



डॉ. एम. अण्णादुरै DR. M. ANNADURAI निदेशक/ DIRECTOR



Dear Students and Teachers

Greetings and a very warm welcome to all of you for the National Science Day 2018 celebrations at ISRO Satellite Centre (ISAC), Bengaluru

MESSAGE

A simple rubbing of two stones and resultant fire has changed the mankind forever along with a simple rolling round object, the wheel. These two discoveries paved the way for future scientific discoveries. These discoveries also suggest that a simple everyday observation can lead to great scientific discoveries. One such observation by Prof Raman was the explanation of the blue color of sea as due to inelastic scattering of light which was later named as "Ramar Effect". Raman effect gave a way to probe the atoms and molecular structure

Raman spectroscopy being non-destructive in nature could be put to use for in-situ measurements. For his profound discovery Raman was awarded Nobel prize in 1930 just two years after his discovery. The day, Prof Raman announced his famous discovery i.e., 28th of Feb 1928 is aptly celebrated as National Science day since 1987 with a different theme every

With an emphasis on popularizing the benefits of science and technology in accordance to this year's theme "Science and technology for sustainable future", various events were conducted for students and teachers at ISRO Satellite Centre to inculcate the spirit of science in young minds. All the events attracted a very good response from the schools with enthusia participation

I hope the events organized during this year's NSD will instill a scientific spirit to achieve a sustainable future

Wishing you all the success.

28th February, 2018

159 3JUUIR डॉ. एम. अण्णादुरै (Dr. M. Annadurai)

भारतीय अन्तरिक्ष अनसंधान संगठन इसरी डान्छ Indian Space Research Organisatio

PRIZE WINNERS OF NSD-2018 Best Performance Trophy: BGS NATIONAL PUBLIC SCHOOL

1. Essay Writing: Convener – Dr Girish V

Dr. K Kasturirangan prize for The Best Essay (Cat B) :

Sampada Guha, NPS, HSR Layout

Dr. K Kasturirangan prize for The Best Essay (Cat C) :

Pranjali Hebbar, Cluny convent HS, Jalahalli,

Category B: 1st Prize winners

Kannada: Sreehari G Navaratna, MES

Hindi: Arya Tendolkar, Sishu Griha Mont & HS

English: Sampada Guha, National Public School, HSR Layout

Category C: 1st Prize winners

Ashwini Kumble, BGS National Public School Kannada: Hindi: Kanishka Mehta, Sindhi High School

English: Pranjali Hebbar, Cluny convent HS, Jalahalli,

2. Test of Scientific Temper: Convener - Jayasimha P

1st Prize(Cat C): Megha Kattimani, Cluny convent HS, Jalahalli,

3. Extempore Science Elocution: Convener - Nidhi Sharma 1st Prize (Category B): Sakshi C Choradia, Sindhi High School, KK Road

st Prize (Category C): Ishmita Menon, New Horizon Gurukul, Marathahalli

Dr. Anil Agarwal

Chairman, Organizing committee, NSD-2018

MESSAGE



Dear Students and Teachers,

'National Science Day' is celebrated all over India on 28th February every year with great passion and enthusiasm to commemorate the discovery of "Raman Effect" by the eminent Indian Physicist Sir C.V. Raman in the year 1928, for which he was awarded with prestigious Nobel prize in Physics in the year 1930. On this occasion, various events were planned on the 17th and 24th & 28th of February. We also provided students and teachers with opportunity to visit 'Exhibition of satellites and related aspects" in ISAC on last day.

The theme for this year was 'Science and Technology for sustainable future'. Science and Technology go hand-in-hand and have always played a pivotal role in the significant growth of mankind from the age-old era to till date. In today's wake of life, we appreciate the accomplishments of science and technology in every minute of life. And students of this generation are going to play major roles in future in aspects of human life. Hence ISAC has put efforts to create an environment for young minds in order to accelerate the curiosity to learn and adopt science.

Not only the students but also the educators were engaged in these activities. The event called 'Teacher's event' was organized so that they can come together under one roof and exchange their ideas with other teachers and ISRO scientists.

A large number of students and teachers participated in the events conducted. The overwhelming response from the participants gave us an immense satisfaction.

