

TWENTY SEVENTH T.A. PAI MEMORIAL LECTURE



**EDUCATION FOR THE FUTURE**

Delivered by

**Prof. YASH PAL**

Former Chairman,  
University Grants Commission, New Delhi

**On MARCH 15, 2010**

**At Manipal**

**T.A. PAI MANAGEMENT INSTITUTE**

**MANIPAL**

## EDUCATION FOR THE FUTURE

I am truly honoured, Sir, for your remarks and that long introduction. When somebody starts saying what you have done and how great you are, you begin to wonder, you are embarrassed, because much of the praise is so undeserved. The world is full of so many remarkable people. I see here that Shri T.A. Pai died at the age of 59. My God, how much he accomplished! It is amazing. I was reminded of a remark which I read yesterday, a sort of a small bit from a letter which Homi Bhaba wrote to a friend of his when he was 25 years old. He had said, "There is so much to do; so much to enjoy; so much music; so much science; so much art; so much painting; so much education. But life is limited. One has to go away. But, but, but, I intend to live as intensively as possible to do all that excites me." I think this intensive engagement in life is something which he showed, and which, I think, Shri TA Pai showed. Otherwise you couldn't do so many things.

Your education city is rather unique; there aren't too many like this. It definitely owes a lot to the pioneers, and many of the pioneers are still around. So it's a real pleasure to come here, to pick your brains, to talk to you, and to meet such wonderful people.

I am remembering amongst others, what I experienced today. I went to a school here, Madhava Kripa. And I interacted briefly with the children there. And, as we started discussing,

one of the things I asked them was, "Do you know that there are other stars around whom, around which, new planets are being discovered?" Their eyes lit up; eighth standard students. I said, "The problem about discovering new planets around stars is that the planets are not visible against the bright light of the stars. They are million times less bright than the stars; so even if you have a very large telescope, you can't see them. And so, how would you find them?" So I called this child, and said, "Will you be my planet? I will be your star." And we did a tickly, holding hands and going around and round. But when I asked them, "How do you think this is going to have any meaning?" he said, "I know how it is going to have any meaning. People may not be able to see me, but they will be able to see that you are wobbling." I was amazed to hear this from that young child. That's exactly—the wobbling of the stars—through which we have discovered the planets around distant stars. So you don't have only wonderful grown up people here; you have wonderful children who are marvelous. I felt nice.

Now, "Education for Future"...the point I want to make is the following; I think just as I have talked about this child, our country is still alive and still keeps moving, and keeps doing things because there are innate capabilities in the population which manifest themselves when we are in trouble. But I have a sad kind of a feeling that these innate capabilities are

not recognized enough. And we try to teach people according to a set way which has been designed by some people. Innate capabilities cannot be confined to the set ways that you have. Take the school education first. I know of a friend of mine, V.G. Kulkarni, who used to work with me in Bombay municipal schools. He found that the SC and ST students didn't perform well at all. He started wondering, and then he did something remarkable. He took their textbooks written in Marathi and rewrote the language taking away all bombastic words, all kind of demagogic things, and wrote in a simple language what was in the books and gave it to the children. And wonder of wonders, these children immediately picked up and came to the front of the class. And we do this all the time. We can't interpret, we can't understand innate capabilities. What are these innate capabilities? Psychologists use this word "innate" very often. And, sadly, it is part of our ignorance that we can't go any further. What does innate mean? All human beings have innate capabilities. But, more and more what one is finding in school education, one thing which we have neglected in curricula, is that the education for each person, young or old, is actually constructed by that person himself. It's constructed on top of the experience the child has had, the environment that the child has been in, what he has observed and thought of earlier. And it's a mix of that making of a building, making an architecture of things together—that is his world of knowledge; and that means, true understanding. We sometimes overlook and try to generalize and say, "This is the way people ought to learn." You

know our music functions very well. Music teachers and dance teachers work with single, two or three pupils. They work with them and instantly recognize their innate capabilities more than organized schools and colleges do. That is why the syllabus is not exactly the same, *arangetram* doesn't happen at the same time and people develop differently. We've forgotten that tradition. And we have not made of use it.

