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Monthly Newsletter of Vigyan Prasar

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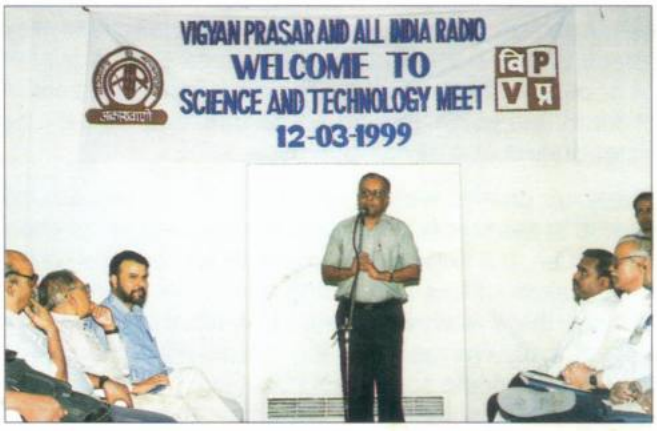
Inside

VP News



Station Director of AIR Chennai initiating the meet.

Vigyan Prasar - All India Radio Chennai Joint Serial on Popular Science in Tamil

A section of distinguished participants.

An interactive workshop was organised by Vigyan Prasar (VP) and All India Radio (AIR) Chennai in the studios of AIR, Chennai, on 12th March, 1999 to plan for a joint popular science serial in Tamil language. The workshop was attended by a host of distinguished scientists, experts, media personnel and journalists from all over Tamil Nadu. In a bid to involve all AIR stations of the state for simultaneous broadcast of the proposed serial, the organisers had invited officials from all these stations. As a result the Station Directors and Science Cell Staff of Tiruchirapally, Karaikkal, Madurai, Pondicherry, Coimbatore, Tirunelveli, Tirunallar, Nagereoil, Ooty and Udhagamandalam were present during this one day event to guide the proceedings. Most of the speakers suggested an interactive type of programme aimed at children and youth of Tamil Nadu. Those who put forward their valuable suggestions included Dr. R.M. Vasagam, Vice Chancellor, Anna University; Dr. V.C. Kulandaiswamy, Former Vice Chancellor of IGNOU; Prof. P.T. Manoharan, Former Vice Chancellor, Madras University; Dr. R. Natarajan, Director, IIT Madras; Dr. Kunthala Jayaraman, Dean of Technology, Anna University; Shri A.K. Bhatnagar, DDG, Regional Meteorological Centre; Dr. K. Subramanian, Member Secretary, Tamil Nadu State Council for Science and Technology and Dr. K. Venkataraman, Director, Zoological Survey of India, Chennai. After lengthy deliberations it was decided to start the mega-serial with themes chosen from information technology and its impact on society. This 52 episode serial is expected to start somewhere during the second half of this year in an interactive mode, in a prime time weekly slot.

... think scientifically, act scientifically ... think scientifically, act scientifically ... think scientifically, act ...

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Despair and Hopelessness

No nation can afford to allow negativism to overtake positivism among its citizens, especially her children and youth. Even the slightest whiff of such a thing happening ought to trigger shock waves powerful enough to awaken the sleepiest and move the laziest among governments (and the country's leadership at various levels) to act.

If you have been interacting with a lot of different people in the normal course, you couldn't have helped noticing that, among a large cross-section of grown-ups and a vast majority of elderly people, we may have already reached that stage – with feelings of despair and helplessness for the present and hopelessness way ahead of any signs and/or expressions of enthusiasm of hope for a better future. The situation in respect of children and youth, though not as bad, may actually be deteriorating at a dangerous pace.

There are enough warning signs and indications around us and in the media to support this apprehension-cum-contention, but none which points to any serious notice being taken of this impending crisis. But then, in our system, there really is no one - individual or an agency - specifically charged with the overall responsibility of thinking and doing something about India's future, which would obviously include watching the present for indications, signs, trends and developments which could have an impact on our country's future. This is true despite the fact that the different sectors (represented by ministries, departments and associated organisations) of the government also have the responsibility of thinking about and planning for the country's future in their respective areas.

From the above, it would appear that a scientifically conducted survey ought to be carried out periodically (preferably every year) but regularly to ascertain the actual situation, not only to keep a watch over it but to enable remedial follow-up action by all concerned.

