an Aurovillian who was born and brought up in Pondicherry.

The course involves 3 stages namely Knowledge development (online exam), Confined water training conducted in swimming pool and Open water sessions conducted in a granite quarry pond. It involves all aspects of Freediving as in the physics, physiology, equipment, open water environment, aquatic life and safety practices.

On the final day I could hold my breath for 2.45 minutes and dive up to a depth of 18 meter. All in all, it was a very exhilarating experience to get certified as a PADI FREEDIVER (Diver No.1806AW0206).

Trivandrum is an excellent place to practice Freediving. Varkala & Kovalam are the best locations where one can rent a boat from the local fishermen or tag along with the boats which ferry SCUBA Divers.

This was an icing on the cake. I was lucky enough to catch a baby Cat-shark that had wandered off to near the coast side at Varkala beach. And don't worry it didn't become my lunch later that day. It was safely put back into the ocean after this picture was taken.

ARIS onboard PSLV C-45

Our Experience

Authors: **Sreehari B Nair, Pranjal Gupta, Naveen S, Aarathi Sathi Nair**

"Sreehari, we have got a big task, we have to develop a model of our proposed payload to be launched in the next PSLV-C45 mission" said Sudharshan Sir. "We have to build it and send it for the launch, and we won't get another chance to prove our work" he added. I did not understand what it meant, as I had no idea on what had to be accomplished, and the procedures behind it. I thought it was an easy task, which probably needed a few extended hours of work. Then I saw the seriousness in Naveen's face, who was sitting next to me, and I understood that this was something big, something serious. Sudharshan sir had just come from a meeting with the higher authorities of IIST, which included ISRO's former centre-directors and engineers. All they needed was to make a phone call to concerned authorities at ISRO and Voila! some space and 10 watts power got allotted for our payload in PS4 experimental platform of PSLV C45. Even though we had done piecewise design, simulation and emulation of our respective sections, we never knew how to develop it into an integrated space qualified model. But we had to take the challenge in this situation or loose this golden opportunity.

The work of ARIS (Advanced Retarding-Potential-Analyzer for Ionospheric Studies) started back in September 2017, as a payload for Mars Orbiter Mission-2, to study the Martian ionosphere. The team consisted of three subgroups, namely sensor, electronics, and chassis/mechanical design and development. The team was led by Dr. Umesh R Kadhane and Dr. Ambili K. M., who worked on the sensor development along with their students. I work as project staff under Dr. Anoop C. S. in the development of analog circuits and Naveen worked under Dr. Sudharshan Kaarthik in the development of the data acquisition and communication section of ARIS.

Initially the electronics sections were developed based on the specifications given by the sensor team suitable for the Martian ionosphere. These specifications included large input dynamic range, very high sensitivity, and required complex hardware and PCB structures. For the study of the earth's ionosphere, the requirements were not as stringent as that of the Martian ionosphere, so the design of the new circuit was not as hard compared to the design that we were testing at that time. The tough part was to find the necessary active and passive components that meets the specifications (functional and environmental specification) that would qualify for the launch within the projected time frame of 1-2 weeks. So, we had to decide on the components before the complete schematic was ready. We decided to use automotive grade components which were ordered

from online stores. ISRO's stores (IISU and VSSC) helped us with a few key components that were not available through online sources. They provided us with unscreened components, as the requirement was forwarded to them in short notice. In other words, we had one attempt - one design, one model, one chassis, and one payload (flight model), which should work as per the design, and should qualify the tests.

The electronics development process included design of circuits which was done at various labs in Dept. of Avionics, IIST. Sections of schematics were ready and can be connected in no time as we had enough experience, except for the power-electronics circuits, which was something we never tried before and thus needed prototyping and testing before PCB fabrication. The schematic was made using an open source tool called KiCAD.

We had to start the PCB layout design as early as possible as the fabrication and delivery of PCBs usually takes around 2 weeks (and this is an optimistic estimate). We had to be sure about the components, its availability that match our requirements (footprints) as PCB design process required their dimensions and package names to start the design. We split the circuit into three boards; two of them were sense boards that required advanced layout techniques for providing immunity to noise and leakage, and the third one was the mixed signal board for digital data acquisition, sensor conditioning, and telemetry. To get a better idea about how ISRO's flight cards are done, Anoop Sir sent Naveen and me to meet engineers from QA/QC at IISU. Even with their busy schedules they, helped us by providing the recommended design specifications for the PCB design. We ourselves designed the layout PCBs with the knowledge we got from our professors and ISRO's PCB design guidelines. The PCB design of the digital card was the toughest one as it included many circuit elements of analog, power and digital circuits in a single board and hence had to be made in multiple planes and layers. With our best efforts we managed to design all three the boards within a week.

The PCBs were given for fabrication at VSSC and it had a turnaround time of 7 days. The PCB facility was working 24 hour shifts for this. This gave us time to work on the necessary logic and software design for the digital sub-system. The algorithm given by Anoop Sir was converted to an embedded-system architecture by Sudharshan Sir and was coded by Naveen. In addition, the code included segments of operation of analog, daq, control of power sections of the ARIS electronics. The codes, were reviewed by an independent software review team comprising of Dr. Priyadarshnam, and M.Tech students Piruthvi and Neethu who work in the satellite lab of IIST.