Now the use of IT for education... when I tried to use it way back in the first satellite TV broadcast in the world...people don't know that it was in India. And it was done only for the villages of India, not for the cities. One of the responsibilities that was given to me was that I had to produce science programs for children. I had always believed that science is learnt through experiments. We must have a laboratory. But, when I went to hundreds of schools in these villages where the children were located, I found that these schools had no laboratories of any kind. I felt so disappointed and wondered what kind of science we would be able to communicate. It suddenly dawned on me—and this we tend to forget very often—that science is in many places. I had sat down one night and wrote a credo for a science program. The objective would be to help children realize that science is everywhere. There is science in the kitchen, there is science around the bicycle, the bullock cart, the kites they fly, and the stones they try to float in a pond and all kinds of things. And all of a sudden the way was opened and we got some very

wonderful young producers. I requested a lot of people all over to write briefs for us; urgent requests, telexes. "Stop everything you are doing. I need some briefs. We need help." These people responded and helped; and wonderful programs came out of it. They had an automatic connection with the lives the children had been living; that is why they worked. And these connections aren't made very often when we go through education. I think it's very important to do that. We have so many craftsmen, people who can make beautiful things in stone, fabrics, metal and all kinds of things, all over the country. There must be millions of people who are doing that. We have not tapped that as a component of knowledge which needs to be translated and combined with our total fund of knowledge in the country.

Now let me come to the main thing about which I am excited. Incidentally Dr. Ramadas Pai was a member of the committee which worked on this with us. And it was a pleasure to work with him. Let me tell you the story of it; it may not be known. I was asked to review the UGC, the AICTE and other councils. I raised objection to the Minister—and the Prime Minister—right in the beginning, saying, "I can't do this kind of a thing. I don't know what to do or what will happen. I have been chairman of UGC myself and I know what goes on. Times have changed. People will say there are delays, there is corruption etc. So what do we do about it?" He said "Please try something." I asked "If it is something out of the box?" He said "That's exactly why I asked you" So two months down

the line, I went back to the Minister and told him "Look, I can't go on with that. Reviewing degrees, and all kind of letters that come, and what do we do? Put them together?" And I'd like to come to the basics. I requested the the Minister to change the name of the Committee to what it is: to "Advise on Renovation and Rejuvenation of Higher Education". I had said that the terms of reference would be included, subsumed, within this name of the committee. An amazing thing in India is that when you make such completely unexpected recommendations, many a time people agree, right away! This is amazing ! If I had asked for a slight alteration, he would have had asked some bureaucrats to get busy redrafting another set of terms. But he immediately agreed.

We went to many universities, held many discussions and about a thousand people have been involved. The basic thing which stays with us, with me, all the time is that we have had the tendency for a long time to cubicle knowledge. We put different pieces of information even before they become true knowledge into different compartments and we teach them. The subjects in a school or a college or a university also have steel walls between them. You can't go across subjects. You can't even go from physics to chemistry, leave aside going from physics to literature. You can't do any of these things. Now, human beings are not so constructed. There are large number of examples you can find about how people derived inspiration entirely from somewhere else. How would Einstein say "This theory is not musical enough?"

