Talk at US Consulate, Madras

HEIR TO TWO TRADITIONS

As you probably realize, I am one of the unsocial scientist. I am basically a theoretical physicist, partly mathematician, partly philosopher but basically a physicist. My own acquaintance with the social sciences is by osmosis and therefore it leaves large patches completely uncovered. It also gives me the freedom to express completely knaivs theories as if they are gospel truths. I have lived abroad most of my life and I even consider United States as more familiar to me than India.

I went there with my bride about 30 years ago. And then there for a period of five years, because somebody told me that it will take 4 to 5 years to get my Ph.D. Once I got there, it turned out that I did not take that long. So my Professor suggested, "would you like to take a job? Harvard University has offered you a job. Could you go and take it?" I said "sure, if you say so". I went there and after staying there for sometime, he said, "would you come back and teach for a couple of years?" So I said, "sure, I will do that." Those days, the United States immigration service was considerably harsher on people who overstayed their exchange visitors' status. But somehow or the other, somebody or the other did some things and so I evneutally ended up with a green card. And there is a smiling young man's face on it and every time I enter the check post, people look at me, look at the card, and then look at me again and at the card, and

finally they look at the date and they say, "well, may be this is the same man". This has left me with both some advantages and some disadvantages. The advantages are that since I commute between the two countries, I am able to be an observer in both countries. The disadvantages are that even though I look brown and I can merge with the crowds here, I really have very few skills of surviving in this country. And as you know since you are all academics, you know academics are the greatest politicians in the world. It requires great skills to survive in an academic world. I mean, in the business world or in the political world, atleast you have your party or your guild. But in academic world, you have nobody because infact everybody in their spare time is trying to do something for you.

In India, the problem is further complicated by the fact that our first Prime Minister was a very charming man of sainted memory. But he was very easily misled into believing that he knew many more things than he knew. And one of the things that he was persuaded to believe was that he was a scientist. The reason being that apparently he had a degree in which he took botany as one of the subjects. So people said, 'you are a great man, not only are you a great humanist and great social leader or probably the greatest man alive, but you are also a scientist' and he said 'sure, I may not be the greatest scientist, but may be I am a scientist". And they

also said, "therefore you must support science". He said, "Sure, science is an integral part of it and therefore much of India's science planning in the post independence period has been marked by a concern for social welfare. Now as you know, if an academic institution is used as a vehicle for social welfare, it is neither good for social welfare nor for academics. In the same sense, when science is used only as a means of improving social welfare, it is not very good for science. But it does mean that we have very huge science establishments and sometimes some of our more exhuberant national diplomats of science who are very articulate, much smarter than I am, who keep saying that we have the third largest scientific force in the whole world apart from the United States and the Soviet Union, and India has the third largest scientific, technical manpower in the whole world.

It is true that in the Third World we are the dominant scientific power, dominant in the sense that in terms of both the numbers and at the level of general understanding and at the degree to which science has penetrated to the everyday life. But that is not saying a whole lot. I mean, if you compare yourself with Ethiopia or Wanderburandi or Afghanisthan and then say we are so much better than Mozambique, Seychelles, it is really not saying a whole lot.

I am afraid that when I start talking in some vein, I just get carried away and I am not necessarily expressing a very considered opinion, as I said before. So I hope you interrupt me, so that I will have some perspective in my talk. The second thing is that in India in the post Independence period, there has been always a linking of science and technology together. Always the department of science and technology, council of science and technology, science and technology advisor to the Prime Minister and Science and Technology of this, science and technology of that. This automatically means that science gets the top billing and that's about it. Science has about the same status as the Queen of England. It is very important. I mean she can refuse to see the Prime Minister of the deposed Fiji. So that's about the option that she has. Not very much else she could not take a decisive action in Falklands' events. In the same sense, Science has really very little to say about what science and technology should do. Much of the funding naturally must go, much of the expenditure and effort should naturally go into technology because technology is infact people intensive, capital intensive things. And India's progress in technology infact has been quite remarkable. It is unfortunately true that much of it is borrowed, adapted, bought, not much of it lifted but that is simply because people have not been efficient enough, not out of principle but just not worked out there. Compared with many other Third World countries,

India has done extremely well with regard to becoming self sufficient. If you travel around in various countries and look at their airport shops, you will see that whether it is in Thailand or Hong Kong or various other placas, you will find many things which are manufactured in a very high state of the art manner, but they are always made elsewhere, while if you go to an Indian airport shop, generally you find most of the things except the dutyfree items, almost all manufactured in India. So in that sense, it is quite remarkable. But I am wanting to tell you a little more about it, even though I have been asked to talk about science and technology, I'll talk a little bit of science.