Sudharshan sir received a call from PCB fabrication facility that the boards that were fabricated did not clear the bare-board tests. This came as a big set-back to the team as the team had no other alternative and any change in the design would mean another 10 days delay. This would also mean that the payload would not make it on time to be

integrated with the launch vehicle. There was another facility which was manufacturing the same boards. Immediately, Sudharshan Sir, Naveen and I sat with the design to see if it was an issue with the design or the process, and immediately it was found that there was a problem with the PCB design files that we had given. This means that the boards that were being manufactured elsewhere also would have the same problem. There was no time to investigate what went wrong, but after some analysis, it was decided that the problem was actually in a redundant component and could easily be solved by a simple cut in the PCB because of the redundancies provided in the system at the design stage. This issue was discussed with QC at IISU and it was resolved. Later, it was found that the cause of this issue was a quirk in the PCB design software that we did not know of. This was followed by Laser soldering, through hole soldering and harnessing of the circuit board – a streamlined process which took 5 days. During the electronics production, testing and evaluation plan was made to qualify the payload for the mission.

ARIS FLIGHT READY PCBS

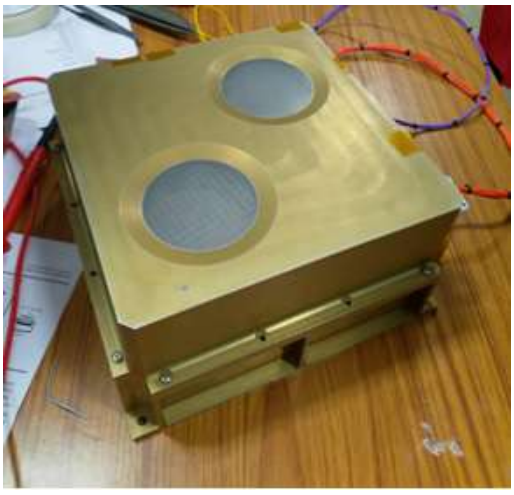
After the boards were ready, we took them back to IIST for first operational test. We uploaded our code to the micro-controller and artificially fed some known current to the input terminal of the sense board and checked the voltages at different points of the circuit through the D-connectors used in the board. For our relief the boards and the code worked perfectly apart from the power supply noise introduced by the surrounding electricity supply lines of power-electronics lab. This was a huge relief to the electronics team that the whole subsystem had worked together in the first try. Now that the circuit was tested, the boards were given for conformal coating and sealed.

Parallelly, Dr. Sooraj V S and Pranjal Gupta took care of the mechanical/chassis design and fabrication.The fabrication of the chassis began in the design department, where its structural design and analysis were done. Later, with the machining facility at IISU, the payload chassis was fabricated and tested in the Metrology lab for its dimensional accuracy. The design assembly was done according to the engineering constraints to achieve optimum performance and efficiency. The optimum mechanical design fulfils the criteria of less weight, higher frequency modes, stress-free stable structure operated at high vacuum environments.

We started our work on assembling the package at IISU around 11 AM. Assembly of the parts into the chassis included the fastening of sensor grids into the top-module along with the collector plates and

fixing the main processing board, DC-DC converter, EMI filter and bleeder resistor. Necessary wiring were done inside the modules. After that the modules were torqued together to make a single unit.

One of the major tasks ahead of us after assembly was to do the external harness for ground level testing of the payload. This took a lot of time that we along with the IISU staff had to stay back at Electronics Production Facility till 10:30 PM. After the payload was ready, we had to transfer it to IIST for testing. We found a suitable box to carry the payload and filled it with foam blocks to prevent shocks during the transit. Even though we had the necessary material outgoing pass we were stopped at the gate by the CISF guards as no material is allowed to go through the gate post 6 PM; in or out. They instructed us to leave the package there and come back tomorrow to get it.We were held at the gates along with the payload till our professors sorted out the problem by talking to the higher authorities of IISU and the officer on duty. Finally after so many conversations over phone and in person we were allowed to leave IISU with our payload back to IIST at around 11:45 PM.



The payload was tested for operation in Atomic and Molecular Physics lab at IIST, where we tested the payload in a vacuum chamber maintained at 10^-5 millibar. This test was lead by Dr. Umesh R Kadhane in the presence of Prof. M. V. Dhekhane, (Prof. Satish Dhawan Professor) and our mentor for the ARIS project.This process was time consuming as initial setup of the vacuum chamber including placing of payload inside the chamber and taking the necessary connections to the payload through a provision provided at the sides of the chamber took time. It took 3-4 hours to drain the chamber of air to create the necessary vacuum. We had to do this carefully as even one simple mistake will make us pay 4 hrs of time. Scientists from QDTE section of VSSC had also come to test the working of payload. Initial tests were not successful due to some connection break in one of the wires from the payload taken outside of the chamber. Second time we tested the payload, the outputs were not satisfactory. We were worried that one of the sensors' grids failed or were not soldered properly. We took out the payload from the chamber and tested the electronic circuits by manually feeding current to its input to ensure the proper working of the circuits. Circuits were working perfectly when tested manually and we couldn't identify the actual problem. After an early morning brainstorming session with professors, Dhekane Sir and Saji Sir we found that the sensor position inside the chamber has caused one of the sensors to be in the shadow of a metallic structure inside the chamber and hence the ions were not properly reaching them from the source. We

had to do the chamber setup again by post adjusting the payload position and hence the test went up-to 3 AM in the morning till a satisfactory output was obtained.

It was around 7pm on 13th March 2019, the preliminary testing of the payload was being carried out in the vacuum test facility in the Atomic and Molecular Physics lab at IIST after which an interface check would be done at SHAR. The atmosphere was charged with anticipation and excitement from all the professors and students who were there. Little did we know that in a few minutes time Umesh Sir and the Registrar would tell us something we had always wanted to hear. They entered the lab and handed us a few documents and said, 'You will be going to SHAR!' The payload was to be transported by road all the way from IIST to SHAR, covering almost 900 km.