Physics theory is musical! I mean, that is an appreciation which soaks into other work that has nothing much to do with that. We completely separate them and we make it dull. And ultimately, lot of it has to be mugged up and put together. We don't connect with what people already know. So, how do we remove this cubicalization? Cubicalization is such that connection with the outside, with where you live, with your society, with even the immediate neighbourhood is never taken care of. The students don't get out, roll up their sleeves and say "I'm going to do something about this junk lying near my Institute; we are going to clean it up and then learn from that what more is to be done." Not only that it's not doing good, but to learn why it happens and how it happens are never understood. Engagement with the society or engagement with the industry is infrequent. Your institute may be doing more of it, but it is generally infrequent. And once you enter there, the walls, as I mentioned earlier, between disciplines are impervious. You can say, "I need walls between disciplines in order to have an intensive detailed study of my discipline. I must be isolated in order to study my discipline properly." Yes, walls are required, but the walls have to be of the kind that living cells have. A cell can't live without a wall. It must have it, otherwise it will die; but on the other hand a cell has walls which are porous. It can exchange with the other cells and there is communication going on with the other cells all the time. If it didn't have porosity, then too it will die. Many things demand porosity of information from various disciplines. We have not done that often. I have been particularly

impressed with the number of new things which have been done in medicine. Look at the number of Nobel Prizes which chemists and physicists get in medicine. The universities in India wouldn't even give them a job. The AICTE wouldn't allow that. The latest Nobel Prize winner in chemistry was a person who did physics, went to biology, and found a very important problem related to medicine in chemistry; and he got a Nobel Prize in chemistry. But with many number of things of this kind, we don't cross-over. We are too imprisoned with the label that has been given to us; and those labels are to be removed. But these labels will stay with us forever if there are people who are always inspecting us, who are always approving us, whether it's AICTE or UGC, who would say, "You can't do this or you can't do that. You don't have a basic degree in computer science; so how do I get you into computer science?" Even if you possess real mastery in computer science, they wouldn't let you get a job or even if you are excellent in chemistry, they wouldn't let you there in biology and so on. I am sure the best medical schools in India would have rejected Venky, who got the Nobel Prize this year. Why would you do that? Special people are rather peculiar people apparently. They are not standard and I believe that people who move away from absolute standardization are the ones who carry society with them and then create new fields. I think this must be a very conscious effort.

Now this eighth standard child who gave me this answer that you will be able to find that a star has a planet

around it if you can find the wobble in it...this child could have been in the research team which discovered large number of extra terrestrial objects. Will we ever recognize it? We will say to that child, "What are you saying? There are lots of very clever people looking at this. Sit down." I always say that we must learn from children how to teach them, because of this innate thing. The innate things which children have are wonder and curiosity. We begin to lose this wonder and curiosity as we grow up. We don't notice as many things as we grow. This is a marvelous temperament children have. To this extent, children are like the stem cells of society. They can become anything, anybody, like stem cells do. It is a very medical terminology, I do not have to say. But why I choose to say "stem cells" is because they can become anything. But once they have grown up and specialized in a certain area, it is very difficult to go back and become stem cells. Children are so precious, so important and I keep saying, "Learn from them, all the time, learn from them. And don't make them all the same." What happens when you have these exams? All parents want their children to get ninety-five percent...ninety-nine percent of marks. For this they put them in coaching classes. One of the greatest creativity-destroying agencies in our country are the coaching institutes. If you make them all the same, how can they be creative? How will you get 100% marks? Let people wander around. So in the schools, in the colleges and in the universities, I think, we need traffic across disciplines. We need non-uniformity. We don't say you must have

only this and this. You let children wander a bit; they should be able to take many combinations of courses; many different ways of working. This happens quite often abroad, but it is not very welcome here.

I had another question from a child yesterday, when I was in Mumbai. He said, "Shouldn't we have the syllabus crafted for a child depending on his likes and dislikes and on his capabilities?" Certainly so! Not only that, we should allow children to wander around, go to any class they want to and allow grown up children like me even to wander around a university. There should be a lot of traffic between disciplines; lot of possibility of creating almost a new world. So my idea of a university is a crazy place in which bright people are wandering and going to classes from one to the other and so on and that is the way of creating knowledge, new knowledge. When you say knowledge, society's standardized knowledge is not knowledge. New knowledge is that which has not been discovered and if you discover new things, *that* is new knowledge. So basically how do we go in that direction? When the boundaries between disciplines won't stop you, traffic between disciplines would be easy, where you do not have to wait for five years to write to one agency, who writes to Medical Council, who writes to AICTE and says "This is not approved," and by the time, 3 years later, some permission comes, all your energy is lost you don't want to do anything anymore. I would like young people who are working to have the ultimate autonomy, not have to go to any authority, not even to the Director if any money is

required. They should be able to do. It should be a bubbling, effervescent place, the university. And it cannot happen in the present control system and in the present ways of working that we have.