If I look at the four decades after Independence, and four decades before Independence, one comes across some remarkable startling statistics. First of all, the greatest of Indian scientists, present company not exempted, were all pre Independence period - Raman, Bose, Saha ... perhaps Baba. All of them were products of pre-independnece India. After Indian government has given a bearhug to science and then the quality of science therefore has gone down. It is true that it has spread widely. But the elephants usually have one or two babies and the pigs have many many offsprings. But usually one thinks that one or two the elephants have are much better than the many that the pigs have, unless you are fond of ham. Well, we seem to be fond of ham and we

therefore spawned a very large number of people. There are even people who say that the days of the great scientists are over. What we now need are team work, their anonymous work. But the people who say these things are always quoted in the newspapers and they are always in the forefront and they keep perpetuating this culture, that one no longer needs to look for achievements any longer and that what we need is essentially all of us pushing a stalled truck. We really don't want to get into it. We are only to be engaged in the big task that we have. The second major thing is the attitude of the people who went to science has changed. Both the socio economic groups of people who go into science and the expectations of the people who are already studying that haschanged drmatically.

I was a student in Madras; most of my classmates would have considered it to be worth their while and their life's ambition was to make a living, but continue to do science. Some of them were willing to do any job and many of them went into administrative service after that, and some of them became secretaries in various departments and so on. But nobody expected to make a quick buck. Nobody expected to be a millionaire. Of course here we don't talk in terms of millions. Here we talk in terms of lakhs and crores. But a crore of rupees is approximately what you know a million dollars and a lakh is not really very much than 10 thousand dollars. But it was a lot of money when the

salary was lower and money had to be earned like they make money theold way. Well, now we make it the new way, namely that if you are going into the computer science whether it is in the US or India, you expect that by the time you get a bachelor's degree, you must get atleast as much as the seniormost professor who teaches you. And if you are any good within a couple of years in weaning and dealing, you should be able to buy the institution which taught you. And the idea that if you could somehow or the other put a little pattern of science and little pattern of technology and get into some kind of business - make a chip, put one chip bought from some place and some other chip smuggled from some other place, put it into a container and put your name outside the thing and sell the thing as if it is a new object. Then obviously the rewards are very much great. Therefore nobody is very enchanted with science. The twin propaganda or the triple propaganda that the purpose of science is to aid technology which is to uplift the weaker section of the society, not the stronger section of the society, itsexcellence is not important.

The second is that science itself is no longer the striving of the individual, but in fact it is a matter of team work. So you say the team working in Madras, I mean the 7000 people together have made some progress and that is all a that would come. But your name is not associated; even in your own mind with anything that you have done.

And the third is that the reward of being a good scientist are very very small. In terms of what is the money value, it has led to people dissatisfied with science. It is not that the things were so much better before Independence or the early independence, post independence years. It was ~~further~~ simply that the perception of the people was different. Somebody who went to study mathematics, physics or chemistry did not expect to be rich. It is understood that this was a different thing and the kick came from what you did and what you thought and what was the company you kept, than other things. At the present time one of the consequences is that the people who go into science in the higher reaches are really neither motivated nor very competetive. It is a terribld ..... I am the Director of an Institute here. We spend more money advertising for students than in giving scholarships to students who come to study and we give scholarships at the highest possible rate permitted by the law. In fact I think we give longer scholarships than many institutions. I don't know what Stella Maries does, but many institutions pay their full time faculty members just for them to be graduate students. They are not satisfied. They recognise this as a failure because they have not gotten into an American university, they have not gotten into master of business administration programme, they have not gotten into computer hacking, they have not been into administrative service, that in fact the abysmal thing is that many of our students are there because they did not even get a job as a bank clerk, because banks too take mathematics MSce and physics