Since the launch was near and assembly of PS4 stage and its harness were done in the PSLV C45 vehicle, we had to take our payload directly to SHAR for interface testing with the PS4 Harness. Usually this was done in MVIT, Valiamala, where the harness was developed. We packed the payload in the same box it was brought here and got it sealed by a CISF officer. The payload was taken to SHAR in IIST official vehicle.

The authorisation letter was given, the payload packed securely, rechecked thoroughly by the CISF and the next day we set off for Sriharikota at 4 am with one of the biggest responsibilities we ever had. Road trips suddenly took on a whole new meaning – travelling in a Govt. of India vehicle, official paper in hand granting us passage through each of the 40 toll booths we had to cross while making our way till SHAR.

After covering almost 18 hours on the road, we finally reached our destination. After going through the rigorous security checks, we found ourselves in front of the building where every launch vehicle that has ever been set off from Sriharikota was assembled - the Vehicle Assembly Building (VAB). Inside the building was another world - a state of the art engineering facility where every single part inside that building was mechanically adjustable, using huge pulleys, iron wires and huge mortars to adjust all the floor levels according to the variable height of the vehicle. The gates were almost 50m in height. The 2stage PSLV enters from one side of this building and exits on rail as a full stage SLV. The fully assembled launch vehicle is then taken to the launch pad.

We went to the upper most stage all the way up to the 18th floor, 42 m high up from the ground level, to the PS4 where our payload was to be checked for the mechanical and electrical interfaces with the power consumed by the payload among other payloads with the same on-board battery.

After interface test, the payload was returned to IIST for official testing and evaluation. The payload was taken to VSSC QDTE section for the remaining testing and evaluation procedures which included thermo-vac test, EMI/EMC test and vibration test.EMI/EMC test began in the morning which included testing the payloads operation under the presence of various RF sources. The RF noise was even fed through the power supply lines and payload's behaviour was verified.

EMI/EMC test took 6 hours to complete. The interesting thing about this test was the room (anechoic chamber) in which it was conducted. The test room's walls were covered with huge sponge spikes to absorb the radiated frequencies. Staring at these spikes gave us a special experience and satisfaction. After EMI/EMC tests the package was taken for the thermo-vac test, to test the operation of payload in vacuum subjected to a temperature range of -20^{o}C to +70^{o}C. This test was the most time consuming as the temperature soak took almost 5 hours to change from -20 to +70 since the chamber was kept at vacuum. We had to stay over-night at the test facility, awake, along with the VSSC staff to monitor the payload's operation. This test got completed around 11 AM and the payload was taken for vibration and shock test. As a part of the test the payload was subjected to vibrate up-to a maximum frequency that was recorded during the takeoff of PSLV vehicles. Random shock waves were also given to the payload and its operation during these were noted. The test room was filled with VSSC staff as everybody was curious about the payload that was made in 45 days that to by first timers. We were given earmuffs to be worn during the complete test procedure. It was almost 3 PM when all the tests got over and fortunately the payload's performance was satisfactory. We had spent almost continuous24hrs in QDTE section from EMI test to vibration test. By 3 PM, the package was officially qualified by the VSSC authorities for launching to space in PSLV C45.

The payload was taken back to IIST for the official release ceremony right after the test result and qualification. We made posters, stickers and badges containing the official ARIS logo and gave one to everyone present in the ceremony. The package was officially released by the Director of IIST in the presence of Registrar, Deans and other higher officials of IIST. The release was followed by a photo session. After the ceremony, the payload was sealed for transit to SHAR, to be prepared for the launch.

A few members of our team again went to SHAR for integration of our payload to the PS4 stage of PSLV on MSA deck. Our month long dream was going to be mounted on the PS4 stage of PSLV. By this time, integration of the entire payload was done and from the next day, the main satellite with foreign

satellites had to be integrated with the vehicle. We got a chance to enter the clean room where the integration of EMISAT was going on at the top most stage of PSLV. ISRO officials maintained a very restricted environment as it was a clean room. And finally,ARIS was ready to fly!

The launch was scheduled for April 1st and we were given the opportunity to see it live at SHAR, from the launch control centre (LCC). On 30th March 2019, at 4am we started for one of the most important trips of our lives – travelling from IIST to SHAR to view the launch of our payload – the culmination of 45 days of hard work, stress, numerous discussions and the time of so many people without whom none of this would have been possible.

People usually spend their whole lives waiting to see something magnificent. But most of the time, life just passes them by and so do they, never knowing what they missed. Once the Chairman completed his press conference, he made his way to the launch site where the PSLV was stationed, and where the official photographs were to be taken. Around 40-50 cars, including our own, raced behind the Chairman's to make it to the launch site. The moment the launch vehicle came into view, bathed in the flood lights, we kept finding it hard to believe any if this was real. As we made our way towards the site, we could hear the various team names being called out and people jostling between the crowds to get their photo taken. Very soon IIST was called out and we, like everyone else rushed forward for our photo with the Chairman with the PSLV in the background. IIST team was extremely lucky as our beloved Chancellor Dr. BN Suresh joined us for the photo. We were told that our payload was positioned right near the emblem of the Indian flag on the launch vehicle, and our hearts swelled with happiness. Standing in front of the PSLV, staring up at the behemoth of man-made engineering, we could feel nothing but pride and pride and more pride. After our photo was taken, we could not stop staring at the PSLV, even as we made our way back to the

car, all the while walking backwards and stumbling over many times as well. Since no phones or cameras were allowed, our eyes were our only cameras. But we knew that this memory would be imprinted in our minds forever.