In any case, tomorrow's leaders would have to come from today's children and youth. But what sort of leadership can we expect to emerge from among those, a majority of whom (i) don't see any thing positive in India's future, or any future for themselves in India; (ii) would have left the country for, what they thought were, greener pastures at the first available opportunity – which never came their way; (iii) believe that problems facing India can never be solved; (iv) believe that no matter what they do, things would not get better; (v) don't think individuals can make any difference to the way things are, or the way things are going; and so on and so forth.

Needless to say that this is unacceptable ! We must ensure, by putting a system in place, that the country never ever comes anywhere near such a situation.

Despite problems, or seemingly insurmountable hurdles and difficulties, a vast majority of the people ought to have confidence in themselves individually and in their collective abilities to overcome and prevail over all odds – external and internal – and continually strive for to build a better and better future for the country and for themselves. This "confidence" in people (individual, as well as collective) develops as a result of a complex combination and interplay of factors – such as formal and informal, direct and indirect, education both at home, school and college, as well as outside of these places; history, culture and traditions of the country; economic, industrial and military might of the country vis-a-vis its neighbours as well in relation to those considered to be the dominant powers in the world; how self-reliant the country is economically and in matters relating to its security; and how confidently and self assuredly is it able to deal with overbearing and patronising big brothers of this world; and so on among several others. An important one among the latter is one's innate or natural love for and commitment towards one's own country - almost like the feelings one has for one's parents and one's progeny!

What is this "system" that needs to be put in place? Some elements of such a system, in effect, already exist; the missing ones need to be identified and put in place; and there has to be someone made responsible (and accountable) for overviewing, managing and making this system work to deliver the desired results. Presently we have no official or authentic scientifically collected data (time series) to assess what our people, in particular, children and youth are thinking/feeling/discussing, or are concerned about, when it comes to their future and the future of their country; or on whether there are trends we need to worry about and act upon. As a matter of fact, this "acting upon" would have to be done in so many sectors and at so many different levels that an essential element of this "system" would have to involve continual sensitization of all the concerned sectors and catalysation and triggering of appropriate action at different levels. This sensitization process would no doubt be helped by looking for and widely disseminating information about invidual and collective examples, from all over the country, of those who never gave up, never despaired, fought off odds, strove hard and won over all kinds of handicaps and hurdles to come out on top.

With such a system in place, positivism will always be the dominant spirit among our citizens and despair and hopelessness would have to give way to a will to continue to strive, determination to overcome and hope forever for a better future.

We elicit and would welcome readers' views and suggestions.

NKS

KALINGA PRIZE - 1998

The presentation Ceremony for the 1998 Kalinga Prize for science popularisation was held on 7th April, 1999 in New Delhi (National Museum Auditorium). The 1998 Kalinga Prize was jointly awarded to Ms. Regina Paz Lopez of the Philippines and Prof. Ennio Candotti of Brazil. Shri Naveen Patnaik, Hon'ble Minister of Steel and Mines, Govt. of India gave away the awards. Shri P.R. Dasgupta, Secretary, Department of Education & Secretary General, Indian National Commission for Co-operation with UNESCO and Prof. Moegiadi, Director, UNESCO, New Delhi Office were also present on the occasion.

The Kalinga Prize was established in 1951 by UNESCO with a generous grant from Late Biju Patnaik, Founder President of the Kalinga Foundation Trust. First awarded in 1952, the Kalinga Prize is presented annually by UNESCO to a person or persons, who have made outstanding contribution to the interpretation of science and technology to the general public. The Director General of UNESCO selects the prize winner out of nominations received from Member States on the recommendation of a Four Member International jury. The Kalinga Prize is regarded as a prestigious international recognition for outstanding science popularisation work. It has so far been awarded to 53 brilliant promoters of science & technology since its inception. Some of the great scientists/personalities who have been awarded Kalinga Prize are Louis de Brogile (1952), Julian Huxley (1953), George Gamow (1956), Bertrand Russel (1957), Karl von Frisch (1958), Arthur C. Clarke (1961), Fred Hoyle (1967) and Sergei Kapitza (1979).