And those people are paid very much more because to be a physicist, to get a job or a mathematician to get a job in a university, it requires there are many many hurdles as you know. I mean,you have to first get your Ph.D. then you have to get a post doctoral job, then you have to get instructor or Assistant Professor's job, then you have to get promoted and if you are very good, then in a few years time, you would have a job paying a certain sum of money. But if you went into a bank and did not do anything against the rules, did not run away with the money, then you will get that money within five years. And all you have to do is to be in the bank, and you will be in the neighbourhood. You don't have to go from one place to another. But that is not the most demoralising, because one could say, 'let these riches attract away the ones who have taken away by the glitter of gold, let us get the really motivated, the pure ones, who are after truth. Even if they are dumb, they couldbe educated, but the attitude is that ~~the~~ 'well, what else have you done for us?' You have given us Rs.1600 a month, but you haven't done anything else for us. After all you people are paid only one third of that of us. The fact that the faculty members have put in 15 years of service and are selected out of probably 5000 such people and come to the top does not bother them at all. They demand concessions after getting this money, they want all kinds of things and they don't think that it is necessary to study. It is a case of saying,

"yeah, we will study, what is so great about it?", "yeah, I don't feel like studying, Yeah, this lecture is not interesting, so I am not going". And some others also suggest that it is is their right to be drunk because that makes him feel better. And one of them threw up in my Institute and I asked him, "Don't you think it is unfair?", and his professor came to his aid and then said, "you should not talk so roughly to mathematics students." So I said, "you clean it up, if you feel so concerned about it". So, there is a considerable degree of confusion as to what is the purpose of scientific research. What is the thing that is to be done. These are all the dismal part of it.

Now let me tell you the good part of the story. At the present time, there are a chain of research institutions in the country. And almost any aspect of science, experimental or theoretical, capital intensive or inexpensive, there is some institution in the country which could handle it. No one can get away by coming to India and saying "we will tell the the people a few tall stories about the achievements of science, anyone, any piece of science". It does not necessarily mean that people are working at their efficiency, and creating science at their particular level but they are scholars at their particular level. Second, it is possible that if the attitude can be changed and somehow science and technology can be decoupled and the study of science made an academic discipline and an end in itself and saying

'excellence is its own reward and it should be judged according to that and after that, people could do whatever they wanted". Perhaps it would be possible to produce some very good people, because we have the strange situation that students perform indifferently when they are examined here or when they study here. But shift them off to U.S. and subject them to extreme pressure and they perform magnificently. Some of them of course fall apart, but that is good. I mean, let them go, but those who don't fall apart seem to do extremely well after that.

Now I must really enter into the question of impact of modern science and technology in Indian society. Indian society, as you know, contains a large number of people who are all telling you what Indian society really is about. I am going to join the group too. You must have heard that one fable that some cowboys from the north crossed the mountains and came with some horses and culture to India. Others say, 'no,no,no. they were really not original culture. But it was the mountain tribes who are now living in various isolated parts who are having the thing. Since I myself come from the coast, I would like to advance my own theory, It has no relavance to anything else saying that it must have come from the sea. Because the polination of somebody like that must have come from the sea and culture must have come by the sea and that is why the coastal areas

are more cultured than the mountain regions. What ever it be that there are many different streams of Indian culture and this has always been India's nature. India has always been one nation but it always spoke with many tongues. Not only many languages, but also many philosophic blends, many different views. It was never one nation under God, because we don't have one God. We have one nation under many Gods. We had many philosophers and each of their philosphies were treated atleast by the majority of people as a possible alternative and everybody took out insurance premiums by saying that atleast there are eight philosphical systems or 6 philosphical systems which we must consider on parts and some of them were very theistic and some of them were materialistic and all of them sounded more or less alike and one would even make a point that infact they were really same but people were arguing because they had nothing very much else to do. In a sense, they were more or less the same.

But with the coming of the various invaders or various skin coloursover the last few centuries, there came up a certain system of ~~xxxxxxxxx~~ sycophancy which was sort of internalised in which people ~~x~~ said, 'see, all these things are superstitious'. For example, I would deliberately put a mark on my forehead so that somebody will ask me what that

mark is, so I would say, 'that is part of my superstition'. So these things are also superstitious but other things are alright. I wear a sort of quasi official uniform, bush shirt or safari suit because if I wore standards south Indian dress and try to go into an office in Delhi, they stop me. They will say that you are really not a full citizen of India, you are only from the south, that you cannot come in. But you wear this, and then of course you are perfectly in.