From Left: Dr. Anoop C.S (Faculty), Aarathi Sathi Nair, Dr. Sooraj V.S (Faculty), Prof. M.V. Dhekane (Prof. Satish Dhawan Professor, IIST), Dr. Umesh R. Kadhane (Faculty), Dr. B.N. Suresh (Chancellor,IIST), Dr. K. Sivan(Chairman,ISRO & Secretary,DOS), Dr. Y. V. N. Krishna Murthy (Registrar, IIST), Dr. V. K. Dadhwal (Director, IIST), Dr. R. Sudharshan Kaarthik (Faculty), Pranjal Gupta, Naveen S. and Sreehari B. Nair.

The Launch Day

'Wait, that's April Fool's day!!!' Having any important event on April Fool's day isn't the most ideal, any moment anyone can jump out and shout 'April Fools'. But, the meaning of that day was changed once and for all for every one of us – it wasn't April Fool's day anymore, it was the day of the ARIS launch!

That morning we were taken to the control room by Umesh sir and he introduced us to each and every check and test that were to be performed before launch. There are two control rooms - MCC (Mission Control Center and LCC (Launch Control Center)- we were given a seat in LCC. The full building was covered with high security commandos and guards with weapons and dogs which made us realise, "Being here at this time is not at all easy, we really did something for our country". The moment the countdown reached the last 5 digits, the moment PSLV disappears from the screen, we were readying ourselves to run out the door and onto the balcony along with several others,

to see the PSLV.

5…4…3…2…(ignition)…**1!** The PSLV rose up into the sky amidst smoke and fire and a roar that tore through the clouds and into our ears, a roaring of a beast! Once the PSLV was beyond our line of sight, we had to believe the very high definition cameras which were capturing the full trajectory of the vehicle till it reached space. The moment the fourth stage got detached and engine got fired we saw our beautiful planet Earth covered with a sheet of blue and white from the onboard camera, I can't describe that view in words, it left us speechless.

After releasing the main satellite successfully, there was a gap of two hours. Director IIST, Registrar, and Prof. Dhekane joined us and shared their experiences with us. After the foreign satellites were ejected into their respective orbits, Chairman ISRO addressed the press. After the launch it was a very charged and happy moment in the control room. We were able to meet all the ISRO officials, including the former Chairmen Shri. Kiran Kumar and Dr. Kasthurirangan who shook our hands and congratulated our team. We were still waiting for our payload to be powered – it was scheduled to receive power five hours after launch and seemed like an eternity. Around 5PM, our professors confirmed that the package is healthy and is functioning well.

And thus, ended our journey, a journey of less than 2 months but packed with experiences to last a lifetime. If there is one thing that we are sure of, this is not an end it is only the beginning!

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Can Stories Transform Our Mind?

"Tell me the facts and I'll learn. Tell me the truth and I'll believe. But tell me a story and it will live in my heart forever." An old Native American proverb.

Stories are the fabric of communities' history and culture. Human beings were aware of the power of stories from time immemorial. The pictures and depictions in the caves and other dwellings of aboriginal people give us proof that they were story enthusiasts. Stories of aboriginal settlers were focussed on helping their fellows to understand the world they live and to unite them. A peep in to history can show that aboriginal story tellers were the first performance artists and they were highly respected in their clans. The stories handed over from generation to generation act as the cementing force of the relation between the civilized humans. Knowingly or unknowingly the metaphorical, spiritual, mythological and transformational stories embedded with morals gave us the first lessons of virtues in our life and shaped our character and moral values.

How stories shape us?

Stories are present everywhere in life. It may be in the form of gossips in office, prattles of radio jockeys, sensitive news in news papers, social media updates and even family conversation over dining table. Stories are powerful enough to engage our brains and we have experienced the comfortable feel of stories since childhood. If we are immersed in a story the emotional situations in the story enhances our heartbeat and breathing. Once we are carried away with the story we will acclimatize with the characters in the story and our emotional resonation will be on par with the characters. The travelling of our mind along with the characters and situation in the story is called 'Narrative Transportation'. Narrative transportation causes the release of neurochemical 'Oxytocin" in our brains resulting in the

creation of empathy in human minds. Several studies on narrative transportation show that most of the people are elevated to the story world when they could acclimatize with the protagonist of the story. It is a proven fact that people tend to be easily persuaded by someone who they love. A person who is under the effect of narrative transportation is mentally involved with the story, creating vivid mental images and responding emotionally to the story's content. Identifying with the favourite characters make the reader more emotionally connected and the reader keep the character as his role model. It has been proved in several studies that the neurochemical "Oxytocin" is produced when we are trusted by someone or become part of kindness in day to day life.