In the field of medicine, there is so much of mugging up. I think somehow in medicine, you have decided that unless you make the job of the student very difficult, and ensure that he works for 23 hours a day before the exams for a month or two, mugs up all kinds of things, he will not become a creative doctor. The world has changed. We all talk about knowledge society; all that information we ask people to mug up is now available by the click of a mouse on the Internet. Why do you want them to mug it up? He should understand it, should have it with him and be able to access it very quickly. If we do some serious thinking, we will not hurt people through this tremendous pressure. Incidentally, it has been definitely established that all people who are subjected to this pressurized working, for IIT entrance, medical and such competitive examinations are, to some extent, permanently damaged. They are permanently damaged; they are weak in terms of creativity and wild thinking; and a lot of things are wiped out, such as some of the processing circuits which work inside their brains.

I am asking for tremendous freedom. Now, how do I get that freedom? I thought about this for a long time, along with my colleagues. "Do I reform UGC? Do I reform AICTE? Why should architecture be with AICTE,

when the arts & aesthetics is not with AICTE?" Doesn't architecture have no aesthetics? It is a ridiculous kind of a division that has happened. We separate them all; arts, humanities, social sciences, sciences, engineering, medicine, everything from one another and we make all the disciplines poorer. Social sciences become poorer if they don't interact with engineering and the world of the possible. Engineers who don't know what the major issues in social sciences are, are poorer because they don't interact with society and the literature people are poorer because they don't know how different disciplines think. The literature-scholars also work with their own kind; they don't know what these brilliant children are going through. And I wonder why have we done that? Why must we keep on doing that: so that somebody can sit at a distance and decide what the areas are, what the subjects are and what the syllabus is before you can get B.Sc., B.A., MBBS etc.?

Human beings are supreme. We have to make them supreme if we want the best out of them. There is no question that if you do something like that and then you decide to find out whether all the rules and regulations are being followed or not, whether the conditions under which an institution can be set up are being fulfilled or not, then there will be a whole lot of people called entrepreneurs who can facilitate you in this entire process. These days, it is the world of entrepreneurship; you know entrepreneurship is a funny, peculiar but great human quality of being able to do all kinds of things which no ordinary people can do: buy this,

take their permission, go and meet him, get back recommendations, meet that person and somehow or the other get things done so that you can move faster and business can progress. And quite often entrepreneurship will have in it an element where the ordinary values of fair play and such are given the go-by. But without entrepreneur, you won't be able to live, because the others don't have the strength to go around and do all the things which are required for this. "You don't have enough computers, ah, don't worry we will rent computers for the day, so when they come for the inspection they will be there. And there will be these suited-booted people who are supposed to teach, oh we'll borrow them; they will come." Now, I think this is atrocious. When this begins to happen, you have killed education. And it has been killed during the last decade or two.

Engineering education in the country, all, private or public doesn't matter, has gone down. We are not training enough. Teachers are teachers. Employment counseling and students have to be recruited. And what do you need? Information technology. What do you have to do? There is nothing very challenging. You recruit people before they are barely finished. They don't learn enough and they go out there; you recruit them, and often you give them more money than they would have got otherwise; for a while they are happy; but afterwards they are very unhappy; I know they are very unhappy, because their capabilities are far better. To deprive people of the ultimate things which they can do is terrible. Take the IITs. IITs are marvelous institutes, very