In the same sense, with regard to many ideas, there were the ideas that these ideas are good and these ideas were not good. One of my friends who is a professor of anthropology in Syracuse, used to say that modern Hindus are distinguished from the traditional Hindu by saying that he considers everything before Vivekananda to be superstitious and everything after Vivekananda to be modern and that distinguishes the person. In the same sense, that the notion of modernity is a very strange notion and every person has a line which is that these things are superstition, animistic, primitive, but these things are profound. And depending upon one's political and social cultural, familiar leanings, you would draw the lines different. In my spare time, instead of plotting against my friends I plot redrawing these lines and taking various positions at various gatherings and then seeing which of them get most plucked. But one of them is the idea that Indian

society is unscientific and what we need is modern science. By modern science, I assume, what most of the people mean is the mechanistic science of post Newtonian period in which weaponry and mobility (transport) and machinery is associated with scientific pre-knowledge background. During this period, in a sense, India was under colonial occupation of one kind or the other. The mughals came and plundered it and after sometime they got tired and they said, "instead of carrying all this loot, we might as well settle down here and wipe it up. Then came the British and they stayed for sometime and they also said, "well, may be we might ourselves stay here". Eventually they also left and now we have our own people doing this - plunder one area and then put it in some other area. But all of them do have the idea that we must use harness, science for technology and technology for power, but also power in the sense of physical power of control. And Science and technology becomes an apparatus of state control. It also becomes an instrument of propaganda because whatever you don't like you call it unscientific and whatever you like you say it scientific.

In the U.S., we always have this new improved Vim, which is used for (not Vim), what is called Bathroom cleaner, the toilet cleaner. Right. Here is something else. I mean, something else which contains GL 27. You don't know what it is and they don't know what is is, but it sounds good with

regard to Vim. So the idea is to have all these things; then it must be good and this thing which you put into the toilet tank which turns the water blue, certainly makes you feel that things are much cleaner. It has nothing to do with it, but it is green or blue. In the same sense, if you say that something is scientific, it would be very good. And the matter has come to ahead with 19th century and early 20th century, because there came various social movements in India. I expect to be challenged on all these statements by the way! Various social movements in India which decided to resist the external cultural aggression by creating internal problems themselves. I mean, Bengal, as usual spearheaded this one and Tamil Nadu was not far behind. And there are great similarities between the Bengalis and the Tamilians, except that the Bengalis are more effervascent and more voluble and the Tamilians do things more carefully. But In both the cases, the idea was that you internalise the intuition of the outsider and make it into a social reform movement within your thing, and you simply prevent the other person by trying to do the thing even before they do. So, amongst these movements, there are movements in other parts of the country also. There were large number of people who said that our way of life is deficient in many ways and most of the reason why we are not successful, why a few handful of Englishmen are able to govern us or a few

Secondly, we must really not observe things which you cannot immediately relate to your own scientific knowledge. For example, in India, there used to be a convention that on days of eclipse, you don't eat. I really don't know why, but people say that it is not good. You don't sleep with your spouse, and you don't eat, there are certain things which you don't do. I say this is superstition, and we must not pay any attention to this one. But if you say 'never on a Sunday', that is a different thing, because Sunday after all is the seventh day and that it is a reasonable thing to say that we must not do certain things on Sunday and that sounds more respectable. If you wear clothes appropriate to the climate, that is not good, because that shows you are primitive. But if you wear clothes which are designed elsewhere and are very expensive, then of course, it shows a taste. You can wear a swim suit, but you could not wear a short pant. There is this cartoon which I once saw, in which a painter is relaxing with his model and then saying, 'look, I am tired. Why don't you take a break, sit down and have a cigarette or a cup of tea with me and while they weredoing this and relaxing, his wife was coming. He said, 'she will make a big fuss. Get up and take off your clothes'. So it is the same attitude - somehow or the other you take it off or do things because that is the accepted pattern with regard to ideas.