An experiment

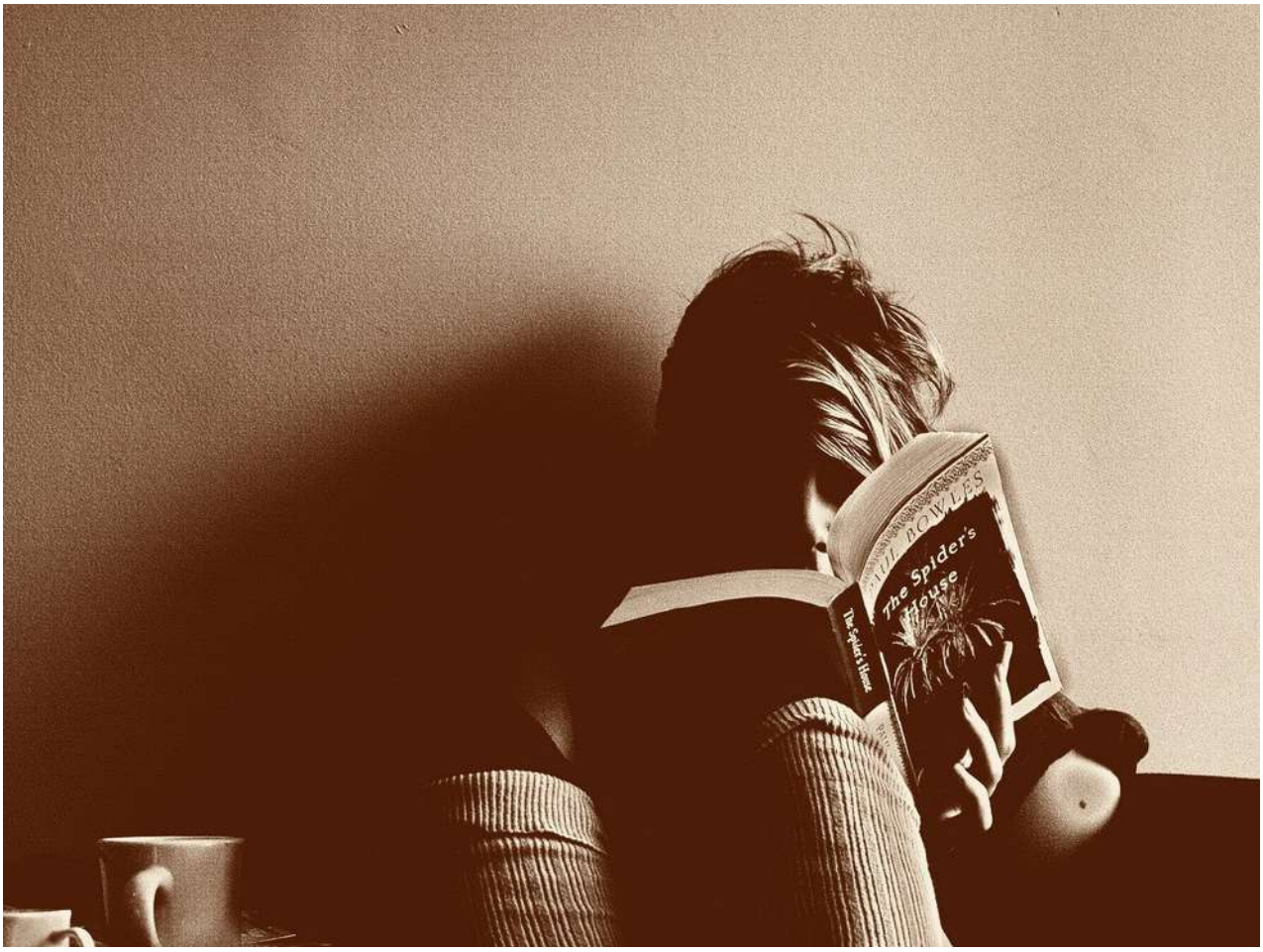
Metaphor is a tool that can be effectively utilized in storytelling. Once our mind starts travel with the characters in the story a trance like situation will occur and as a result mind will become highly suggestive. Once a psychology laboratory conducted a test to substantiate the claim of the power of stories to arise sympathy in human mind. Two professors were arranged to conduct a class for undergraduate students in different class rooms. One of the professor presented the story in matter of fact way and the other one narrated the story with metaphors in a trance inducing way. The result was astonishing. To analyse the result the psychology laboratory had arranged a person disguised as a beggar in the portico of the building. The intention was to analyse the effect of story in students after the class. Most of the students who attended the matter of fact lecture ignored the beggar but at the same time the students of the professor who presented the story blended with metaphors were very much empathetic towards the beggar. That was the effect of narrative techniques used in the classroom. This can be projected as the best example of the power of stories in creating better values in human mind.

How stories transform our mind?

If the characters and situation of the story are in sync with the reader's attitude, half of the battle is won. First stage of the transformation process is identification. It would be more effective when the characters in the story belong to the same age group. If the problems and incidents depicted in the story are similar to what is happening in the life of the reader the possibility of narrative transportation would be higher. Once the reader is emotionally immersed and acclimatized with the character, the repressed feelings will be released. Expression of repressed emotions will give relief to the reader. The next stage is that of gaining insight or gaining accurate and deep understanding of the character. A reader who is identifying with the characters in the story and situation in a book will easily face a near similar experience in the life. The reader will get the feeling that he or she is not alone. The fictional character will become his or her imaginary friend and he will become a mirror to his mind. Stories with therapeutic value can be used for preventive and rehabilitation purpose by tapping this potential of our mind.

Conclusion

Complexities of life can be experienced through different points of view of the authors and it help to widen the dimension of our mind. Involved reading is a trance like pleasurable experience and it helps to drain away tensions and enable us to relax. Several researches prove that regular readers have lower rates of depression and slow cognitive decline in old age. However, conversely some stories can make us narrow minded also. If story selection is wrong there is a chance to develop prejudice about ideologies, race, gender and nations. Reading materials should be selected with keen attention because transporting into the world of stories is an unconscious process powerful to transform our attitude.



