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Reinventing Education For An Inclusive World

Prof. Yash Pal



UGC Golden Jubilee Lecture Series

Chairman's Foreword



The University Grants Commission, an apex body of higher education responsible for the coordination, determination and maintenance of standards of university education in India, is celebrating its Golden Jubilee Year during 2002-2003. As part of the academic activities the UGC has conducted the 'Golden Jubilee Lecture Series' throughout the country by eminent individuals who have excelled in their respective fields and made a mark not only in India but abroad too. These Lectures have mostly been organized in Universities located in remote areas. The basic concept behind organizing these Lecture Series was to bring UGC closer to students, teachers and intelligentsia in that region. It is hoped that these luminaries including academicians, scientists, social scientists and others, with their rich and varied experiences have motivated and enabled the youth of the country to understand things in better perspective.

To reach out to a wider audience, the UGC is presenting these lectures in the form of Golden Jubilee Lecture Series Booklets. I hope students, teachers, educational administrators and the general public at large, will benefit from the vast repository of knowledge of these achievers.

A handwritten signature in black ink, which appears to read 'A. S. Nigavekar'.

Arun Nigavekar

This lecture was delivered by Prof. Yash Pal at M G University Kottayam, on 26 November 2003 as part of UGC's Golden Jubilee Lecture Series.

Modes of acquiring information have been changing very fast. We are so exposed that our own faculties of reasoning and model making are not used very often. Fashions have predominance, in thought as in dress. Yet in the middle of tremendous forces of uniformization the rebels and nonconformists need not be submerged or eliminated.

Means of acquiring information might have been transformed but education still needs teachers and fellow students. Libraries are necessary aids; they have existed for a long time but they have never been universities. Nor would they become so in foreseeable future. But a radical transformation in the character and modes of learning are definitely indicated. In fact it is already happening. There are tremendous advantages to be derived through the emergence of the new- like digital libraries and the Internet. There are also some pitfalls and dangers that might destroy education and replace it with mere training for skills. This needs explanation.

My complaint against the present education system in our country is that it tends to be contextually disconnected. Personal observation and experience do not change what is required to be learnt and the manner in which it is to be learnt. A defined collection of competence and well-listed pieces of information constitute education for every one, with little or no room for personal variation. Not only the learner but also the teacher is bound by contours, in expanse and in depth. The interconnections with allied areas are normally frowned upon but when allowed they are restricted to examples that might not be relevant any more. The testing methods ensure that diversion from the well-defined path does not take place. Even the pathways for excursion are defined to the extent that they too form a part of the inorganic contour that contains the syllabus. This works reasonably well for restricted training but not for growing minds that might wander off into unexpected but often exciting new areas. We are not honed for creating new disciplines.

Why is this the way it is? We might argue about the reasons that made education as mere training for a world created by others.

Let me share my thoughts on what seems to me an important challenge before the present world. This concerns the need to combine :

Globality and Intimacy

**For education, for social inclusiveness,
and a sustainable future for humanity**

Over a quarter of a century ago I became enamoured of the possibility of quickly interacting with and reaching masses of our people living far from concentrations of infrastructure using space communication and space broadcasting. In addition there was also the element of forecasting weather and monitoring of resources. I felt that this technological possibility had been specially invented for a country like ours. This is how I got involved with the setting up of the Space Applications Centre at Ahmedabad and the first large-scale socio-technical experiment in communication using a satellite. The aim was to reach thousands of remote villages, and only villages, via direct reception TV. This was when television in India was confined to a couple of hours transmission a day in Delhi and Bombay.

This experiment involved several thousand man-years of effort by technologists, social scientists and communication experts, in addition to the NASA satellite ATS-6. It did not radically change India but it did influence the life of a large number of people – some of them directly involved and many who were influenced by the effort. A number of things became clear during our engagement with thousands of villages spread across the length and breadth of our country. Bridging the distance was a great advantage but giving voice and initiative to the enormous diversity therein was not so easy. I began to realize that intimacy is crucial. However, it is seriously violated when the physical and cultural distance of the source increases. Space communication is a marvelous gift of the present epoch, but by itself it can be best used for sermonizing, indoctrination or advertising. Even though lot of information can be delivered, true education and development need greater contextual connection and participation. On the other hand without a long range connection intimacy by itself would lead to parochialism and alienation from the world. The challenge is to find ways of addressing this dilemma.