well run. They take tremendous care to get extremely bright students, who have been through several coaching classes beforehand. Yes, they get very bright students, who go there. And they say "We have a brand name," and they do in a sense, but these are students who got 99% in schools and 100% marks, went through coaching classes and so on, and then you take such bright children with such harsh selection, incidentally a selection of the kind where the exam is of a kind that an IIT professor can't do in 10 hours ! I have argued with IIT professors, "Why do you do this?" They reply, "Look at all the questions; they don't require only memory, they really require logical thinking." I said, "Logical thinking alright, but, who can do logical thinking in five minutes? You can't build a bridge in five minutes; it takes time. And if you don't give time to people, you are corrupting them. They have to memorize; they can't go any other way and this is very unfair." And so ultimately you end up with these marvelous institutes, hardworking teachers, fair amount of money and you make them into undergraduate factories, to use a very bad phrase. Now, IIT is supposed to train a large number of post graduate professors and teachers. Very few good people are left to become post graduate teachers and professors. And if you don't train large number of post graduate teachers and professors, who will train the other engineers all over the country, whom you need, whom you don't get enough of? They are not available. You need enormous research capability in IITs, which has been much less than it ought to have been in institutes of its kind.



Shouldn't a medical school be really a source for an engineering institute and science institute to find out which kind of technology to develop and use? A physiologist has great difficulty in finding out which kind of laser instrumentation will be good for him. A laser instrumentation person doesn't know anything about physiology. So they don't work together; nothing gets invented. You have to have people who are both medical cum technologist cum scientist cum computer scientists; then new things emerge. All the new things which you see are of a kind which comes out of such collective works. You have made them illegal in our country; morally illegal, because you don't allow such combinations.

Once I was giving a lecture at AIIMS about imaging the Central Nervous System. I had read about it and was very well taken with this and the technique of positron emission tomography. That was many years ago, 20 years ago or something. I read this story of the man who tried to do this. And he was a psychiatrist. He did not know anything about technology. All he knew was that if you want to find out what is happening in brain, what function is happening, and then you must see which part of the brain is eating something that is to do with glucose etc. Anyway, he traveled to Brookhaven National Laboratory. He met biochemists; he met all kinds of people. They worked together. They became essentially people who knew as much about his problem as he knew about theirs. And that's how these things develop. We don't give chances like that in our academic organisations.

Hence, we don't get competent people who are simultaneously creative. So I asked the AIIMS people after I had talked to them for an hour and a half, "Now you tell me, if you want such a machine tomorrow, will you give a job to a computer scientist, a physicist, a chemist, and together with a neurosurgeon and create a cell, giving the same salary to all these people as you give to your doctors so that they can work together and create machines like this, here?" No, they will not do that. "We know it will be imported after 2 to 5 years from abroad and then we begin to use it." No ! Medicine, medical field is full of these fantastic innovations and inventions which have happened, and they all involve people working together like this.

A child wrote to me. He had said, "I recorded my voice on a cassette recorder. I listened to it. But it didn't sound like my voice." All of us have had that experience. He said, "I played it to my friends. They all disagreed saying, 'What are you saying? You sing beautifully. It's your voice. What do you mean?' But to me it didn't sound like my voice." So he went to school and asked the teacher. He was brave enough to ask the question. "Teacher, I have had this experience. I have recorded my voice and it doesn't sound like me. Why doesn't it sound like me?" And the teacher replied, "Not a school question. Sit down". Why is it not a "school question"? It's not a school question because it involves sound, it involves electronics, it involves amplification, it involves physiology and so on. Now which teacher is allowed to think about all these things together? Or even to

worry about it together? Soon after that, I met once a large number of school teachers in a function. I said, "I got this story. Did you experience that? Did you have the same experience when you were a child?" They all said, "Yes, sir". I said, "What happened? Did you ask anybody?" "Sir, we went to school and asked our teachers and they said, 'No need to know'".

"No need to know this." This is terrible. We have created a large universe, where not knowing is considered legal. Once you begin to enlarge that universe to a child, you are doing horrible things.