Well, with regard to ideas also, the idea was that you take off a number of things and if you took them off, then you became more fashionable. And a particular version of the thing gained prominence with the ideas of socialism and marxism which took considerable amount of attraction to many of the people in India, and said, 'well, after all Marxism is very scientific and socialism is based on reason and science is also based on reason; and Marxism always says that science is very important. After all it is the next thing after cleanliness. It is not godliness but science which is important. You say science, but science of course, the whole movement is related to people and everything derives from people. Science should be for the people, for the proliterian, I mean not for the elite- So if you are a scientist, then your son should not be a scientist, but if you are a factory worker, then your son should be a scientist. So the idea was that we must do science as part of the rational thing, not because science gave you happiness, because that is an elitist's notion that you do science because it is necessary for building better factories. And our first Prime Minister, beloved Nehru, was a very good man and he believed his statement that in fact a scientific pattern of society meant also being rational and also having science, and science was for society. We continue this fiction even today, that if I want funding for a

proposed study, I must say, I must now develop a abstract, algebraic topology in my Institute because it is very necessary for understanding the structure of society. To say that application of science and technology for the upliftment of the weaker section of society is an essential part of the beauty of every citizen and this institute shall not be left behind in its task, and therefore we would like to have 5 crores of rupees because we would like to study the theory of quantized strings as a possible model for the universe.

There is a new group of people who talk about the scientific temper. Pandit Nehru was very fond of it and somebody researched his life and discovered that this isa phrase that he liked, and some of our eminent science administrators got together and then decided that what we must have is scientific temper. So like the lion in the Wizard of Oars, the cowardly lion was given a ~~xx~~ medal. In this particular case, all the people had a charter saying "statement of scientific temper" and from that time onwards, we all have scientific temper.

Now, not all things are completely negative; there are places in which science and technology do affect people. First of all, science and technology, in particular technology, has brought about transportation and communication to

That alone does not necessarily advance the cause of communication. But in India, we have seen over the last 5 to 10 years, the production of news magazines mushrooming. Those of you who have been in India before would know that at the present time, the scene is very reminiscent of the United States. I mean, there is India Today and so many other news magazines which contain a great deal of detailed research, glossy print, well written articles, documented follow-ups of various new stories. But all the ability for doing the thing was there 20 years ago, but nobody had done it; but one or two people succeeded and then lots of people followed suit.

Secondly, people travel a great deal. Much of the travel is public travel, public transportation, railroad trains, buses, aeroplanes. Aeroplane travel is by almost exclusively international visitors and government officials who travel on behalf of the working people, because nobody else can afford it and even if they afford it, they cannot afford to manage to get the seat. But the railroad travel and bus travel has become very comfortable, very efficient and lots and lots of people travel. Therefore people in India have become much more homogeneous than it has been in a long time - dress habits, food habits, political discussions - have all become much more uniform. Telephones are another

the other in which the cells come too fast and therefore expectations of people are raised considerably above what is reasonable. In some cases of course, other social structures follow. We have what arecalled blade companies. I don't know whether it is a common expression all over India, but atleast in Kerala. There were a number of finance companies which paid 25 percent interest, 30 percent interest on money deposited with them, and they paid it promptly for the first year; not so promptly for the second year and of course, there was neither the interest nor capital in the third year. And those companies were there to produce very immediate and quick and substantial reward which could possibly not be earned in the ordinary way of things. This week's Week magazine has a feature story on blade companies, which hase now fallen like a house of cards - almost faster than bank failures in Texas. There are about 20 different finance companies which are closed, and a government dragged its feet for about 2 months during which time almost all the assets and the proprietors have disappeared.