I am convinced that many beautiful aspects of being human arise from closeness of a limited number of people. Crystals and gems arise from residual short range forces. This is equally true of naturally existing elements and molecules. Leave everything else and think about the molecules like the DNA, so central to the happening of life. Language, humor, music, plastic arts and crafts, architecture of different places, even science would not show their peaks unless some people were together and communicated through a language much beyond mere words. This is not something that happened only in the distant past. Great educational institutions would not become great unless people could infect each other at close range. That is why people strive to go to places where there are some outstanding teachers, researchers and gurus, notwithstanding the fact that books and papers written by the distinguished academic in these institutions can be accessed in print or over the net and in libraries all over the world. In our country we traditionally recognized that learning could not be transported as books or instructions uniformly applicable to all the learners. We believed that it comes through the chemistry of interaction between the teacher (guru) and the learner (shishya) – the tradition being known as the guru-shishya parampara.

Basic talent of humans is evenly spread across the world. Much of it is hard wired in our make up, thanks to our common evolutionary past. It is a pity that a large fraction of people cannot participate in the process of creating new knowledge and new things. Therefore we have come to a state where a few are in a position to condition the world and the rest are only conditioned. There is a small concentration of creators who might be excused for believing that they are also the one's who have the right to create the world in their own image. This situation prevails all across the world – not only between countries, not only between the North and the South, but also between people separated by religion, race and caste, between men and women and between the countryside and the metropolis.

In the field of education our country has always had some discrimination between those who could afford and most others who could not. Now this has been taken to a vulgar

level. This is being done through various mechanisms, partly unintentionally but mostly with a purpose to keep the riff raff out. Exclusion is becoming extreme. I do not have to give examples of this phenomenon, but a few reminders might be appropriate :

- Private schools, usually called Public schools, some excellent, many pretty bad with their distinction being that they also want children to carry heavy bags and start with English at Nursery itself.
- Municipal and Government schools
- Schools that have no buildings
- Schools that have no trained teachers
- No schools in the neighborhood
- The first category of schools might cost (per child) much more than the average per capita income of an Indian.
- The mismatch between the load on children and quality of teaching is such that a large fraction of the students need to join coaching classes. In metropolitan areas coaching expenses per child reach 5 to 10 thousand rupees per month in the last years of the school ! This has become a fine mechanism of social exclusion. Some times I feel that many of the ills of our system arise from a huge conspiracy of coaching institutions. Indeed in many a case coaching has replaced education. How much lower can we get ?

I may go on but even this small list makes it clear that our system is designed for excluding a large fraction of our population.

Academic Reasons for The Barren-Ness And Non-Inclusive Nature of Our Education

If I were asked to name one major direction that could drastically change the nature of our education and research enterprise from kindergarten to the university level I would say :

Build on individual competence and exploration and couple with the life around you.

If this advice were taken seriously it would imply that :

Learning is not delivered; it is created.

The process of creation necessarily requires building on what the child already knows, what it observes and explores, the experiments it does while playing, studying and dealing with the world around.

Since the experience on one child may be different from that of another, the syllabus for learning would also be different.

If that were so we would not insist on centralized examinations. We would examine each child the way a music- or dance guru examines his/her shishyas, or an ustad or craftsman trains his/her apprentices. We would not make children run a competitive hurdle race to get that extra mark of distinction. There would be no need of education destroying coaching classes.

Learning would not be imprisoned within disciplines. Nothing would be out of course if it were comprehensible.

The system would require full freedom to teachers to learn, explore and grow with the children under their care. They would also form alliances with each other and others outside the school to pursue their learning into uncharted areas.

University Level

What I have said above in respect of school education applies even more strongly at the college, university and research levels. If we engage with society and couple with its arts, crafts and industry while learning and finding out each of these sectors would gain. The fresh minds of young students along with their energy would lead to mutual transformation. Research students would not be waiting for their guide to hunt for a new problem for their dissertation. This would have emerged naturally through their engagement, with each other and the environment and industry around.

For our research areas this would be rejuvenating. For example, there would be a chance for physiologists and physicists to work together. If they both happen to be in a university and are also engaged with industry, they might get to a stage when some of the new marvelous technology for medical diagnosis would be invented in our country. This would be a way to correct the imbalance in which most resources are spent in national laboratories while most of our young persons are in colleges and universities.