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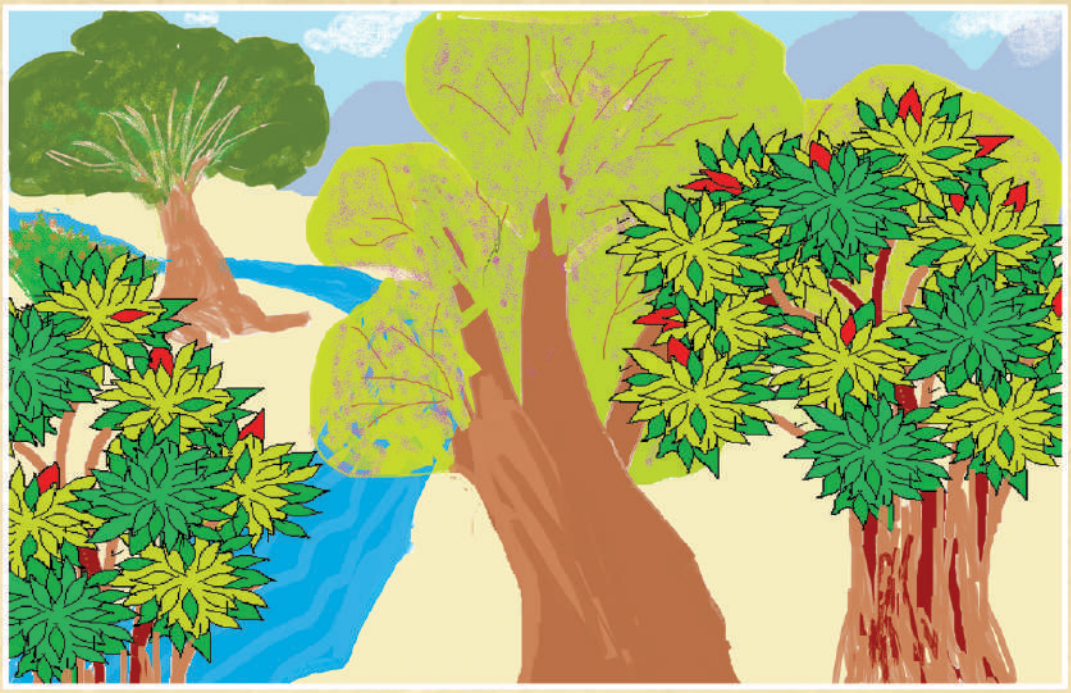

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Memories of Childhood

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It's a mistake. My mistake, precisely.

I should have understood your value when you were with me.

Now, there's nothing more left for me but to weep.

All the time we had together, now reduced to mere memories.

Memories, that haunt me day and night reminding me of your loss.

Remember, how it used to be us against the world?

We had our own world, didn't we?

Our world, where all the fantasies and beliefs could come true.

It was magical, wasn't it?

I was the queen and you became my kingdom.

It was not always just fun with you now, is it?

You assumed a tutor role too.

You kept my soul alive and the spark in me igniting.

You encouraged my enthusiasm and my eagerness.

And you taught me the value of friends, family, pain, and happiness.

You protected me against the evil clutches of the world.

You accepted me for what I am and patiently bore my mischief.

But the world saw you as a threat.

A threat to its growth, to its advancement and to its general welfare.

I remember my parents and teachers scolding me for being with you?

All they said, all the time, was to let you go.

They said that your friendship only makes me lose in the race.

I never understood what they meant then.

But looking back, I could see they meant the rat race that every grown-up has to run.

They took every possible measure to stop me from hanging out with you.

I always thought that grown-ups act the way they do because of a spell.

Maybe, an evil curse, because they incurred the wrath of some witch or wizard.

They looked lifeless all the time. And they went through their life as if it's a war.

I thought I was immune to all this because you would never let that happen to me.

You wanted me to be different and full of life even when I grow-up.

And you did everything you can for that cause.

But soon, it became a fool's errand.

I became a victim of that spell too.

I ignored you and your pleadings.

I destroyed the friendship I had with you believing I would make the society proud.

But, I was wrong. I was wrong beyond a measure.

Losing you when I could still be with you is a mistake I can never redeem.

I wish I had listened to your advice and enjoyed the brief phase of our friendship.

But now, all I have left is a lost childhood,

and a beautiful friendship.

Continuity Equation & Life...

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In fluid mechanics the Euler's continuity equation, Energy equation and Navier stokes equation are some of the fundamentals to describe three dimensional fluid flow. These concepts involve considerable amount of mathematics and in particular vector calculus and partial differentiation are frequently applied. In this article I would like to draw an analogy between continuity equation and real life without going much deep in to mathematics.

Three dimensional fluid flow is described by the velocity components u, v & w in the three directions x, y & z respectively. These are mathematically represented as $\frac{\partial u}{\partial x}, \frac{\partial v}{\partial y}$ & $\frac{\partial w}{\partial z}$. Fluid flow is classified as laminar and turbulent based on the Reynold's number. As the Reynold's number increases the fluid flow changes from laminar to turbulent flow regime. There are also other classifications such as compressible, incompressible, steady, unsteady, viscid and inviscid. Now, if a mathematical expression is said to satisfy continuity equation then the vectoral partial differentiation of the expression should yield the result, zero. Partial differentiation is a technique where only one term is differentiated keeping all other terms constant. Sometimes differentiation has to be done twice or thrice as the case may be. Vector calculus will follow an order starting from i, j & k for the terms x, y & z respectively. This means when the mathematical expression is simplified and partial differentiation is carried out, the resulting expression should have an equal number of terms with a different sign. Then all the terms get cancelled and give the result, zero.

I happened to study this topic in the first semester of my master's course in thermal engineering. Having gone to an institute to pursue master's degree after a gap of ten years of doing undergraduate studies at the age of 43 years was quite challenging a task for me. Our professor used to give number of assignments and each problem if worked out independently would easily take ten minutes of careful attention. Now I understand that these exercises were given to improve the concentration and alertness of the student. Once I discussed about these assignments with a classmate who was

much younger to me and did this work with utmost sincerity and he said this is similar to separating small chips of white marble mixed in rice grain. I solved every exercise of the assignment carefully, diligently and religiously without resorting to any malpractices.

Finally after doing this for one semester, one day a thought came across my mind that how nicely human life satisfies this Euler's continuity equation. A great analogy with respect to human life unfolded in me.