Since the inception of the Award in 1952, four Indians have been awarded Kalinga Prize : Jagjit Singh (1963), Narender K. Sehgal (1991) (jointly with Radu Iftimovici of Romania), Jayant V. Narlikar (1996) (jointly with Jiri Grygar of Czech Rep.) & Dorairajan Balasubramanian (1997)

About the 1998 Laureates

Prof. Ennio Candotti, is a physicist. He was born in Italy. After completing his studies in Italy he moved to Brazil and became a Brazilian national in 1983. Presently he is at the Department of Physics of the Universidade do Espirito Santo. He has been closely associated with the Brazilian Society for the Advancement of Science (SBPC). He served the Society as its Regional Secretary, Vice President and President.

With the mobilisation of the local scientific community he began activities towards the interpretation and diffusion of science to the public. A result of one such initiative was the launch of a series of more than 50 public conferences entitled Ciencia as Seis a Meia or Science at 6.30 pm which spanned a period of 4 years.

In 1982 Professor Candotti was the key figure within a group of scientists initiating the launch of the monthly science news magazine Ciencia Hoje or Science Today, supported by the SBPC which brings information on scientific development of a quality that is acceptable to the scientific community but also accessible to the general public. This publication today remains a landmark in the popularisation of science in Brazil. During his long career Professor Candotti has published over 100 articles and research publications. Professor Candotti later launched a similar initiative in Argentina called Ciencia Hoy.

Professor Candotti was the brain behind a series of books, Science Today, at school dealing with various aspects of the natural sciences; a series of CD-ROMs and science information directed at children and a series of publications on technological developments called Technology Notebooks.

Ms. Regina Paz Lopez, a Master in Development Management from the Asian Institute of Management, is an exponent of television-assisted instruction. She spent 11 years carrying out humanitarian work in the African continent mainly in Kenya but also in Zambia and Ghana. Her work involved assisting in the establishment of orphanages and children's homes. She is the producer of Bago Yan Ah!, a radio program which provides a valuable grassroots science and general interest information service. She played a major role in the establishment of the Phillippine's first media-based hotline, Bentay Bata 163 or Child Watch 163, part of a nation wide campaign on child welfare and against child abuse. She is the producer of four popularly - watched educational television programmes - Sine'skwela, Hirayamanawari, Bayani and Math-Tinik in the country. She presently serves as President of the Southeast Asian Foundation for Children's Television, programmes of which are aired in Phillipines nationwide and cover diverse subjects such as fibre optics, future sources of energy, effects of pollution on organisms, human responsibility to the environment, as well as information concerning states of physical disability and basic First Aid, the list of topics goes on.

Ms. Lopez has also made a contribution to the socio-political development of her country and has been instrumental in the establishment of various infrastructures and services benefiting the public she so well serves. Such programmes as the Communities-in Crisis programme utilises the media to draw much needed resources to poorer provinces of her native Phillippines.

INSAT - 2E

India's most advanced multipurpose satellite INSAT-2E was launched by European Ariane Launch Vehicle at Kourou, French Guyana, in South America. It is the latest in the INSAT-2 series of satellites built by ISRO, for telecommunication, television broadcasting and meteorological services.

The satellite is located at 83 degrees east longitude in the geostationary orbit. INSAT-2E, weighing, 2,550 kg at lift-off, carries seventeen transponders – twelve operating in the normal C-band frequency with coverage over Central Europe, Southern Region of former U.S.S.R., East Asia and Australia. Seven of the normal C-band transponders have wide beam coverage and remaining have zonal coverage. Rest five are in the lower extended C-band which would cover India, China, West Asia and South East Asia.

Out of seventeen, eleven transponders will be leased to Intelsat Consortium of countries which will bring over US$10 million every year as lease fees to the ISRO. The rest of the transponders will be made available for domestic use.

INSAT-2E launched to a Geosynchronous transfer orbit has a perigee of 250 km and an apogee of 36,150 km. The satellite was manoeuvred to its final orbit by firing the satellite apogee motor in three phases. Subsequently the deployment of solar array, antennae and the solar sail were carried out and the satellite commissioned after in-orbit checks.