There are many tricky areas where social sciences and physical sciences need to work together. This is required even for defining what would be a good society and furthermore the means to achieve it. Lot of new thinking is required in economic, political and social spheres. If done without including scientists and engineers even the new would be copies of what obtains elsewhere or impossible to achieve.

For all this to happen we need to break walls and couple. Couple and engage with out society. I am sure that if we design our education and research enterprises this way all the other problems would resolve themselves. The sheer excitement of such a free Manthan and mission would ensure that. The silly competitive exams on which we expend so much energy would acquire a diminished importance and then disappear. I do not know why we are afraid of going this route.

Foreign Universities

I am not surprised that so many foreign colleges and universities want to set up shop in our country. The goods they come with are not different from those brought by sellers of TV, computers, cars, motor-cycles and cosmetics. They will sell so long there are buyers with money who can flaunt foreign degrees. We are already decoupled from our society. All they would do is to decouple us some more. We should not be too worried because the individuals they would capture in their net would be relatively mediocre (not being able to get into good institutions on the basis of their merit) besides the fact that they might have already decided that emigration is the most desirable step towards their future. I may not be too worried but that would change if we begin to believe that this would lead to import of truly high-class education into our country. I do not think too many Nobel Laureates are going to be on the staff of these outside teaching shops who would be available for relaxed interaction with students here and consider their presence in these shops as significant steps for advancement of their own thought and exploration. As I said earlier, good education is not delivered; it is imbibed and created.

Information Technology, Internet and the Web

Let me first state that I agree with many people that coming in of this technology has had, and will in future have even more seminal impact on the way the world develops. But there is need to develop specificities and configurations suited to our needs and aspirations. As for as education is concerned I find it amazing that at my age, without traveling out to a library every day, and without the help of an office and stenographer, I can stay fairly active and in contact with the world. If spectacles had never been invented I would have stopped reading by the time I was fifty. I got another twenty-five years lease, after I got my glasses. I was getting a bit hazy in vision, particularly at night, till I got a lens implant in both eyes and now I see as well as I did when I was forty or younger and I am mobile twenty four hours a day. If I had been born fifty years earlier the world would have been saved from my meddling for the last 25 years. Poor world- now that I can exchange conversation and bother it with what I think might be useful ideas even now. Yes it is good to have internet and the Web. But Internet works better for those who are already engaged with something. If you are not then internet is like having a dictionary with something. If you are not then Internet is like having a dictionary with the hope that you would learn a language and become a great writer! Well, not quite, firstly because a dictionary does not have as much misinformation as the Net, and secondly because the dictionary is not as alive and changing as the Net. Internet is mostly full of rather superficial information and that is what you would encounter if you just surf. Indeed you could almost say that you have to wade through lot of noise and sometimes you can get fond of noise, much like you can get fond of loud unmusical music. There is a tendency to avoid depth and immersion. If you get addicted to that you might be moving away from the habit of independent thought. Down loading from the net and by using the image making facility of your computer you can easily use lot of eye-catching and colourful

presentations as substitutes for a well thought out argument. It is easy to fool people and, sometimes, even yourself that what you have said is not without real content. It might appear that you have said is not without real content. It might appear that you have lot of information, that you have learnt a lot and it is easy to mistake it for understanding. Lot of dependence on Net surfing can encourage a culture of education in which information substitutes for understanding. Indeed it might be easy to forget what after all is “Understanding”. Such a thing would be fatal. In fact that is the main flaw of education now. We load children with enormous amount of information to remember and pass examinations with 100 % marks but we do not give time for or value understanding. There is a danger that thought less use of the Web and other manifestations of IT like CD ROMs might encourage this tendency besides another of our present failings – we are already decoupled from our environment and might begin doing so even more enthusiastically.

My belief is that Internet should be used to Increase the dimensionality of our education and not just its information content. This would demand that we begin treasuring diversity of learning and move away from standardized, industrial production of graduates tested on machines we call “common examinations”. Such an education would also encourage respect for and inclusion of people who have acquired their capabilities and skills with different or no certification.

Possible Socio-Political Significance of the Web

The most important feature of the Web is that people can communicate even if they have different voices and languages. They can communicate and access. No one is superior; no one is on top. No one has to give up its way of expression. No culture is inferior. The Web has a texture that is inclusive.