Okay, let me go a level beyond that in this story.

I then solved it and I asked lot of children, "Well, come on, speak your name. Speak something". And then said, "Close your ears and then speak. Do you hear anything?" They replied, "Yes, but it sounds different. I told them, "You are hearing your own voice which is conducted up rather than coming through the air. It's going through a different medium and is modified and you hear the overlap of the voice which is conducted from inside and the voice which goes through the microphone and to your friends." Clearly, it can be different and that is understood by them. After understanding this, I had a hypothesis about something else I noticed—and you must have noticed too—that very often our classical singers, when they're performing, have a tendency to cover one of their ears. I suspect it must be because they want to concentrate more on the voice coming from the inside and the not be

disturbed by acoustics of surroundings. And so I told this story to the daughter of a friend of mine who was classical singer: "Neena, I have this hypothesis that you folks do this because you want to concentrate on sound that is conducted from inside" and she said, "Ah... Uncle, now I know." I asked, "What do you know?" She said, "When I used to do *riyaaz*—practise singing—Khan *saab* said, "*Gadhi, kaan me rui daal ke riyaz kar*. Close your ears, stuff your ears with cotton and then do the *riyaaz*." Now, what do we have here? A cultural thing, a scientific thing, a technological thing, all bundled together, requiring an explanation. That is what knowledge is. We say that there is no need to know. Knowing yourself, putting all together, that is very very important and children bring you to do this all the time, force you to do this.

So, how to set up a system where politicians, bureaucrats, ministers and othetrs don't interfere: whom to appoint, what positions, what control? Education cannot run that way. And if ordinary silly corruption gets into education, you pay for it dearly. The only thing which occurred to me and my friends was it should be a constitutional body like the Election Commission where the people, politicians and bureaucrats have least influence. Otherwise you have to go to state governments or central government for further aid, and delays, non-responsiveness and such things will happen forever.

So we suggested that there must be ultimate autonomy given to the universities in terms of academics,

essentially going down to the level of students, certainly to the teachers as to what is to be taught and how. If teachers can't design a course they are not worth being teachers. Let them design the course themselves or get help if they want. You don't want courses to be passed down from AICTE or UGC; they are the worst kind of courses because they have not taken into account all types of possibilities and they don't have to be the same everywhere. Let there be enormous amount of diversity, and if there is enormous diversity then you have larger creativity. If you reduce the need for taking permission—getting all kind of things from the top—then the top doesn't become your boss; it doesn't become a Czar. Don't allow a Czar. Actually after this autonomy is given to the universities, the top should be a catalyst for ensuring that universities interact with one another and people can move from one place to another. It provides a conveyor belt. It should help a person go very quickly from one place to another, and if he wants, work with anyone. This is the setup and this means that it costs a little bit of money; and the commission looks at it, and says "It looks marvelous." It doesn't matter where they come from; which state it comes from; or which organization it comes from. Medicine or engineering or computer science or wherever. And so, why do you need anybody else? Why do you need enormous number of *babus* sitting there doing all kinds of things? You don't need it if you begin to proceed like this. Give honour, give respect to the academics and proceed this way.

Now I come to the trouble; the problem in this...There are two categories of people; one is medical. The health ministry even wanted to do something with the medical council. They wanted to change it. After I submitted our report, somebody said to this Ministry, "What will happen to you? You are dead! Aren't you going to do something about it?" And some people sat down, and the Health Ministry prepared a report within four days to set up a Council for Health Sciences. It is still under discussion. Then I had a discussion with all the active people, and they agree that medicine is such a subject that something like a medical council is needed to ensure that nobody who is practicing medicine begins to kill people. But the universities are the places where the new courses ought to be designed, and so that power should be given to the universities. They may not all design exactly the same; let them get together with the others and do something about it. I sense now that it might be possible; I am not sure.

