

# BASE line

A Quarterly Bulletin of the Jawaharlal Nehru Planetarium, Bangalore Association for Science Education

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## The New Hybrid System inaugurated

The planetarium is back in action with the new hybrid system. It was inaugurated by the Honourable Chief Minister Sri Siddaramaiah on the 17<sup>th</sup> January, 2017. Shri MR Seetharam, Minister, Planning, Statistics and Science and Technology and Mr Martin Weichmann of Carl Zeiss, Germany, were guests of honour. Prof U R Rao, Chairman, Governing Council, presided over the function.



The up-gradation work was initiated in March 2016. The new projection system needed several changes like that of acoustics system, creation of a projection bay along the periphery apart from a different seating arrangement.

All the jobs were taken up in right earnestness and the complete overhaul of the sky-theatre was completed by mid-October 2016. The opto-mechanical projector ZKP4 by Carl-Zeiss, Jena, and high resolution digital velvet projectors by the same company were installed and commissioned by end of December 2016.

The Chief Minister stressed in his speech the need for rational thinking to weed out the superstitions associated with celestial bodies. Sri M R Seetharam, Minister for Science and Technology, described the role of the planetariums in imparting the education in the right spirit. Prof U R Rao, Chairman of the Governing Council, highlighted the unique features of the Planetarium in his opening remarks.

The Founder Director Prof C V Vishveshwara passed away on the 16th January. Prof U R Rao acknowledged his involvement in bringing up the planetarium apart from the contribution to the academics which earned him the title of "black hole man" of India.





It was very unfortunate that we lost C V Vishveshwara, the Founder Director, on the previous night of the inauguration. Here we have a brief write up on his association with the Planetarium and messages from students and others. He was well known in the academic circles for his contribution to the fields of GTR and black hole physics. His 40 year old research was in limelight last year in the context of the detection of gravitational waves. His talents were recognized almost 30 years ago by the team headed by Prof. Satish Dhawan and Prof. U R Rao. His skill on communication of a scientific topic laced with very apt visual, music, humour and anecdotes made the programs of this planetarium unique. He launched a new and most effective way of communicating science encapsulated in humour, stories, anecdotes and artworks laced with India music. He identified local talent for all these skills. He taught us these skills which we have been able to digest only partially.

He was very keen in developing a science centre here and today you see that it has become a role model for other science centres. He created several opportunities to our students to interact with many great minds in science. He told us of an antigravity cottage 25 years ago when we hardly understood the practical difficulties of making one. It is a reality today. He also dreamt of breathtaking visuals of the celestial events which is also becoming a reality today. It is our misfortune that his guidance will not be available to us anymore. We pay our tribute to the departed soul.

- B.S. Shylaja

## C.V. Vishveshwara and the Planetarium

- H R Madhusudan

Prof C V Vishveshwara (CVV) as a General Relativist, Black Hole physicist and as one whose one of the earliest works played a key role in the direct detection of Gravitational Waves in late 2015, is well known. In addition to research, CVV pursued several other areas such as music, art and education in full measure. Well, there were no half-measures in anything that he did! In this article, we would like to bring forth some of CVV's most significant contributions to science popularization and science education through a series of programmes that he conceptualized, implemented and sustained as the Founder Director of Jawaharlal Nehru Planetarium (JNP), Bengaluru.

CVV's tryst with JNP (which was established by the then Bangalore City Corporation) began with great scientists, Profs U R Rao and Satish Dhawan picking him for the coveted post of Director of JNP in 1987. In hindsight, we think that Prof Rao's selection of CVV is in itself a great contribution to science education. Fortunately, CVV took up the directorship even before the planetarium infrastructure was complete. It is now part of folklore with JNP staff, who worked with him during those days, about his commitment and passion to achieve perfection in every aspect such as the choice of colour of the carpet, the design of chairs, the acoustic treatment and wall paneling. Each of these reflects the aesthetic sense that he had.