In my book, the basic philosophy of the Web should be to move the world away from the present manifestation of globalization that has a few innovators and creators and the rest consumers; a few influence and the rest are only influenced. If we do that we would benefit the whole world. We would benefit not only by increasing the variety of directions in which innovations would occur but also through sharing the joys and depths of wisdom developed under different environments. In addition there could be, in my view, a fundamental transformation that might lead to different concepts of equity, harmony and inclusiveness – Indeed in the way we organize the world from now on. I will presently dilate on this assertion.

Let me step back a little. We all realize, I hope, that a propensity for closeness to a limited number and categories of humans comes natural to us – evolution has ordained that. To repeat what I have earlier indicated, intimacy is that precious thing that defines humanity. Without intimacy we would have no love, no literature, no ceremonies, no ways of dressing, no cuisine, no festivals, no dance, no ways of greeting, no compassion, no reverence, no nothing. Intimacy is a product of evolution and long memories of myth and fable situated in specific environments. We are designed to treasure it. We are built to care for those who are close. We seek closeness for assurance that we would be OK. We consider it essential for our survival. It defines for us what we are – it gives the contours of our social “self”. We tend to define this “self” variously in terms of our country, the nation ethnicity, race,

language, religion and ritual. However we must recognize that this essential element of humanity has also produced our heroes, patriots, colonizers, conquerors, despots, dictators and now, in large numbers, our technically equipped terrorists. We are in a serious bind and we have to find some way out in the next few decades of this century. I put such a short time scale for doing something so radically different – firstly because the problems have accelerated but also because we have an inkling of the way we might go about it. Till very recently we did not.

The Real Issue of the Modern Times

Let me, at the end, come to the basic question impinging on the search for the architecture of an inclusive world. I will not spend too much time defending its desirability. There is no future for a civilized existence without that. That such an architecture would necessarily demand a change in the way of thinking goes without saying. But it might also need inventions suited to our present predicament. I will not demand that every one of this planet should become equally affluent. Inclusiveness should not be so much about equality. Nor should it include any element of charity. The driving force has to be an enlightened self-interest. Without meaning to sound pontifical I would summarize my exhortation to the world and to us – my formula – in the following words :

NO INDIVIDUAL, NO HUMAN COLLECTIVITY, NO COUNTRY, NO PROFESSIONAL, NO CORPORATION, INDEED NO ONE SHALL : BE ONLY, OR BE MADE INTO ONLY, A CONSUMER.

As a young man I was much taken with the independence movement of India. Our supreme leader was Mohandas Karamchand Gandhi. He had the pulse of the country and every one followed him. He was not a politician in normal sense of the word. Even though some of the young people were on occasion a bit skeptical about several things he said and did there was an instinctive appreciation of the fact that freedom he was seeking was not for the country but for the lowliest of individuals in the land. Simultaneously he was also seeking an enhancement of those who governed us at that time! He was a religious man but the most valuable insights he provided were not that of a religious leader. Even when he talked of religion it was not any one religion. He picked thoughts from everywhere. In any case his important ideas about the essence of freedom and organization of a value-laden society were not based on moralistic teaching but as an insightful architect of an inclusive society. I do not think this was well understood by his followers or other charismatic leaders who later came to rule the country. This is understandable because at that time in human history his

deep yet simple-looking ideas were not sustainable. So why am I bringing him into my talk today? I am doing so because I feel that Gandhi came too soon. Today he would be sustainable. A few implications of this statement are the following:

Gandhi talked about the concept of Gram Swaraj. This implied that no one should be controlled from a distance. This implied responsibility for independent thought and action. It also implied that if you wanted you could go your own way without being dominated by distant powers. He also emphasized that no one should be only a consumer. It was almost immoral to be so. He said he wanted production by masses not mass production. In the area of learning and education he firmly believed that lot of learning happens through physical involvement with your environment, designing and making what the community needs. When such activity is combined with book learning then you become a true scholar. Such an approach would introduce contextual elements into learning and make it more creative. He could be considered as the first environmentalist of the last century when one remembers his statement “there is enough in the world for every one’s need but not for every one’s greed”. Though it might be difficult to take each of his statements literally we cannot escape the discerning direction he was suggesting. There was clear understanding that distant control would usurp real freedom. That using goods and services provided by other without a similar thing being given in exchange would also lead to an enslavement and economic and cultural denomination. That learning and creating have to be simultaneous. That lot of education can happen through fingers was an instruction we certainly needed in our colonial days and we still do. And all these ideas were soaked in an ambience of non-violence. In Gandhi’s says technology was massive and could not be easily decentralized without losing the advantage of scale. This is no longer true for most of modern technology. Not only software but also hardware production can now be decentralized much more easily. Information can be accessed and shared. You do not have to travel out for information you need or want to give out. You have the option of living your own way and yet be connected. You can also change at your pace and change others with whom you interact. Gandhi’s slogan “production by masses