The laminar flow may be considered as a time period when days, months and years pass off peacefully without any significant changes in our life. Turbulent flow is similar to upheavals and the drastic changes that we come across in our life. Some of the fluids are treated as incompressible and this behaviour is similar to how we confront a situation that is going against us without succumbing to pressures. Some of the fluids are compressible and their volume changes as they are subjected to load, yet the flow continues. This could be applied in our life. They are the compromises we make with our life partner, colleagues, friends and relatives in the society and give in to their opinions so that life becomes easy and moves on.

There is another important aspect of fluid flow. The flow is steady and unsteady. Steady flow is one that does not change with respect to time, where as in an unsteady flow the fluid parameters change with respect to time. This is quite interesting when applied to human life. Our human body continuously undergoes changes and as we all know we are not the same as what we were in our childhood. But some of the values we have inculcated in our life do not change over the years.

We are brought to this world by our parents, we enact different roles in life, and indulge in several pleasures. We suffer several pains, including untimely losses and ultimately we die and thus everything becomes zero.

If getting a degree, landing at a great job, spending a happy married life, having fun with our children and friends are some of the positives of life, this life also throws up some sad moments of losing loved ones, accidents, ill health, etc. The net summation of our life as a mathematical expression is zero when we leave this world altogether.

Finally, I remember the saint Meera's bhajan immortalized by the famous singer Lata Mangeshkar, "payojimaine Ram rathandhanpayo...Janamjanamki poonjipayi".

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Double Trouble and Triple Terrible

It is not my intention to scare my male readers but to caution them to avoid one or both of the situations, where the possibilities of them getting into either 'double trouble' or 'triple terrible' circumstances exist. I speak from personal experience when I talk about the 'double trouble situation'. I used to think that I was the most unfortunate human being on Planet Earth until I came across one of my colleague who was experiencing the 'triple terrible situation'.

First, let me enlighten all my readers of the 'double trouble situation' which is more of an annual affair. It is said that 'all marriages are made in heaven'. While the above saying is accepted by most of us, I hope the above adage does not extend to the date of the marriage. I fervently hope and wish that the marriage date is not decided in heaven. If only the date of marriage is decided in Earth by the bridegroom, then there is a very good likelihood to avoid the 'double trouble situation'. My marriage date is exactly ten days (not in the same week and not after two weeks, but in the next following week) after the birthday of my spouse and this is the root cause of my 'double trouble situation'.

You will all appreciate how difficult it is to please a wife with a present once a year but to keep her happy with two gifts on two (important) occasions that follow one another in a week's time is truly overwhelming. I am not and I don't expect to be so lucky to have my marriage day to fall on the same day as my wife's birthday. I wish I had got to know my wife's birthday when I got married; if only I had known it, I would have taken the trouble to shift our marriage date by a month or two. Surely you will sympathize and appreciate the fact that all husbands can only hope for and possibly get to shift their marriage dates and not shift their spouse's birth days. As an anguished husband, I don't have a clue on the nature of the gift that would exactly delight her. Like most women, my wife keeps telling me that I need to flatter her with a particular gift that would not only surprise her but also keep her in high spirits. The 'double trouble' situation brings in no relief with the passage of time and is completely unaffected to the arrival of new entrant (children) to the household.

Assuming that all marriage dates are decided on Earth and by men (husbands), I don't understand why all the men do not choose their marriage dates to be the same as their wife's birthday. The above would greatly help in not only saving money for the second gift but also earn them grudging admiration from the other not so intelligent men who are destined to splurge for two presents for their spouse, in quick succession, year after year. Since I did not get to fix my marriage date and did not realize at that time that my wife's birthday preceded our marriage date by ten days, I had to endure the 'double trouble' situation, year after year.

I didn't realize that my situation was not all that bad until I met one of my colleagues recently. The colleague is also my good friend and being his good friend, I ventured to ask him his marriage date. My friend being new to the place had sought my help in finalizing the best shop in town to buy a nice present for his wife on her birthday. I realized sadly, that the destiny of my friend was no different from mine as the above two days were within eight days of one another. However, what jolted me was that the above two days were also closer to a third date called as 'Akshaya Tritiya', the above falling between the third week and the fourth week of April. Buying gold on the day of 'Akshaya Tritiya' is believed to bring in endless (good) fortune into one's lives and hence most women from India do buy gold on the above day. It is generally believed that buying and worshipping gold on the day of 'Akshaya Tritiya' is likely to please Kubera, a yaksha and a God of wealth. Needless to say, my friend found himself in an unenviable 'triple terrible' situation as an act meant to please Kubera burns a hole in his pocket.

