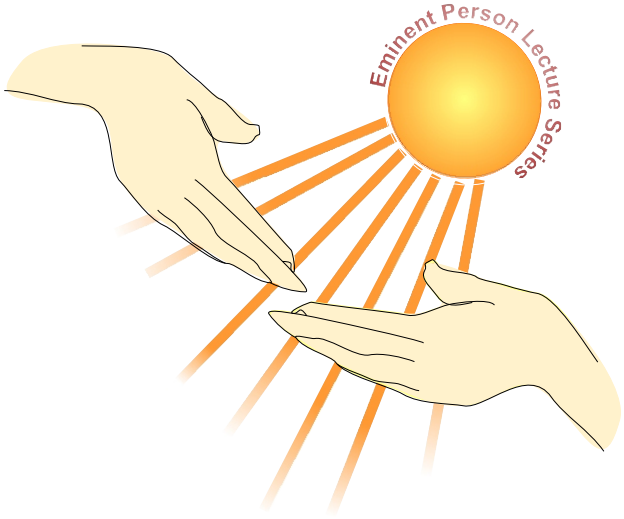
Eminent Scholar Lecture Series



REPORT

National University of Educational Planning and Administration
17-B, Sri Aurobindo Marg, New Delhi-110016

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17-B, Sri Aurobindo Marg, New Delhi-110016
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Eminent Scholar Lecture Series

Prof. C. N. R. Rao, *F. R. S.*
National Research Professor and
Honorary President & Linus Pauling Research Professor
Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore
on

Science and Higher Education in the Future of India

on Tuesday, February 20, 2007 at 1030 hrs.

Venue: Hall No. 1, Ist Floor, NUEPA, New Delhi 110016

This Lecture is free and open to all but you are required to register latest by 18 February, 2007 at Telephone Nos.: 26515472, 26853038

Content

PROF. C. N. R. RAO – A BRIEF INTRODUCTION

Prof. Ved Prakash, Vice-Chancellor

It is indeed, a matter of great honor and a special privilege to have Professor C. N. R. Rao with us this forenoon. I am inspired and humbled by the opportunity, I have been given to introduce Prof. C. N. Rao to you.

Professor C. N. R. Rao need no introduction - primarily for two reasons.

- One, Prof. Rao is no mere scientist - but an institution. Unlike the prism, he generates his own light – intense, direct and concentrated as a beam.

Prof. Rao generates his own light – intense, direct and concentrated as a beam.

- Two, it is almost impossible for any one to do a reasonable job whilst introducing Prof. Rao to the audience. One finds it hard to know where to start from and where to end. Nonetheless, I will make an attempt, more so, for the benefit of my younger colleagues.

Professor C. N. R. is Linus Pauling Research Professor, Honorary President of the Jawaharlal Nehru Centre for Advanced Scientific Research and Honorary Professor at the Indian Institute of Science, Bangalore.

Professor C. N. R. Rao is the most distinguished scientist of contemporary India. He has been honored with innumerable national and international scientific and civilian awards. His contribution to materials science and also to science and higher education is unique. He is Linus Pauling Research Professor, Honorary President of the Jawaharlal Nehru Centre for Advanced Scientific Research and Honorary Professor at the Indian Institute of Science, Bangalore.

Having received the most prized possession of his life from Bangalore, Prof. CNR Rao, earned his Master's Degree from Banaras Hindu University in

1958 and thereafter he moved over to Purdue University where from he earned his Doctoral Degree. His main research interests are in solid state and materials chemistry.

Several universities across the world have honored him with honoris causa doctorate degrees that include Purdue, Bordeaux, Banaras, Mysore, IIT Bombay, IIT Kharagpur, Notre Dame, Novosibirsk, Uppsala, Wales, Wroclaw, Caen, Khartoum, Calcutta, Sri Venkateswara University, Visva-Bharati, etc. Prof. CNR Rao has to his credit over 1400 research papers and 39 books.

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He was conferred the first India Science Award for the year 2005 by the Prime Minister of India on January 3, 2007. He shares the Dan David Prize for science in the future dimension for the year 2005 for his research in Materials Science with Goerge Whitesides of Harvard University and Robert Langer of Massachusetts Institute of Technology. He was named as ‘Chemical Pioneer’ by the American Institute of Chemists (2005) and "Chevalier de la Légion d’Honneur" by the President of the French Republic (2005).

Professor Rao is deeply committed to basic research and strongly believes that India can achieve new heights in basic science research. He urges to give greater priority to basic science research. He is a constant source of inspiration to young researchers who wish to make basic science research as their career.