and not mass production” can now be realized. If the world needs a “jihad” then it should be to make people understand that this seems to be the only way of having decentralized integration, only way to preserve and enhance diversity, the only way to give fulfillment to individuals. Such an enterprise would need the best of technology. People would not live in their wells. They would be connected and yet in control. That needs a major upheaval. I do not know who would be equal to this challenge. Perhaps Gandhi did come a century too soon. Perhaps socially oriented technologists and their friends can make it happen.

To summarize, the basic challenge of today is the following: As the world globalizes at breakneck speed, the intimacies feel threatened. Intimacies are essential to being human. They have produced music, culture, values, language, art, literature, and even humor. A quick assault on these seems to human entities an assault on their existence. Much like the immune response of a living system the resistance is almost automatic and sometimes most virulent. Often it manifests itself as mindless terrorism. It is my view that modern terrorism cannot be combated only through military means. It has increased in parallel with the process of globalization, with superficial uniformization of the world, with “Cola-nization”, as a friend¹ has said. Besides the cultural assaults there are also economic consequences. All this seems to have been foreseen by Gandhi. Now it should be possible to have a different kind of globalization, without assaulting the economic and cultural autonomy of human collectivities. Globalization should be subsumed in a deeper global consciousness. On this substrate of global consciousness, call it new globalization if you like, human collectivities could live an autonomous existence, in control of themselves, not in a well any more but networked with the world and the universe. The techniques and technologies for doing this have now become possible. This is the architecture for a truly inclusive society that I would commend. It would be recognized that for this to happen we would need to develop the Web in dimensions that might not have been so far touched. We have to move in a direction where there would be a Web of people with all their diversities and not only of computers with their specific quirks.

¹ Kiran Karnik, President, NASSCOM, India.

Profile

Prof. Yash Pal



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| Born | 26 November 1926 |
| Education | After completing Post-Graduation in Physics at Punjab University, in 1949 joined the Tata Institute of Fundamental Research. In 1958 obtained Ph.D. degree in physics from the Massachusetts Institute of Technology. |
| Professional Positions | <p>Visiting Professor at the Neils Bohr Institute Copenhagen, University of Maryland, California Institute of Technology, Danish Space Research Institute & other Indian and foreign Universities.</p> <ul style="list-style-type: none">• Chairman, University Grants Commission (1986-91)• Secretary, Department of Science & Technology (1984-86)• Chief Consultant, Planning Commission (1983-84)• Secretary General of the United National Conference on Outer Space (1981-82)• Distinguished Scientist, Indian Space Research Organization (1980-83)• Director, Space Applications Centre, Ahmedabad (1973-80)• Professor, Tata Institute of Fundamental Research (upto 1983)• National Research Professor (1995-)• Jawaharlal Nehru Chair in Technology, Punjab University (1997-1999) |

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| Previous Positions | <ul style="list-style-type: none"> • The first Chair of the Modern School, New Delhi • Is/ has been Chairman/ Member of various National and International Committees, Boards and Organisations, and on the editorial boards of scientific journals. • Chairman, National Institute of Design (1984-91). • Member, UN Advisory Committee of Science and Technology for Development (UNACSTD). • Member Scientific Council, International Centre for Theoretical Physics (ICTP). • Chairman, National Council of Science Museums. • Chairman, Sky Art Conference, Linz, Austria in 1982. • President, Indian Physics Association. • General President, Indian Science Congress (1989-90) • Vice President, International Union of Pure and Applied Physics (IUPAP) • Member, United Nations University (UNU) Working Group for World Institute for Space and Society • Member UNESCO Study group on Future of Universities • Chairman of National Advisory Committed report "Learning without Burden" • Chairman, Governing Board, INFLIBNET • Member, Governing Council, Giri Institute of Development Studies (Lucknow) • Chairman Project Board, Hanley Telescope Project of IIA |
| Some Current Responsibilities | <ul style="list-style-type: none"> • Chairman, BHARAT JAN VIGYAN JATHA • President NCSTC Network • Member, Council of Centre for Rural and Industrial Development (Chandigarh) • Trustee: Indira Gandhi Memorial Trust (Till 1997) Indira Gandhi National Centre for the Arts • Member, Governing Council, Indian Institute of Astrophysics (IIA) |