The aesthetics did not confine to mere materials and colours. It extended to the philosophy of making planetarium shows. The script had a strong story line that carried the audience along, mesmerizing them with ideas drawn from mythologies, culture, literature and unusual anecdotes from around the world, scintillatingly illustrated by the renowned artists Chandranath Acharya and B G Gujjar who were handpicked by him for the purpose. One of the highlights of his scripts is the way he created opportunities in his narration to use special effects. These were mechanical gadgets rendering animations on to the dome (unimaginable for the digital artists of today!) All the staff being first timers in a planetarium, (some of us had never been to one before!) it was an onerous task to convey the visual effect that had to be created. But then, CVV being a very good, imaginative cartoonist himself, he had mastered the art of visualizing the abstract. And, he could effectively convey it to the engineers and fabricators at JNP. It is another story from the planetarium engineers as to how difficult it was to achieve what CVV desired.

CVV would get the music composed exclusively for the planetarium shows. Here again, his deep understanding of



As the Director of the Planetarium in 2000

finer aspects of Indian and western classical music and musical instruments shone brightly. Since the beginning days, blending science with art and culture and appropriately composed music with a distinct Indian touch to it, have become the style of making planetarium shows at JNP.

The administration of JNP was handed over to a newly constituted autonomous Body, '*Bangalore Association for Science Education (BASE)*' headed by Prof U R Rao with CVV as the vice-chairman. The formation of BASE, served as the right kind of stimulus for the educational programmes at the planetarium and to expand the reach of the planetarium. One of the primary objectives of BASE is to impart science education at all levels by non-formal methods. To begin with CVV conceptualized an exhibition of working experiments in all branches of science entitled, '*Science in Action (SIA)*' in 1992. About thirty classic and high-impact experiments were set up at JNP with active involvement of various departments of IISc, NAL, RRI, ISRO and IIA. Demonstrating scientific phenomena as it happens is the key to bring the spirit of doing science to young children. At a time when most science exhibitions were content with posters and thermo-col models and had few experiments, SIA came as a whiff of fresh air. Since then, we have held SIA every year and is popular among science-minded people. It serves as a rich resource to teach science.

For a theorist, CVV's great interest in experiments comes as a surprise to many. But he liked experiments. In fact, he would tell students that it is a cardinal mistake to brand themselves as 'theorist' or 'experimentalist' until they got into a Ph D programme. In his inimitable style, he would underline the role of experiments by saying that one would never become a good swimmer by merely reading excellent book on swimming! One had to jump into waters and learn to swim, he would say. He advised students to pursue both ways of solving scientific problems. In fact all the educational programmes at JNP are strong in both theoretical and experimental components.

In association with Mr Hariparameswaran, a ten-day activity-oriented programme called BASE camp was started almost 25 years ago. Children from class VI to X would involve in carrying out experiments on a variety of topics such as optics, sound, centre of gravity. These simple-to-do experiments brought joy to the children. His sensitive mind willed to extend this joy to the physically challenged students also. So, special workshops to enable such students began. True to his character, however, CVV strongly believed that one-off programmes such as SIA or BASE camp or workshops alone would not be enough to cultivate the culture of doing science. A continuous rigorous interaction was essential. And, it had to start as early as possible in a child's education. Thus, over a period of time, we started several programmes for children - '*Science Education in Early Development (SEED)*' for primary and middle school children, '*Science over*

*Weekend (SOW)*' for high school students and '*Research Education Advancement Programme (REAP)*' for undergraduates. REAP is at the pinnacle of this educational programme pyramid. It is a rigorous three-year physics programme conducted over the weekends for those desirous of a career in research. REAP has turned out to be highly successful considering that several students are selected by reputed institutions in India and outside for Ph.D programme, every year. We have '*REAP*'ed more than a hundred research students so far! And, some of them are the '*SEEDs*' '*SOWn*' here! That is a rich harvest by any measure. CVV has distinctly contributed to its success by visualizing a programme of this kind, getting the best and the right kind of people to teach in REAP all of whom willingly agreed.

A similar programme in Life Sciences, entitled Bio-REAP was started and with faculty from IISc, UAS and NCBS actively involved in teaching. It is also flowering into a successful programme.