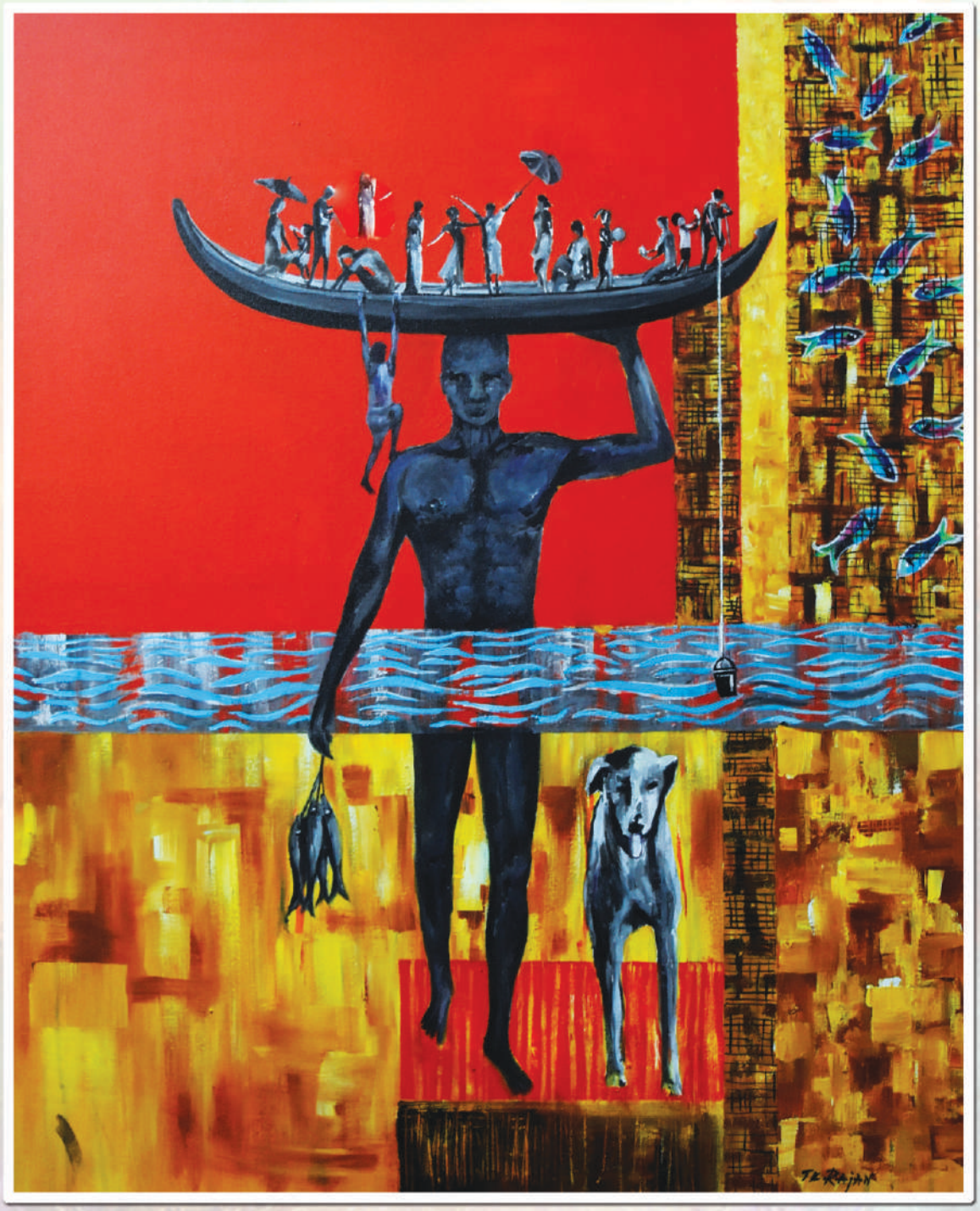
The third aspect (buying gold during 'Akshaya Tritiya') of the 'triple terrible' situation in most households comes about without the need for the husband to accompany his wife while buying gold. Needless to say, while buying gold will always remain a very expensive proposition, the fact that the husbands are spared the agony of visiting a gold store with their spouses and endure the invariably long wait that it entails is indeed an act of mercy. It is when you don't know what to buy as a gift to your wife that there is endless distress. Unfortunately for my friend, he finds himself in a truly disagreeable situation as he not only has to surprise his wife by buying her gifts that would please her on her birthday, on their marriage day as well as on the 'Akshaya Tritiya' day; each one following the next within a few days.

Is there a way for the poor husbands to get themselves out of the circumstances of the 'double trouble' and/or 'triple terrible' situation? The only solution which is applicable for the first year of the married life is to choose a wife whose birthday coincides with the 'Akshaya Tritiya' day for that year and have the marriage also on the same day. While this provides for some succor in the year of marriage, this is not likely to bring any respite for the poor husband in his subsequent years of married life since the 'Akshaya Tritiya' day does not fall on the same day every year. Hence all that the poor husband can hope for is to

successfully alter a 'triple terrible' situation to a 'double trouble' situation.

The above possibilities were suggested keeping in mind the saying that all the marriages are made in heaven while the marriage dates are not. If the above were not true, there is a distinct and sure possibility that all the 'double trouble' situations would lead to the 'triple terrible' situations. Hence the adage needs to be changed from 'all marriages are made in heaven' to 'all marriages are made in heaven; however, the marriage dates are decided in Earth by the husbands'

Painting



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सुरभि

कला साहित्य पत्रिका

भारतीय अंतरिक्ष विज्ञान एवं प्रौद्योगिकी संस्थान की अर्धवार्षिक पत्रिका

सुरभिः कला साहित्य पत्रिका भारतीय अंतरिक्ष विज्ञान एवं प्रौद्योगिकी संस्थान द्वारा प्रकाशित अर्धवार्षिक पत्रिका है जिसमें कलाकृतियों एवं सर्गात्मक रचनाओं का प्रकाशन किया जाता है जैसे – कहानियाँ, कविताएँ, अनुस्मरण, फिल्मों एवं पुस्तकों की समीक्षाएं, यात्रा विवरण, भेंट वार्ताएँ, रिपोर्ट, आरेख, छाया चित्र, वैज्ञानिक साहित्य, पेन्सिल ड्रॉइंग, चित्ररचनाएं आदि । अंतरिक्ष विभाग के विविध केंद्रों के लोगों की सर्गात्मक प्रतिभा को प्रोत्साहन देने में यह प्रत्रिका विशेष रुचि रखती है। इस पत्रिका में अंग्रेजी, हिंदी एवं भारत की किसी भाषा की रचनाएँ शामिल की जाती हैं। पत्रिका में प्रकाशन के लिए उपर्युक्त प्रकार की रचनाएं आमंत्रित की जाती हैं।

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