A sound knowledge and deep understanding of science aids development of technology which equips us find solutions for various economical, social and environmental challenges that we face in our lives. In order to achieve sustainable development, it is very much essential to encourage and equip ourselves with education at all levels and venture into research areas of science and technology. Involving every individual in one way or the other to bring out the best of science and technology for greener future with sustainable energy has become the necessity of present time. On behalf of organizing committee, I sincerely hope that we could contribute to induce a motivational force for young minds to think and make use of knowledge, science and technology for sustainable future

Consectation of Dr. Anil Agarwal

NSD – 2018 PHOTO GALLERY



CELEBRATION OF NSD – 2018

'National Science Day' is celebrated all over India on 28th February every year with great passion and enthusiasm to inculcate a scientific spirit in the young minds and kindle their curiousity towards scientific reasoning at a very young age. This day is celebrated in commemoration of the discovery of "Raman Effect" by the Indian Physicist Sir C.V. Raman in the year 1928, which fetched him the prestigious Nobel prize in Physics in the year 1930.

We at ISRO Satellite Centre, Bangalore, celebrate the National Science Day, every year, by encouraging students and teachers from various schools in and around Bangalore to participate in various events held at our centre. Every year there is a theme associated with NSD. This year it is "Science and Technology for sustainable future" and various events at our centre has been organised linking to this theme.

NSD celebrations at ISAC on the 28th Feb 2018 was inaugurated by Director, ISAC with lighting of the lamp. There were two exhibits, one was the Mobile science exhibition by M/s Agastya International Foundation and the other was the Mobile Planetarium by M/s Varnaaz Technologies, both been set up at the entrance of the Main Building. The students were entertained with both these exhibits largely. In addition, the students and teachers from various schools visited the space exhibition at our centre which has displays of various satellite models right from Aryabhata to Mars Orbiter Mission and exhibits related to space and satellite technology.

The events for the students held at ISRO Satellite Centre, this year have seen a very wide participation of about 1000 students from about 100 schools from various parts of Bangalore. To start with, on the 17th Feb 2018, we had two events "Essay Competition" and "Test of Scientific Temper" held for the students. Essay Competition had about 150 students participating from about 30+ schools who wrote excellent essays on two topics "Solar energy for sustainable future" and "Electric vehicles for a sustainable future: Bane or Boon". The event "Test of Scientific Temper" kept all the participating students engrossed into the depths of science for about 90 minutes with various inquisitive questions for them to think through and bring out scientific reasoning.

4. Science in Action: Convener – Bhavesh Jaiswal

1st Prize: Category B: Sarvesh Prabhu, Sindhi High School

1st Prize: Category C: Megha Kattimani, Cluny convent HS, Jalahalli,

5. Spot Painting: Convener – Saurabh Gupta

1st Prize: Category A: Shri Hardhra, The Oxford Senior Secondary School

1st Prize: Category B: Prathamesh Amembal, Sri Vidya Mandir Education Society

6. Science Quiz: Convener – Shashank S

1st Prize: Aditya Panpaliya, Siddharth Parmar, Adit Kalbalia, **BGS Public School**

7. Teachers' Event: Convener – Lalitha Abraham M A

1st Prize : Ms. Shailaja Manikandan, Sishu Griha Montessori and H. school 8. Innovative Ideas: Convener - Smrithi Varma

1st Prize: Category B: Aryan Ramesh, Krishanth R. J, Pavithra V. Nair,

Presidency School, Kasturinagar

1st Prize: Category C: Rishabh Patnaik, Arnav Aditya Singh, Aryan Tanwar, National Public School, HSR Layout

INSARM Prize- Shreya Bhat, BGS National Public School

On the 24th of Feb 2018, we had three events: The "Teacher's Event", "Innovative Ideas" and "Extempore Science Elocution". The "Teacher's Event" had about 15 presentations selected from the teachers speaking on "Science and Technology for sustainable future", with about 30 teachers and students participating in the event.

The event "Innovative Ideas" had a good number of participants with about 30 students bringing out very innovative and thought provoking ideas on two topics: "Life is confirmed on an extraterrestrial planet, what will you plan for space missions" and "Application of artificial intelligence in space industry". It was very impressive to listen to the young and energetic minds bringing out exciting ideas on these topics.

The event "Extempore Science Elocution" also had a very overwhelming participation from about 70 students from various schools talking on topics related to the theme of NSD-2018. It was indeed very amazing to listen to the extempore ideas of the young kids bringing out very informative points on various topics. It was also a very tight competition and the judges had a tough time in selecting the prize winners.

Today, the final day of the celebrations of NSD-2018, we had three other competitions in the forenoon: Science Quiz, Spot Painting and Science in Action. We had about 300 students participating in these competitions. While the "Science Quiz" tested the depth of knowledge in the young minds, the "Science in Action" made them realize the level of understanding of the fundamentals of science in them. "Spot Painting" brought the artists in the young and energetic students, which amazed all of us with its glory.