The salient features of INSAT-2E:

Orbit	:	Geostationary (83 degree E longitude)
Dry Mass	:	1,150 kg.
Mass at Lift-off	:	2,550 kg.
Size	:	Cuboid 1.9 m x 1.77m x 2.4m with solar array on the south and solar sail & boom on the north.
Length When fully deployed	:	26m
Spacecraft Propulsion and Control	:	440 N Liquid Apogee Motor with N_2O_4 (Nitrogen Tetroxide) and MMH (Mono Methyl Hydrazine) for orbit raising, 3-axis body stabilised in orbit using momentum wheels, sensors, solar flap, magnetic torque and sixteen Reaction Control Thrusters of 22 Newton each.
Power	:	Solar array generating 2,050 W. Two 60 Ah Ni-H_2 batteries to support full payload operation during eclipse period.
Mission Life	:	12 Years.

Richard P. Feynman Who Changed the Image of Science

Richard Phillips Feynman's life and work signify the joy of discovery and the pleasure of exploring things. He demonstrated that doing science could be fun. He provided an "image of science that cut right across the stereotype". He loved people more than he loved physics. He believed that the highest forms of understanding one can achieve are laughter and human compassion. He was an accomplished drummer. He was so fascinated with drumming that he hardly missed any opportunity to beat a rythm – whether on a wall, a table, a pot or on a pan. He enjoyed listening to African drum music. He also became an accomplished amateur artist and he could organise an exhibition on his own. And, of course, Feynman is one of the greatest physicists that the 20th century produced. He was a great problem solver even if it meant breaking a lock.

Above all Feynman was a simple man, who could laugh and make others laugh and so as Hans Bethe wrote, "More than other scientists, he (Feynman) was loved by his colleauges and his students." And as Laurie Brown and John Rigden have stated, "there is an important sense in which all modern physicists are Feynman's student." He taught his students how to think, to reject any theory if it did disagree with experimental facts and he inspired them to appreciate nature and love science. He epitomised honesty and integrity. The whole basis of the scientific pursuit of knowledge as percieved by Feynman can be seen from his following observations:

"In general we look for a new law by the following process. First we guess it. Then we compare the consequences of the guess to see what would be implied if this law that we guessed is right. Then we compare the result of the computation to nature, with experiment or experience, compare it directly with observation, to see if it works. If it disagrees with experiment it is wrong. In that simple statement is the key to science. It does not make any difference how beautiful your guess is. It does not make any difference how smart you are, who made the guess, or what his name is - if it disagrees with experiment it is wrong."

He was against pseudosciences. While explaining the underlying difference between real science and different forms of pseudosciences he said: "It's a kind of scientific integrity, a principle of scientific thought that corresponds to a kind of utter honesty - a kind leaning over backwards. For example, if you're doing an experiment, you should report everything that you think might make it invalid - not only what you think is right about it: other causes that could possibly explain your results; and things you thought of that you've eliminated by some other experiment, and how they worked - to make sure the other fellow can tell they have been eliminated.

Details that could throw doubt on your interpretation must be given, if you know them. You must do the best you can - if you know anything at all wrong, or possibly wrong - to explain it. If you make a theory, for example, and advertise it, or put it out, then you must also put down all the facts that disagree with it, as well as those that agree with it."

Feynman put his views straight without mincing words. He disliked when people used the language in a phoney way. He could never appreciate philosophy and thought religion is nothing but 'wishful thinking'. He never bothered with empty formalities. Feynman lacked respect for authority. Some of the traits of Feynman's personality were as summed up by General Donald Kutyna: "Feynman had three things going for him. Number one, tremendous intellect, and that was well known around the world. Second, integrity.... Third, he brought this driving, desire to get to the bottom of any mystery. No matter where it took him, he was going to get there, and he was not deterred by any roadblocks in the way. He was a courageous guy, and he wasn't afraid to say what he meant."

Richard Phillips Feynman was born on 11 May 1918 in Manhattan, USA. He was greatly influenced by his parents. Feynman's father Melville Feynman encouraged his son's fascination with science in all possible ways. While not pushing in any particular direction his father would explain things about the way the world worked. Melville taught his son at a very early age 'the difference between knowing the name of something and knowing something'. To quote one of Richard's oft-quoted anecdotes about his father:

'See that bird?' he say. 'It's a Spencer's warbler. (I knew he didn't know the real name.) 'Well, in Italian, it's a Chutto Lapittida. In Portuguese, it's a Bom da Peida. In Chinese it's a Chung-long-tah, and in Japanese it's a Katano Takeda. You can know the name of the bird in all the languages of the world, but when you're finished, you'll know absolutely nothing whatever about the bird. You'll only know about humans in different places, and what they call the bird. So let's look at the birds and see what it's doing - that's what counts!