There are two or three problems however, which have not been solved in the normal course of thing. And that is that science has not really had very much of an impact, because it is cacopony of talking about scientific temper, science and superstition,science and religion, science and human welfare, scientific temper, all these things. One

story. If you do have access to the national communication network, then you can talk from any place to any other place and trace the movement of any person, including a foreigner. But for most people, telephones work if they want to. But the fact that there are telephone access to not only distant cities within the country, but abroad, means that again, with the fast breaking world of ideas, very often ideas do get transmitted but the most forvasive form of communication is the most pernicious form of communication and there it is not very different from United States. Nobody has time to read a newspaper and therefore the newspapers have become the kind that people read only headlines and a few lines after that. Much of the news reporting is electronics, and in electronic news reporting, there is no necessity to establish to premises. You simply suggest something and if you happen to conclude one news item or the other, that is your mistake. In India of course, the cinema, or the movie, is very much more influential and with the advances in video cameras and ~~xxxxxx~~ processing, it has again become possible for lots and lots of people to be able to be involved in the thing; and instesd of mythological stories of kings and queens or extremely rich people, we do have stories about very ordinary people,about very ordinary situations. But much of the time they are really about things which are not consistent with a society in which everybody works. It usually is always about something or

the other in which the cells come too fast and therefore expectations of people are raised considerably above what is reasonable. In some cases of course, other social structures follow. We have what arecalled blade companies. I don't know whether it is a common expression all over India, but atleast in Kerala. There were a number of finance companies which paid 25 percent interest, 30 percent interest on money deposited with them, and they paid it promptly for the first year; not so promptly for the second year and of course, there was neither the interest nor capital in the third year. And those companies were there to produce very immediate and quick and substantial reward which could possibly not be earned in the ordinary way of things. This week's Week magazine has a feature story on blade companies, which have now fallen like a house of cards - almost faster than bank failures in Texas. There are about 20 different finance companies which are closed, and a government dragged its feet for about 2 months during which time almost all the assets and the proprietors have disappeared.

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has not even heard what science is. Nobody wants to hear about it. They want to hear about scientific temper; they want to hear about how much money was spent; how much money was saved by not importing the piece of equipment. Nobody asked the question: 'Suppose we did not import the equipment, suppose we did not make it, suppose we did not have any of these things, would we have been better off or worse off? The question is, always, have we made some money? So we are thinking always in terms of money, or in terms of benefit from the thing. But not what science is. The idea that science is a way of comprehending the universe, the idea is that science is the layman's ways of dealing with the world, namely to bring order into an otherwise disorderly world. The way of trying to reduce the multitude of phenomena and facts into a few orderly laws, so that might come so natural that you cannot even forget them. So that you don't have to have the individual facts remembered, but only the general principles remembered that things will always fall vertically down, that every body attracts every other body unless you don't like them and so on. That the force is of thiskind and something is concerned and something is not concerned this is the cause, this is the effect, that the world is really not a world of things but a world of processes that infact the motion, the rates of changes are very important things and the world is really made up of those things. This idea does not really get through. If it didn't

get through, then of course one would start thinking in terms of a whole system all around it. One would start thinking forbidden thoughts about a philosophic time, one would start thinking about oneself as a physical system. And then one would ask the question, 'but where is the processing unity?'. We thought of computers. Having really thought of the computers, he would ask "What am I? Am I a computer? - in which case the processing unit, the central processing unit ....

Is it possible to remove the software from this one and put it into another machine? I mean all kinds of questions could arise. Similarly, one could ask the question, "If I were able to cut down all the trees in the Kerala forest and make a grand fortune, precisely what will I do with the fortune? Will I live in Kerala or would I have to immigrate because the weather would have changed then; that the living conditions would have deteriorated so much. Should I do that or would it be better to be not a millionaire but only a quasi millionaire and leave a few trees lying around, and what shall I do to prevent other people from cutting it all? Should I join with a group to do various things? This kind of thinking does not seem to work well except in terms of either cosmetic groups which are involved in environment or in terms of groups which are involved with regar to internal environment. Somebody might say, what we really

need is to teach students in such a fashion that competition is unimportant and excellence is important. There are some schools here, where they say no grades in the lower grades. So these parents are all very impressed, very nice school, all bright kids, they are all happy, clammering to go to School rather than stay home. So they want to get their kids into that school and they all compete with each other to get their kid into the school and then when finally when they have got the kid in them, they say, 'by the way, how do they do in the examination - public examination afterwards? So the whole point is vitiated. So there are such individual piecemeal arrangements. But there are only very few groups which seems to be interested in dealing with, in a sense, educating the public with regard to the effect of science as a humanistic ..... as a fine art, as a humanistic discipline. In many parts of the country, Bengal, Kerala, for example, these are the two places I know and in a certain extent, Karnataka and Tamil Nadu, the [illegible] group of scientifically minded journalists or socially minded scientists get together and decide to educate the public about the scientific component of their everyday life. For example, talk about pollution - what is pollution? How much of it