The valedictory function was conducted on 28th Feb, 2017 in the afternoon. Dr. M. Annadurai, Director ISAC

presided over the function. The highly inspirational NSD-lecture was presented by our Chief Guest Dr. B. S. Shylaja, from the Jawaharlal Nehru Planetarium on the entertaining topic "Binary Stars and Gravitational Waves". The programme concluded with the distribution of prizes for winners by the Director, Chief Guest and Chairman-NSD. NSD-2018 at ISAC was very well organized with a number of events and competitions by a number of Conveners and Members of the organizing committee, NSD-2018, with a overwhelming response of various schools in and around Bangalore.

Do you know about these members of solar system?

Asteroids

Asteroids, also called minor planets, are rocky objects in orbit around the sun. Most asteroids

orbit the sun between Mars and Jupiter, moving in the same direction as the planets. Asteroids range in size from Ceres, which has a diameter of about 1000 km, down to the size of pebbles. Sixteen asteroids have a diameter of 240 km or greater. Some asteroids, called Apollo Asteroids, cross the orbit of Earth. It has been estimated that there are around 1000 Earth-crossing asteroids with a diameter of a kilometer or more.



Comets

Most comets are believed to be composed of rocky material and water ice. A few have highly

elliptical orbits that bring them very close to the sun and swing them deeply into space, often

beyond the orbit of Pluto. The most widely accepted theory of the origin of comets is that there is a huge cloud of comets called the Oort Cloud (after the Dutch Astronomer Jan H. Oort who proposed the theory), of perhaps 1011 comets orbiting the sun at a distance of about 50,000 AU (just under a light year). These comets are near the boundary between the gravitational forces of the sun and the gravitational forces of other stars with which the sun comes into interstellar proximity every several thousand years. According to the theory, these stellar passings perturb the orbits of the comets within the Oort cloud. As a result, some comets may be captured by the visiting star, some maybe lost to interstellar space, and some may begin to "fall" toward the sun. Actually, the comet is still in orbit around the sun as it "falls." However, the orbit has been modified from a relatively circular orbit to an extremely elliptical one. These are the comets we observe.

As many comets approach the sun they develop enormous tails of luminous material that extend for millions of kilometers from the head, away from the sun. As the comet absorbs ultraviolet light, chemical processes release hydrogen, which escapes the comet's gravity, and forms a hydrogen envelope. This envelope cannot be seen from Earth because its light is absorbed by our atmosphere, but it has been detected by spacecraft. Each time a cometvisits the sun, it loses some of its volatiles. Eventually, it becomes just another rocky mass in the solar system. For this reason, comets are said to be short-lived, on a cosmological time scale.

Meteoroids

Meteoroids are small, often microscopic, solid particles that are in orbit around the sun. We see meteoroids as bright meteors when they enter Earth's atmosphere at high speed as they burn up from frictional heat. Any part of a meteor that reaches the ground is called a meteorite. As volatiles boil off from comets they carry small solid particles with them. Particles released from comets in this way become a source for meteoroids, causing meteor showers as Earth passes through them.

AstroSat – Three years of Astronomical Exploration

India's 1st multiwavelength observatory, AstroSat was launched on 28th September, 2015 with five unique payloads (UVIT, SSM, SXT, LAXPC & CZTI) to cover a wide band (UV to X-rays) of electromagnetic spectrum to study the heavenly bodies of the Cosmos. At present, the space observatory is in its 3rd year of exploration phase of astronomical sources (Black Holes, Neutron Stars, AGNs, GRBs, Star formation region, SNR etc.). Several new findings and high quality images have been published (more than 50 research articles) in various International journals showcasing the accomplishments of the AstroSat mission.



LAXPC onboard AstroSat has demonstrated its unique capability of detection of high frequency Quasi-periodic Oscillations (HFQPO) phenomena in the millisecond domain (~ 60 Hz to 800 Hz) for comapct object studies. On the other hand, CZTI has proven to be a hard X-ray polarimeter by measuring the polarised hard X-ray emission (100 - 380 keV) from the Crab pulsar for the first time in hard X-rays. SXT, a high resolution spectro-imager has identified several emission line features in X-ray spectrum to probe the emission mechanism in SNR, CVs, AGN etc.

The beautiful picture imaged by UVIT, showing the star clusters in the faint dwarf galaxy, Wolf-Lundmark-Melotte (WLM). Composite image of the star clusters in FUV (130-180 nm) and NUV (180-300 nm) is shown as blue and yellow dots. WLM forms stars at higher rate than our own Milky Way galaxy.