CVV also revered the role of teachers; several workshops were held on various topics to motivate the teachers for a very efficient mode of communication. Again, he believed that a one day workshop or enrichment programme would not deliver goods. Thus began a series of interactive sessions with teachers. Many REAPers have now taken up teaching and are continuously participating in all educational activities.

Now, looking back at all the educational activities of the planetarium spread a little over a quarter of a century, the path made by CVV through slow but firm steps cannot be missed. He lives through the rich legacy of inspirational work carried out by him.



## Cartoons for the Planetarium program by B G Gujjar as instructed by CVV



The twin paradox



Addressing the superstition on eclipse for the Eclipse program



Why the extraterrestrials are not contacting us?

My association with Professor C.V. Vishveshwara was relatively late in our lives. In 1996 he called me to ask if I would assist him in organising a program for undergraduate Science students keen on a research career. Later called Research Education Advancement Program (REAP) it has, since, flowered.

Vishu, as he was to friends, had an extended view of the role of the Planetarium. It was not only to stimulate public interest in Science but also to act. A centre to motivate the young to pursue a Scientific career. This was particularly so in Bangalore where there are so many premier research institutions. Within a year or two, Professor Bala Iyer and I were joined by others in this endeavour. It's success is, in great measure, due to the continuous care and attention to detail and the planning and organising it involved, that was given by the Planetarium Staff, particularly Sri H.R.Madhusudan and Dr. B.S.Shylaja.

The key to this was Vishu's unflagging enthusiasm. He had this unusual charm of sounding ideas, letting them take root and crediting his associates with their success! No wonder he was adored by the Planetarium staff.

Often, Vishu would share reminiscences of younger days - as it happened, he too had spent some time as a post doc in Columbia University, New York, where I had been a student some years earlier. A charming story teller often embellishing with a touch of mischievous gleam, I used to enjoy having a cup of tea with him after a REAP class. Among his many talents was his adorning a lecture of his with a cartoon or two that he had drawn as also his inventing apt acronyms (REAP was one such!)

When a brilliant scholar was also pleasant company and a fine friend it was a gift for me. I cherish the memory.

- S.Lokanathan



With Dr. David Malin, Prof. UR Rao and Prof. BV Sreekantan in 2002

My memories of CVV start with "The Black Hole Hunt" series of lectures. He was the then director of the Planetarium and the backbone of the REAP programme. Full of wonderful illustrations and his characteristic witty explanation, the course made general theory of relativity look easy! I was fortunate to do a summer project under him during my Masters and he gave me a simple project with ample freedom to decide how I wanted to do it. Support and encouragement was his way of making a student work hard. I also attended many of his general lectures on "Einstein and India" and a Kannada lecture in IISc called "adu-idu". Memories include watching "To Kill a Mocking Bird" at JNP arranged by him. He always replied to every one of my e-mails and was always approachable. His legacy is much more than his Physics achievements, it lives on in the form of many students who benefited from REAP and will fondly remember him as CVV- a wonderful human being.

- Padmalekha K

Post Doctoral Researcher, FB Physik,  
Technical University of Kaiserslautern, Germany



with Prof. U R Ananthamurthy



Inauguration of the planetarium programme; Time – the Eternal Stream, by Chief Minister S M Krishna, with Prof U R Rao, and Mrs Sudha Murthy

# BASE line

For me and many of my REAP friends from J N Planetarium, Prof. C V Vishveshwara (CVV, as we used to call him) was an inspiration to do science. During my pre University days in 1997, I attended a lectures series at Planetarium 'Black hole hunt' taught by the 'Black hole man of India'. With his sharp intellect, charismatic wit and humor, CVV made sure that even students with minimal background could understand the essence of general relativity and feel the beauty of black hole physics. He was a polymath, who not only had deep knowledge of different fields like literature, art and history, but knew how connect it to science and evolution of scientific thoughts. His talks were filled with anecdotes of scientists, artists, historical figures and his own personal stories. He used to bring life to the equations through his cartoons and stories (for which he is famous for in Physics community), and through ingenious ways such as substituting Kannada scripts in equations when you run out of letters in English and Greek!