can be avoided? How much of it cannot be avoided? What is the point in talking about pollution? And then say, you don't want any pollution. But if the trucks do not roll, then you will not have any commerce and you will not have anything and nobody is in a position to do anything about the trucks, because if you don't have any trucks xx then you don't have trucks at all. So you must change the entire social system before you could have pollution research. What should you do? If you have effluence going into river, is it better to have the factory in your village and have full employment or is it better to shut down the factory and then try to develop alternative forms in which case, what sacrifice would the society be willing to take for the interim period and how do you guarantee that the pollution which is already there is not pernicious enough to make it dangerous. Is it mini lava canal, or is it something that nature will cure in a short time? One example is in Tamil Nadu, where leather industry is very advanced and very successful. There is a Central Leather Research Institute in Madras city, and there are whole villages which are involved in the processing, tanning. Leather is a very high quality export item and it makes them prosperous, but it means that no water for miles around there can be drunk because the ground is saturated with it. I am surprised that the people are alive there, they seem to be alive. The water has to be brought in from outside. It cannot be even kept open, because the atmosphere is surrounded with, I think alam or some other chemicals xxxxxxx powdered residue. But it is impractical. It is a

sort of banning vehicle or traffic from downtown in the interest of beautifying downtown. We cannot simply say, "we will shut this down", because that will be a very expensive thing. We cannot say that we will not use this chemical, because then you would have to essentially develop an alternative method and do it sufficiently fast. Who should take the initiative? Certainly not the government, because they are talking about scientific temper. The great men are talking about increasing their budget and increasing their export. They are not interested in this particular thing. What is needed are a few interested people who would be involved in the thing. In Madras, there is a group of people who found a society called the Environmental Society of Madras - ESM - who are interested in improving the Coovam river. There is a river here which unless you are very very imaginative, you could not see, because there is no water in it and even at the best of times, there is very little water in it. There is Cauvery which has lots of water most of the time. But it is also rapidly being exploited out. So people say we must do something about it. Atleast people sing hymns to Cauvery almost as a Goddess saying that it is a giver of plenty. But after having sung the song, we go and do whatever we want to do with its bank and water and so on.

..30

So this kind of involvement of science with the thing, together with a school system, in which the children are taught about science in the school in relation to what is around them. Don't talk to them in Madras about apples and pears and peaches, because they are abstract ideas. Much better, talk about molecules and atoms because they are nowhere and therefore can be seen and just as often near as elsewhere. But apples are infact brought from Kashmir or from Assam down here, from Himachal and so on. So apples are not the right things for a child to learn about as trees; they should learn about trees which are growing in their place, like mango trees. Yes, that would be very interesting to learn, and various kinds of mangoes. But that is not the way normally syllabus is set up. You must learn about this particular island, this particular genus, you must do this, you must do that. You must also know about things that is considered as the core of the subjects. In the olden days, when children were sent away into a sylvan surrounding, the so called forest academy to study, then of course, the nature was around them, and they could study them and the only wild animals that they could not study were the human beings and they gradually got to know more and more about them as they grew older. Unfortunately, now the situation is reversed. The plants are rare things and people don't know enough about the thing. One does not know what happens, what does the earth do to the water and chemicals, dust and the dirt to process it; how much time is needed; what is the safe time for something

to be processed; will it be processed in one area; what can be done in a place where there is a lot of rain, versus places where there is so little rain; when there is extremes of climate, what kind of clothing is most applicable and so on. These are not considered as part of one's curriculum. Either you know it or you don't know it. Now in the old days people knew it from long habits and therefore they used traditional clothing, traditional eating habits, traditional things. But now of course, they are superstitious, old fashions, primitive. So we are in a sense between stages and there are only very limited things. So if I were to sum up the impact of modern science and technology in Indian society, I would say modern science and technology is a long tradition of various influences, which have been trying to alienate Indian society from its natural heritage of cultural moorings in the name of modernity, but somehow or the other the society continues to survive, possibly because of the fact that nobody takes any of these things too seriously, that they pay lip service to the thing, but somehow the connection between the word and the meaning has been broken, so that we always say "we believe that what we need is science and technology to influence the ordinary life".