Nearly 1000 proposals have been submitted for observations with AstroSat by Astronomers from India as well from outside India. So far, around 450 sources have been observed with AstroSat. Data from the accepted proposals (using UVIT, SXT, LAXPC, CZTI) have been disseminated to the observers and are being analysed to investigate/study various sources. At the same time, SSM onboard AstroSat, continues to scan the X-ray sky for observations/detection of transient/persistent sources and the data product (light curve) for more than 300 sources is being made public.

PSLV-C38 Successfully Launches 31 Satellites in a Single Flight

ISRO's Polar Satellite Launch Vehicle PSLV-C38 successfully launched the 712 kg Cartosat-2 Series Satellite along with 30 co-passenger satellites today (June 23, 2017) from Satish Dhawan Space Centre SHAR, Sriharikota. This is the thirty ninth consecutively successful mission of PSLV.

PSLV-C38 lifted off at 0929 hrs (9:29 am) IST, as planned, from the First Launch Pad. After a flight of about 16 minutes, the satellites achieved a polar Sun Synchronous Orbit of 505 km inclined at an angle of 97.44 degree to the equator (very close to the intended orbit) and in the succeeding seven and a half minutes, all the 31 satellites successfully separated from the PSLV in a predetermined sequence beginning with Cartosat-2 series satellite, followed by NIUSAT and 29 customer satellites. The total number of Indian satellites launched by PSLV now stands at 48.

After separation, the two solar arrays of Cartosat-2 series satellite were deployed automatically and ISRO's Telemetry, Tracking and Command Network (ISTRAC) at Bangalore took over the control of the satellite. In the coming days, the satellite will be brought to its final operational configuration following which it will begin to provide various remote sensing services using its panchromatic (black and white) and multispectral (colour) cameras.

ISRO's Telemetry, Tracking and Command Network (ISTRAC) at Bangalore took over the control of the satellite. In the coming days, the satellite will be brought to its final operational configuration following which it will begin to provide remote sensing services using its panchromatic (black and white) and multispectral (colour) cameras.

Of the 103 co-passenger satellites carried by PSLV-C37, two – ISRO Nano Satellite-1 (INS-1) weighing 8.4 kg and INS-2 weighing 9.7 kg – are technology demonstration satellites from India.

The remaining 101 co-passenger satellites carried were international customer satellites from USA (96), The Netherlands (1), Switzerland (1), Israel (1), Kazakhstan (1) and UAE (1).

With successful launch, the total number of <u>customer satellites from abroad launched by India's</u> workhorse launch vehicle PSLV has reached 180.

Moon

I like to keep secrets

One of the most beautiful sights ever is the serene full moon in the vast expanse of the night sky with wisps of cloud floating by. Have you wondered how the world would be if our Moon wasn't around? Moon is moving away from us a tiny 3.8 cm every year from which we know we were pretty close early on.

Long long ago...that is a 4.5 billion years ago Earth and Moon were born. The current theory says it was a giant impact! A Mars size body collided with young Earth and Moon formed mostly from the material of the impactor. A lot of heat melted the Moon and its surface was uniformly covered by the bright whitish material called plagioclase. Impacts later on created deep pits which are called craters and molten material from inside the Moon filled the craters. These are the dark areas we can see with our eye.

Well, how do we know all this? Missions in the past have taken photographs, landed and brought back lunar rocks. But even today Moon surprises us with new findings: is there water ice at the permanently shadowed regions at the poles of the Moon? Is Moon still active? Does Moon have a core like Earth? Can we use the soil there to build houses in the future? We don't know several such facts yet and hence we go again to the Moon with a renewed interest. Chandrayaan-2 will not only take photographs from a distance but also land on the Moon and use a rover to study the surface. After all who knows whither are we bound until time pulls us apart!

PROF U. R. Rao

Prof. Rao was a versatile space scientist, a technologist par excellence, and a passionate space application protagonist, all rolled into one; with sharp analytical bent of mind and enormous intellectual ability with uncanny knack of grasping the contemporary happenings; and astounding ability to quickly make back-of-the-envelope computations for complex solutions and decision making. While he was a tough task master with deep insight, abundant enthusiasm and indefatigable tenacity, and penchant for speedy action, his ability to instantly connect with his subordinates is an attribute often cited as his best quality with each one of them has one story or other to tell about his personal interactions and experience with him.



Above all, Prof. U.R.Rao was a great Institution builder of global repute, and ranks along with Dr Vikram Sarabhai and Prof. Satish Dhawan as the one who brought the vision and mission focus in the Indian space programme with unstituted commitment to align the goals

of the organisation with national development. In this, he had to take in his stride the brunt of the innumerable initial difficulties, obstacles and failures of the satellites and launch vehicles in the experimental and its transition to operational era. He steadfastly brought in high levels of professional competence, mutual respect, and team spirit with trust that became the organisational norm and continues to be the guiding force in defining what is known today as 'ISRO culture'.