Prof. Rao is National Research Professor of India, President of The Academy of Sciences for the Developing World (TWAS), Chairman, Scientific Advisory Council to the Prime Minister, Member of the Atomic Energy Commission of India and Chairman, Indo-Japan Science Council.

Prof. Rao was President of the Indian National Science Academy (1985-86), the Indian Academy of Sciences (1989-91), the International Union of Pure and Applied Chemistry (1985-97), the Indian Science Congress Association (1987-88), the Materials Research Society of India (1989-91) and Chairman, Advisory Board of the Council of Scientific and Industrial Research (India). He was the Director of the Indian Institute of Science (1984-94), Chairman of the Science Advisory Council to Prime Minister Rajiv Gandhi (1985-89) and Chairman, Scientific Advisory Committee to the Union Cabinet (1997-98) and Albert Einstein Research Professor (1995-99).

Among several other medals, honours and awards received by him, mention must be made of the Marlow Medal of the Faraday Society (1967), Bhatnagar Prize (1968), Jawaharlal Nehru Fellowship (1973), Padma Shri (1974), Sir C.V. Raman Award (1975), Centennial Foreign Fellowship of the American Chemical Society (1976), S.N. Bose Medal of the Indian National Science Academy (1980), Royal Society of Chemistry (London) Medal (1981), Padma Vibhushan (1985), Honorary Fellowship of the Royal Society of Chemistry, London (1989), Hevrovsky Gold Medal of the Czechoslovak Academy (1989), Meghnad Saha Medal of the Indian National Science Academy (1990), Blackett Lectureship of the Royal Society (1991), CSIR Golden Jubilee Prize in physical sciences (1991), TWAS Medal in Chemistry (1995), Einstein Gold Medal of UNESCO (1996), Linnett Professorship of the University of Cambridge (1998), Centenary Lectureship and Medal of the Royal Society of Chemistry, London (2000), the Hughes Medal of the Royal Society, London, for original discovery in physical sciences (2000), Karnataka Ratna (2001) by the Karnataka Government, the Order of Scientific Merit (Grand-Cross) from the President of Brazil (2002), Gauss Professorship of Germany (2003)

and the Somiya Award of the International Union of Materials Research (2004).

Besides being a Fellow of the Indian National Science Academy and the Indian Academy of Sciences, Prof. Rao is a Fellow of the Royal Society, London, Foreign Associate of the National Academy of Sciences, U.S.A., Foreign Member of the Russian Academy of Sciences, French Academy of Sciences, Japan Academy as well as the Polish, Czechoslovakian, Serbian, Slovenian, Brazil, Spanish, Korean and African Academies and the American Philosophical Society. He is a Member of the Pontifical Academy of Sciences, Foreign Member of Academia Europaea and Foreign Fellow of the Royal Society of Canada. He is on the editorial boards of 20 leading professional journals.

The Prime Minister, Dr. Manmohan Singh, presented, Prof. C. N. R. Rao, the first India Science Award

The Prime Minister, Dr. Manmohan Singh, presented, Prof. C. N. R. Rao, the first India Science Award amidst a galaxy of scientists and Nobel laureates, at the inaugural of the 93rd Indian Science Congress on January 3, 2007.

Even after five decades of tireless research work, Prof. CNR Rao continues to be a student of science, looking to learn new things with a childlike curiosity.

Regarded as the world's foremost solid state and materials chemist, Prof. Rao's current passion, at the age of 72, is nano - materials - thinner than human hair stuff that promises to revolutionize several fields –from defence to human health.

Prof. CNR Rao is currently the Chairman of the Science Advisory Committee to the Prime-Minister.

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Friends, the great reality of our age is science. The understanding of nature which science provides, and the deep harmony it unfolds, are deeply satisfying to the human mind. The power of science to transform society is immense, perhaps more than of any other activity. There was a time when a gifted individual could encompass the whole of science. This is no longer true today. Science and technology are now divided into innumerable number of subjects. The division is often arbitrary. The fragmentation of science has to be supplemented by cross communications cutting across subject-barriers. There must be a continuing re-shuffling of boundaries between subjects.

With these words, I would now call upon Prof. CNR Rao to kindly address the audience which I had to split into two Conference Halls. We have made provision for the close circuit TV on two floors so that, Sir; you could be heard by everyone. Thank you.

Prof. CNR Rao please !