His pioneering contribution to understanding Black holes- its stability and ring down effects, which was eventually confirmed by Gravitational wave experiments is well known. He should also be remembered for nurturing science education in India, in particular Bengaluru. He initiated a Science Centre at Planetarium, which acted as a magnet to attract young students into science. He inspired many (including myself) to attend the weekend science lectures at Planetarium, which later turned into REAP (Research Education Advancement Programme in Physical Sciences). He used to quote a line from Spanish poet Antonio Machado "Traveller there is no path, Paths are made by walking". Many of the REAPers have made their own paths in science and can be seen in various scientific institutions in India and abroad.

- Shivakumar Jolad

Assistant Professor (Physics, jointly with Social Science)  
Indian Institute of Technology- Gandhinagar.



With Roy Kerr, when he visited the Planetarium

I attended the weekend classes on science at JNP, while I was in high-school and later, the first year of the REAP programme. As is the case for many others, the activities of BASE motivated me to take up basic science as a career. By founding and mentoring this exciting center of activity, CVV has left us a legacy. Though I was not as fortunate as to attend courses offered by him, it was always a joy to listen to him speak on several occasions. Such was his caliber that he could entertain both, a scientific audience on Relativity and a public audience interested more in literature/culture, equally well. I would cherish his memory as that of a person who could fill a serious discussion with humour.

-Sakshath S

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CVV was the first senior scientist that I interacted with. A news report or listing of events in the city today in a newspaper had brought me to the weekend science program (that became REAP a couple of years later). I came to get motivated to study pure science, especially the physical sciences. The environment created by Dr. CVV and team in the BASE campus nurtured, sustained, and encouraged my resolve. I always sought out opportunities for small talk with CVV – though they were casual conversations, invariably I came out of it with a much clearer understanding of the concept or question I went in with. Seeing the white maruti van on campus would always bring a smile on my face and I would quicken my pace as I came to the planetarium every time.

-Dwijendranath Guru

Independent technology developer for/of sustainable  
food systems



With Chandrashekar and Mrs Chandrashekar



I first heard Prof C V Vishveshwara in the summer programme organised at the Planetarium in May 2000. He gave an introduction to general relativity and black holes. I

was fascinated and mesmerised, and his charismatic style and the cartoons reminded me of Gamow's 'One Two Three...Infinity'. At that time, I was unaware of his fundamental contributions to the physics of black holes. It took several years to dawn upon me that I was interacting with a living legend in the field.

The Research Education Advancement Programme that CVV initiated at JNP has had a serious impact in nurturing students towards a career in science. Me and several friends owe our careers to this programme.

Two incidents have left a lasting impression of CVV and JNP on me personally. The first incident is when JNP came to our rescue when me and a friend met with an accident while travelling for an academic visit. The second incident was when CVV & others continued the REAP programme even when I was the only survivor in a particular year. These acts bring to light the commitment CVV had towards education and also his warm human nature. He was always there to consult on every possible issue —science or otherwise, and I have appealed to his wisdom on many an occasion. We will miss him very deeply.

Perhaps the best way to respect him would be to maintain the standards of excellence in science and education that he set for us.

- K Vijay Kumar

International Centre for Theoretical Sciences (ICTS-TIFR)

I was lucky to meet Vishu as soon as he took charge of the Jawaharlal Nehru Planetarium.

Sharp, quick witted, simple always lacing every conversation with his inimitable style of humour is how I recall every meeting with Vishu. He was ever dynamic and steadfast in chasing his visions to reality and fruition.

Vishu gathered a few of his scientist friends and asked me to talk about my experiences with kids in giving them a taste of hands-on science with simple materials. This event started a journey that produced for the first time in India affordable science kits on four topics at Rs.10/- per topic. Air, Water, Sound and Centre of Gravity were available for all those who joined the KIT OF THE KWARTER CLUB a name coined by him.

I did not know that I touched a vibrant chord in him when I suggested workshops for the Disabled- and soon several workshops for students with disability saw the light of the day at the Planetarium.