I had mentioned two people in the abstract that I have sent. Vishwamitra and Vasishta. Visvamitra is the traditional sage who was a king, and as a king of course, he

..32

was involved in the kingly pursuits. One was to have a large army and to be the boss of whatever he surveyed and appropriate whatever he liked, raise revenues by accessing whatever he liked and the second thing was to hunt. And at one time, he was hunting, that he got lost and he became very hungry and of course, he had a lot of hungry people along with him, which did not help him a great deal. The entire group of people, who were hunting with him, eventually found a small cottage, a hermitage, and somebody said that it was the hermitage of Saint Vasishta, a great teacher. Vishwamithra said, "what can this poor man do for all us? But any way, it is good to go and say greetings. Who knows, may be he can do something". And when he greeted the sage, the sage said, "Oh! you must be hungry. Why don't you go and freshen up and come and I will have some food ready for you". The king said, "But sir, I have got 2000 troops". Vasishta said, "no,no,no, all of you. Of coursd, you will be served first, but all of them will be served". So all of them were served and it was very good food. So the king was puzzled. Where did this old man get it out from? and he asked Vasishta. Vasistha said, "Why do you bother? You said you people were hungry. I have you food. That's my job". Visvamithra said, "no,no,no. I must find out. So Vasistha said, "I have this cow and this cow is a magical cow and this cow .... Then he said, 'I must see the cow". He was a very research minded person. and then they went to see the cow and he was satiafied that the cow could give the food and then he told the sage, "you see,

..33

you get such few guests. This is one of the occasions you got so many guests, but in my case, I have guests all the time. So I must have the cow". So Vashista said, "This cow was a gift to me. So I cannot give it". In any case, I need milk for my sacrifices and so on.So I cannot give."I am sorry I am the king, I can command you". So he said, "you are the king, but remember, I was the one who fed you. I'll take it if you don't need." The king said, "you take it".So he sent some and they could not take it. Then he said, "in that case, I'll ask my army to take it. So Vasistha said "take it" and [illegible] took a little stick and put it infront of him and said "if anybody can cross this stick, they are welcome to take the cow"[illegible]. The entire troop could not do anything. At this time, the king decided that this man had not only the cow, but he had more powers. So he went to him, and said, "You see, I thought as the king I was the most powerful person, but it is quite clear that your power is greater than mine. Since I am after power, there is really no point in my continuin to be the king. I am willing to give up the whole business and become your student and learn your tricks. Vashista said, "this is not a trick. I am not interested in power, but you wanted my cow and I said I cannot give it. You wanted to take it and I said I can't. That's all". But this man was very persistent and then and there he gave up his kingdom and started tapas and eventually after many many adventures of the same kind, he became a great saint and he is theone person who is credited with the insight into the so called

..34

Gayathri, which is the invocation to inspiration, and some of us consider him to be the first scientist of the world, because he really after some particular things very mundane, and in the process, discovered lots of truth and that is the nature of science. ..... was a nice young boy and his father in a fit of anger, said "I am going to give you away to the God of Death. So he was sent to the God of Death and he went there and waited. The God of Death is a very peculiar man. He likes to have people come to him when he wants them; otherwis he is very unwilling to see them. It is like a Director. I summon somebody and I want to see them right away. But if nobody comes to see me without them asking me, I really do not want to see them because I know it is trouble. So the god of death did not want to see him but eventually they had a lot of discussion and the boy said, "I really have only one question to ask you. What is the nature of death? " The God of Death said, "why do you ask this unnecessary question? You ask for riches; I am a God, you ask for long life, many wives, whatever wealth you want, I will give it to you. The boy said, "I do not want any of those things. I just want this particular thing and eventually they had a long discussion and this formed one of the traditional writings. So .... is again another person who seemed to have a scientific temper, namely (1) who is interested in finding an answer to a particula question, and is not thrown off by technology, thrown off by social welfare, thrown off by advantages along the way, but woul like to continue along this line.

I thought since you are all visitors from another country, it will be nice to throw in a couple of these things and you will think I am a scholar.

Thank you very much!