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| Area of Work | <ul style="list-style-type: none"> • Member: Organising Committee of Indira Gandhi Conferences on World Affairs. • Founding Member: Steering Committee for the Project on the “History of Indian Philosophy Science and Culture • Founding Member: Centre for Study of Civilisations. • Advisory Committee for selecting Marconi Fellows, Marconi Foundation. <p>Fields of Cosmic rays; high energy physics, Astrophysics; science education; space technology; communication and development; education.</p> |
| Honours and Awards | <ul style="list-style-type: none"> • In 1976 Awarded Padma Bhushan by the Government of India for contribution to Science and Space Technology • In 1980 the Marconi International Fellowship Award “to recognise wise and humane leadership in applying modern communications technology to meet the needs of isolated rural villagers in India” (Highest International Award in Communication). • In 1989 received 5th Annual Award of the Association of Space Explorers (the first award was given to Jacques Yves Cousteau) in recognition of work in bringing the benefits of space research home to earth. • In 1989 Shiromani Award for achievements in the Chosen fields of activity. • In 1984 Dayanand Saraswati Centenary Gold Medal for Excellence in Science. • G.P. Chatterjee Memorial Award (1987) of Indian Science Congress. • Zaheer Memorial Lecture Award (1991) at the Indian Science Congress. • First Lord Perry Award for Excellence in Distance Education (1992) • Arthur C. Clarke Award for Communication and Space Technology (1994) • The Asiatic Society’s Sir William Jones Memorial Gold Medal (1996) • Indian National Science Academy Award for |

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| Fellowship/ Membership etc. | <p>Science Popularisation (2000)</p> <ul style="list-style-type: none"> • Ashutosh Mukerji Award of the Indian Science Congress • CEC Award for Educational Communication. <p>Fellow of Indian National Science Academy.. Indian Academy of Science; National Academy of Science; Fellow: Indian National Academy of Engineering, International Academy of Astronautics, National Fellow of the National Institute of Education.</p> |
| Foreign Member Honorary Fellow | <p>American Academy of Arts and Sciences. Inter University Centre for Astronomy and Astrophysics; Indian Society of Astronautics; National Fellow of the National Institute of Education.</p> |
| Publications | <p>Has made significant contributions over the years in the areas of cosmic-rays, high energy physics, astrophysics, science education, communication and development and has published a large number of papers in national and international journals. Some of his scientific work led to:</p> <p>The first observations of pair-production of elementary particles; Elucidation of properties of K-mesons & Hyperons; The first measurement of K – K mass difference; Understanding the role of cosmic & cosmic-ray neutrinos; Prediction of rise in p-p cross section; Recognition of importance of excited states of particles in multiple meson production at high energies; First development of the leaky-box model of cosmic ray propagation in the galaxy, and aspects of cosmic-ray phenomenology in the atmosphere and below the ground. Has done extensive work in the theory and practice of Communication for Development, and has proposed new ways of using modern technology, including space technology, in ways</p> |

appropriate for developing countries. Has written and spoken extensively on issues of Science and Society, specially on the need for science to form an integral part of human living, not only in terms of providing tools and techniques for doing things but also to influence human values, ethics and consciousness.

Media Activities

Chairman: Advisory committee of TV series "BHARAT KI CHAAP" "TUR-RUM-TU", "RACE TO SAVE THE PLANET"

Solar Eclipse programme; Comet programmes Advisor, including script correction and approval, answers to question, for the Science Magazine T.V. Series (over 150 episodes) "TURNING POINT".

Answering questions on Internet and Chat sessions on Egurucool.com for two years. Large number of other programmes on T.V. and Radio.

Institution Building

Responsible for conceptualization and/or Establishment or Development of the following institutions including Inter University Centres (IUCs)

Space Application Centre, Ahmedabad

Nuclear Science Centre, New Delhi

Inter University Centre for Astronomy and Astrophysics, (IUCAA), Pune

I.U.C. DAEF (Indore, Calcutta, Mumbai)

Centre for Educational Communication (CEC) (Countrywide Classrooms), including initiation of Video Classrooms Lectures Programme.

Information and Library Network (INFLIBNET), Ahmedabad

I.U.C. for Social Science and Humanities, (At Indian Institute of Advanced Studies, Shimla)

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