He also encouraged workshops for the parents and teachers of the disabled. Put together, it was a capsule of three days.

I suggested that we should catch young kids and energise them to invent and create things. The Young Inventors Meet with a beeline of enthusiastic kids soon became another milestone in the history of the Planetarium. Now it has set the trend for many such programs by various agencies.

Vishu was truly one of a kind. He will continue to live in the young minds he nurtured.

- Hari Parameswaran

Dynam



with Prof. S.Chandrashekar at the Planetarium



with Prof. Roddam Narasimha

# BASE line

I met Prof. C V Vishveshwara, when his daughter Namita was in the ART production of George Orwell's "Animal Farm" and he was then with the Indian Institute of Astrophysics. We used to chat during recordings of the English commentary for the programmes which were always stimulating. Ignoramus that I was, he with his wry smile, drily pointed out that a total solar eclipse occurs only because the sun although 400 times bigger than the moon is also 400 times farther away so that the nearer disc obliterates the other. Simply put and yet unforgettable. Thank you, Vishu.

- Jagdish Raja  
Jagriti Theatre  
Ramagondanahalli, Varthur Road



With the families of JNP staff



With Prof. G. Vekatasubbiah on the occasion of renaming the "New BEL Road" as "C K Venkataramayya Road" after his father



With Prof U R Rao on the inauguration of the second planetarium program in 1990



He had posed in front of the old projector last March, just prior to the dismantling in view of the up-gradation.



On the 19<sup>th</sup> November 1989 when the Planetarium was inaugurated

# BASE line

Vishu as he is known to many of his friends, colleagues and students, was the first to explore the stability of black holes and their characteristic signature. These characteristic waves are technically termed *quasi-normal modes*, which is why Vishu, a scientist with a great sense of humour and wit, calls himself "*Quasimodo of black holes*". They are not unlike the dying tones of a bell struck with a hammer and are often called the ringdown radiation. Vishu's work is fundamental to our understanding of black holes and began a new chapter in how to study them. When the GW discovery by LIGO was announced last year, Vishu was elated. I have never seen him so high, thrilled by the possibility that soon there would be events where the QNMs would be even more strong.

The first relativity meeting I went to was the Einstein Centenary symposium at Physical Research Laboratory, Ahmedabad in 1979. Though I have many wonderful memories of the symposium the most memorable one was Vishu's lecture entitled '*Black Holes for Bedtime*'. To me it was a magical experience; an exotic cocktail of science, art, humour and caricature. Equations were not necessarily abstract and unspeakable and could well be translated in the best literary tradition if you were Vishu! Over the years, Vishu's cartoons in the ICGC proceedings were always awaited. The series of cartoons on GW in those proceedings deserves special mention. Alas they are incomplete since he could not make one after the discovery.

It was always a pleasure working with Vishu. There is no pressure, no generation gap, a natural possibility to grow and contribute your best, an easy personal rapport, a refreshing sense of humour, an unassuming erudition and most importantly a warm and wonderful human being. It did not take time for families of those who worked with him to come closer with Vishu becoming the elder of an extended family as happened in my own case.

The JNP where we all have assembled is a wonderful example of Vishu's vision and showcases his multi-faceted personality. Whether it was the colors of the fabric or the fabric texture, the chairs or the high quality astronomy posters, the script or the narration, the music or the literary quotes.. Think of it and Vishu was involved deeply in it.. By example he set up high standards for all the JNP personnel and what we are about to inaugurate today is their tribute to Vishu and their determination to keep up the excellence. But JNP was not to be just a theatre. It had to play a role in science education in the city. Thus Vishu set up BASE where we mentor students from school, high school and colleges for a career in science. Vishu was inventive with acronyms. We have SEED, SOW and REAP programs. REAP Physics being a physics study circle over the weekends to prepare undergraduate students for a research career in physics.

We will miss you, Vishu, even as we try very hard to follow your lines from Antonio Machado:

*Traveller there is no path ; Paths are made by walking*

- Bala Iyer  
JNP, 17 Jan 2017



At the press meet on Gravitational Waves Detection

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