The real problem here is of the turf. This was now with the health ministry, and later on will be with another ministry. People are thinking that now that the MHRD is doing the talking at the moment, I meant that it should all be given to the MHRD...No! No department of the government should be an owner of this Commission. Maybe MHRD also doesn't know that that's what I said. Maybe they will try to corner it. It is quite possible that they may have indicated that they wanted to corner it. So it may have led to opposition from department of agriculture and so on. But otherwise

imagine if no department of the Government, centre or state, is involved, and you have this Commission that is a new territory of universities working together. If universities can't be autonomous, who else can be? If they can't think for themselves, if they can't think up a new world to create, who are the people in this country or any country who will think up the future, except academics, except those who think, except people who engage with ideas? So, tomorrow, day after, or some future...my dream is that let's have a situation where if we reduce the distinction between State University funding and Central University funding, we've solved the problem of private universities, not a great deal of problem, so long as the major objective is not just business but education, and business is incidental. There are a lot of bodies where major objective is business rather than education. So if you get together with this, I see no problem of that kind.

And then you can really create a fantastic future that would be a real flowering of Indian education and Indian knowledge production. We have those capabilities. Some people say 'Ah, but why, you can get that university from outside?' Harvard is not a place which is a business proposition. No businessman can set up a Harvard out here which has enormous endowments and enormous contracts of the government. You don't create universities like that, for universities are created (you must know here that first you create the soul and then you create the buildings around it; you don't create universities like this, and lots of them in the country are in

that category) and you see the country can begin to fly.

I'm quite hopeful. Whenever you give challenges to young people, they go to places where you couldn't imagine they could go. With the last story: I went to Ahmedabad to do this space experiment and everybody told me "Sir, you come here. But sometime, we'll have to do satellite remote-sensing." This was 1973. I said, "Of course. It might be needed sometime. But where do we find people?" They said, "No, there are no people. Why don't we take half a dozen people and send them for training to America?" I asked, "When did the Americans launch their first remote-sensing satellite?" It was 3 months before. I said, "Please tell me where did the Americans send their people?" Of course there was no answer. So I didn't send any people. However, I went back to my old institute, TIFR, where there was a wonderful man working with me on infrared astronomy, who made a telescope looking into the sky. I said, "George, will you come to Ahmedabad? We want to start satellite remote-sensing." He asked, "What is remote-sensing?" I said "Remote sensing means instead of looking upward for the stars, you look downwards on the earth and they make different sensors and then you learn to process the data." "Ah! So why don't we ask Kamath also to come, who has built the first TIFR computer and somebody else?" And I partially twisted their arms and partially persuaded them. They all came. And that is why I believe that our remote-sensing programme turned out to be unique, technologically, socially. Really