ISRO will always remember Prof. U.R.Rao's abundant energy, dynamism and his sense of urgency and enthusiasm to get the things done on time with professional finesse. His determination and speed in making decisions to achieve the seemingly impossible task of building ARYABHATA, the first satellite, starting from the scratch, within the stipulated time and budget, without any basic infrastructure in place, and with an inexperienced young team was something phenomenal. ARYABHATA brought into fore his project management and system engineering abilities as well as the faith he had nurtured in his team of scientists and engineers. He proved conclusively that India has the ability to master the high technology and deliver world-class products, if there is a professional leadership that leads from the front, bestowing confidence and encouragement, and posing adequate scientific and technological challenges to the younger generation. In fact, it has become the watch words for all subsequent more complex satellite and launch vehicle missions of ISRO.

Immediately after ARYABHATA, Prof. Rao went on to conceive the experimental remote sensing satellites, BHASKARA 1&2, ROHINI D2 and technology satellites in the SROSS series, which together provided the foundation for the operational Indian Remote Sensing Satellites (IRS) for natural resources & environmental applications; and the experimental communication satellite, APPLE, as first step to boldly embark on ISRO's ambitious operational Indian National Satellites (INSAT) for communication applications. IRS became a well known global brand, even capturing global leadership and attention as India's imaging capability made a quantum jump from around 1 Km spatial resolution in BHASKARA 1&2 to better than 1 metre, in the Technology Experimental Satellite (TES) launched in 1999. INSAT series of satellites made India a leading country in the world in providing domestic satellite communication services. For this immense contribution in building self reliance in satellite technology, Prof. Rao is affectionately called as FATHER OF INDIAN SATELLITE PROGRAMME.

One of the 30 co-passenger satellites carried by PSLV-C38 was the 15 kg NIUSAT, a University/Academic Institute satellite from Nurul Islam University, Tamil Nadu, India. The remaining 29 co-passenger satellites carried were international customer satellites from USA (10), United Kingdom (3), Belgium (3), Italy (3), Austria (1), Chile (1), Czech Republic (1), Finland (1), France (1), Germany (1), Japan (1), Latvia (1), Lithuania (1) and Slovakia (1).

With successful launch, the total number of <u>customer satellites from abroad placed in orbit by India's</u> workhorse launch vehicle PSLV has reached 209.

PSLV-C37 Successfully Launches 104 Satellites in a Single Flight

In its thirty ninth flight (PSLV-C37), ISRO's Polar Satellite Launch Vehicle successfully launched the 714 kg Cartosat-2 Series Satellite along with 103 co-passenger satellites today morning (February 15, 2017) from Satish Dhawan Space Centre SHAR, Sriharikota. This is the thirty eighth consecutively successful mission of PSLV. The total weight of all the 104 satellites carried on-board PSLV-C37 was 1378 kg.

PSLV-C37 lifted off at 0928 hrs (9:28 am) IST, as planned, from the First Launch Pad. After a flight of 16 minutes 48 seconds, the satellites achieved a polar Sun Synchronous Orbit of 506 km inclined at an angle of 97.46 degree to the equator (very close to the intended orbit) and in the succeeding 12 minutes, all the 104 satellites successfully separated from the PSLV fourth stage in a predetermined sequence beginning with Cartosat-2 series satellite, followed by INS-1 and INS-2. The total number of Indian satellites launched by PSLV now stands at 46.

After separation, the two solar arrays of Cartosat-2 series satellite were deployed automatically and

Swacch Bharath – An Initiative Towards Clean India

10 simple ideas for every school pupil to make a clean and green India

- 1. Do not use plastic bags; Use paper, cloth or jute bags.
- 2. Do not litter the place with chocolate wrappers and bits of paper use a dustbin.
- 3. At the end of the day, water a plant or tree with left over water from your water bottle.
- 4. Make seed balls and plant them in your garden, school and open yards. He who plants a tree, plants a hope!
- 5. Dig a small pit, and make your own compost, using soil, dung and kitchen waste.
- 6. Keep the area around your home garbage free. This will prevent the breeding of disease carriers, like mosquitoes, flies and rats.
- 7. Call a plumber immediately to fix a leaky tap in your home. Save water. Every drop counts.
- 8. Try to harvest rain water during the monsoon season.
- 9. Switch off lights and fans, when you leave a room. Save electricity.
- 10. Cycle to school-or take a bus/van; these steps help in reducing air pollution.