(Contd.)

Since his childhood he developed a habit of not taking anything for granted, to question everything, to go to the bottom of any mysteries. Here again he was helped by his father. Feynman later recalls that on being asked about the odd behaviour of a ball left lying in a playing wagon, his father replied: "That, nobody knows. The general principle is that things which are moving tend to keep on moving, and things which are standing still tend to stand still, unless you push them hard. This tendency is called 'inertia', but nobody knows why it's true."

What did he learn from his mother (Lucille Phillips)? In Richard Feynman's words: "My mother taught me that the highest forms of understanding that we can achieve are laughter and human compassion."

Feynman was awarded Nobel Prize in Physics in 1965 with Julian Schwinger and Shinitro Tomonaga for their development of quantum electrodynamics (QED), a theory describing the interaction of charged subatomic particles within electric and magnetic fields. QED combines quantum theory and relativity and asserts that charged particles interact by the exchange of photons. The theory not only describes all interactions involving photons and electrons but any interaction between light (photons) and charged particles. Feynman is best known for his invention of Feynman diagrams, which illustrate the interaction between charged particles by the exchange of virtual photons. "The diagrams", Feynman pointed out "were intended to represent physical processes and the mathematical expression used to describe them. Each diagram signified a mathematical expression. Mathematical quantities were associated with points in space and time." Feynman explained the superfluid behaviour of liquid helium. When liquid helium is cooled below 2.2 degrees Kelvin it behaved differently than the liquid helium above this temperature. It behaves as superfluid. It can move through capillary tubes effortlessly that is without experiencing any frictional resistance. It even climbs up the walls of the container to escape through pores which do not allow gas to pass through. He was a key figure in the Manhattan Project to develop the atom bomb.

To consider Feynman simply as one of the greatest physicists of this century would mean undermining his true achievements. He was one of the greatest teachers that the 20th century ever produced. The *Feynman Lectures on Physics* have inspired generations of students worldwide and continue to do so. There is no parallel to it not only in Physics but also in other disciplines of science. These lectures described Feynman's approach to physics.

What made Feynman a great teacher? To quote David Goodstein: "For Feynman, the lecture hall was a theater, and the lecturer a performer, responsible for providing drama and fire works as well as facts and figures. This was true regardless of his audience, whether he was talking to undergraduates or graduate students, to his colleagues or the general public."

His lectures were self-contained, they had a beginning, a middle and an end. The lectures not only provided a great mass of information, but also opportunity to go beyond the formal teaching.

In the long run what is the importance of Feynman's scientific achievements? To quote David Goodstein : "His scientific contributions were profound. They are not ordinary. They are not similar to other peoples". He imposed his personality and his views on the world of science; he reformulated quantum mechanics, he virtually reinvented it. And gave it to us in a form that's still widely used throughout theoretical physics, in every field.

Feynman died on 15 February 1988.

To know more about Richard Feynman one may look up one or more of these books:

Richard Feynman by John Gribbin and Marry Gribbin, Universities Press (India) Ltd., 1998; *Surely You're Joking, Mr. Feynman!* by Richard Feynman & Ralph Leighton. W.W. Norton, New York, 1985; *What Do You Care What Other People Think?* by Richard Feynman & Ralph Leighton, W.W. Norton, New York, 1988; *No Ordinary Genius: The Illustrated Richard Feynman* by Christopher Sykes (Editor), W.W. Norton, New York, 1994; *Genius: Richard Feynman and Modern Physics* by James Gleick, Pantheon, New York, 1992; *The Beat of a Different Drum* by Jagdish Mehra, Clarendon Press, Oxford, 1994; *The Feynman Lectures on Physics* (3 Vols) by Richard Feynman, Robert Leighton & Matthew Sands, Addison-Wesley Redding, Massachussets, 1963; *QED: The Strange Theory of Light and Matter,* by Richard Feynman, Princeton University Press, Princeton, 1985; *The Art of Richard P. Feynman* by Michelle Feynman, Gordon & Breach, Basel, 1995.

Subodh Mahanti

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18. Voluntary Health Association of India
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