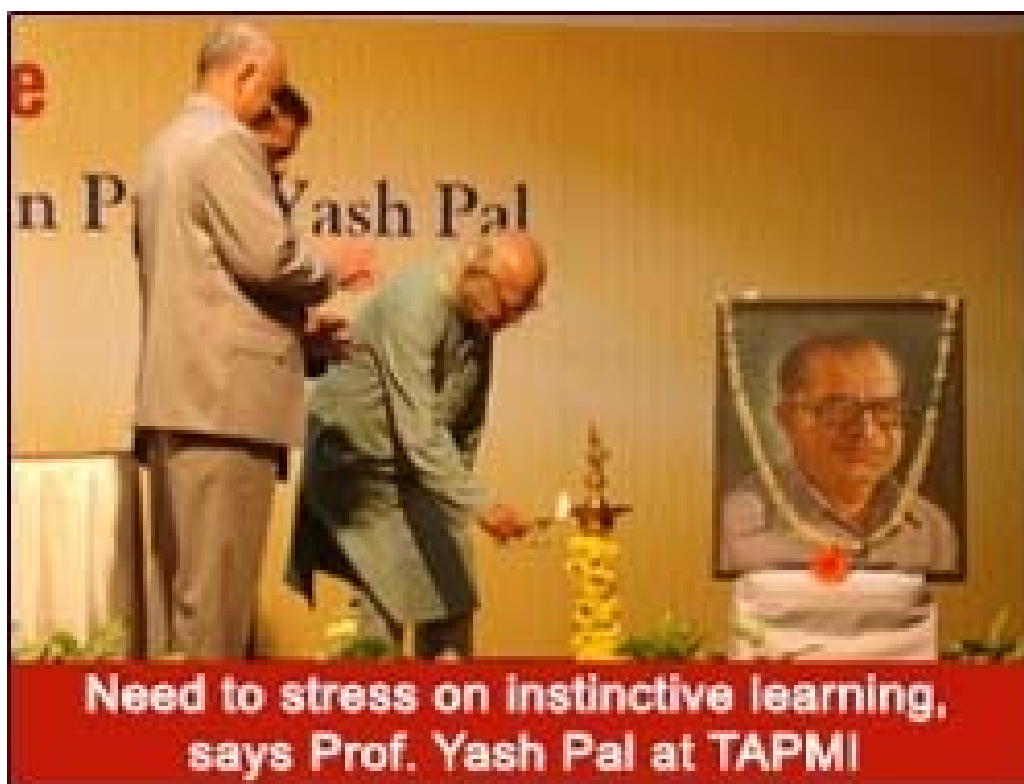
unique. In addition, it turned out to be the most humanly connected remote-sensing program in the world, because, they were in a centre where even in communication we were trying to connect to the villagers, and in the process, a fantastic breed of people were born. If they were trained somewhere, they would have been carbon copies of that somewhere. They're capable of training people.

There is an international training school set up now in India and so on and so forth.

Have confidence in your young people. Let them wander. Let them do new things. Let them invent new areas of knowledge, new areas, new disciplines and then you see where we go.

Thank you very much for listening to my peroration.

### About the Speaker: Prof. Yash Pal



Prof. Yash Pal born 26 Nov. 1926 (age 83) is an Indian scientist and educator. He graduated with a degree in physics from Panjab Univ. Chandigarh in 1949 and was awarded a PhD degree in Physics from the Massachusetts Institute of Technology in 1958. During a long academic and research career he served as a visiting professor at the Niels Bohr Institute, the California Institute of Technology and the Danish Space Research Institute. He was made chairman of the Committee to advise

on Renovation and Rejuvenation of Higher Education in India by Ministry of HRD.

Yash Pal has held several prominent positions during his career which includes Chief Consultant, Planning Commission (1983-84), Secretary, Department of Science & Technology (1984-86) and Chairman, University Grants Commission (1986-91). He was known for his regular appearances on the science programme Turning Point telecast on Doordarshan, and for his knack of explaining scientific concepts in layman's language. He has been on the advisory boards for several TV Science programmes like Bharat ki chaap.

### Recognitions/Awards

- 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”
- In 1989 received 5th Annual Award of the Association of Space Explorers in recognition of best effort 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.
- In 1987 G.P. Chatterjee Memorial Award of Indian Science Congress.
- In 1991 Zaheer Memorial Lecture Award at the Indian Science Congress.
- In 1992 First Lord Perry Award for Excellence in Distance Education
- In 1994 Arthur C. Clarke Award for Communication and Space Technology
- In 1996 The Asiatic Society’s Sir William Jones Memorial Gold Medal
- in 2000 NCSTC Award for Best Effort in Science Popularisation

### Fellowships and Memberships

- Fellow of Indian National Science Academy.

- Indian Academy of Sciences; National Academy of Science;
- Indian National Academy of Engineering; International Academy of Astronautics;
- National Fellow of the National Institute of Education; Foreign Member of American Academy of Arts and Sciences.
- Honorary Fellow Inter University Centre for Astronomy and Astrophysics;
- Indian Society of Astronautics; Computer Society of India;
- Institute of Electrical and Telecommunication Engineers (IETE).

### Publications

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. 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 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.