LECTURE

"Science and Higher Education in the Future of India"

Prof. C.N.R. Rao

Shri Sudeep Banerjee ji, chancellor of this university, and Prof. Ved Prakash, my dear friends, colleagues, ladies and gentlemen,

Todays' topic which I have chosen is something that everybody is worried about. Everybody is concerned about. Therefore it is very difficult to be original in a topic of this kind. Roughly we know what we have to say; roughly we know how we are going to say. But I think it is very important that important things are repeated. After all we come from Indian tradition where repetition is one of the same thing makes us purer. We repeat the same Sanskrit *shloka* every morning year after year day after day. So it allows a fractional distillation in your mind. This fractional distillation eventually makes you pure and purer till you reach perfection, ultimate, highest of perfection. So with that in mind, I want to say few words today. Much of it may be known to you, much also may be common knowledge today.

Today is the day, when we are looking at scholarship, learning, and creativity.

But I have to say this in a particular way, the reason I thought, this topic is of importance today because if we do not do right things today and tomorrow. I am talking of very short term next two to three years. I believe India is going to face great danger. This is the point; I am going to make clear. Those of us who are concerned with Science and higher education when I say Science, Engineering is included. I consider Engineering as part of Science. But I do not include Technology. Because today is the day, when we are looking at scholarship, learning, and

creativity. How India is going to be in future centre of so called knowledge world. That is the concern of my talk. Do not forget many of us; I think I am one of the ancient Indian here, born in 34, when India got freedom. I still remember the fantastic day when India got the freedom. I cannot forget that day, I still remember my neighbor, I can not forget that gentleman, Mr. Venkatraman, superintendent engineer in Bangalore. He was very great friend of mine. I was only thirteen years old. He would say, of course he had one or two other friends, "We are going around Bangalore with a bell". He was superintendent engineer, educated in London. That excitement of Independence was something which my generation can not forget. That is why we all are here. It is not because opportunities were not elsewhere. But after independence many things happened. When I decided to do Science, everyone my relatives, friends asked what is this you are doing? Science? M.Sc? Research? There is no future in this. But in fact nobody worried about it. Nobody assured anybody of any future. You just did what you wanted because you assume something will come eventually. Nobody said, 'you be good engineer, you will get job there'.

But however I was part of the first IIT being created. I was there. Mr. S. Ghosh was the first Director. Many new institutions came-TIFR, Atomic Energy, lots of CSIR laboratories and so on. Fortunately I also at very young age became full professor and head of the department at IIT Kanpur. I was just 29 year old. I had wonderful positions in life where I could participate in the growth of India. The reason I am mentioning this is because these are the positive things in India- building of institutions, building of great laboratories. Although however I must say, When I came

These are the positive things in India- building of institutions, building of great laboratories.

back after my Ph.D. and post doctoral work in Berkeley to India to Indian Institute of Science, My God! I saw pathetic state of laboratories. The only instrument worth mentioning in my laboratory at Indian Institute of Science, chemistry department was a galvanometer. There was no spectrometer, at all. The old galvanometer, the lamp, you had to really make that null point. Very unbelievable. That is what I had to use to build instruments. And then I found an old X-ray diffract meter collecting dust. Nobody had used it for 10 years or something. Then I went for little camera, 4.5 cm camera. Nobody had ever seen it. None of you would have seen such a small camera. You put a little film and you can only do that research where you require one line in the X-ray pattern. That one line should solve the problem. So I had to think, what is that problem I should work on with just one line? And I could make major contribution to that field. Or whatever field. In fact I picked one problem: transformation of TIO-2 anatase to rutile form. It is very important technologically for transformation. Even today it is most cited paper of mine. In one line I could get how antase goes to rutile. Because rutile is technologically important.

So I still remember that. But then we graduated. I remember coming to IIT Kanpur. For the first time I saw good instruments in India. But of course every thing was central facility. This is very stupid thing we did in Kanpur, too much of centralization. Because research can not be done on centralized basis. Research is a personal thing. I can not do great research on public property. You have to have good laboratory of your own. You can not do otherwise. We did not know that. But it did not matter. IIT Kanpur was

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great place which gave us facilities. Slowly I got the feeling India is catching up.

I remember in 1973, the first National Committee for Science and Technology was formed in Indira Gandhi's time with C. Subramaniam as chairman. I was one of the members, very young at that time. I had a feeling that India is catching up. Every thing is happening, great.

Soon enough it was true around 80's just about 25 years ago that gap in terms of facilities, institutions in India and in advanced countries seems to be closing up. I really felt like that. The gap between us and elsewhere when I was a young student was very little. When I went from this country to United States in 1954, it was not too much. Within a few months we could pick up things. But the gap increased enormously in next few years. Our instrumentation became bad. Our facilities became bad. For me IIT Kanpur was the first time I found the gap closing in my own life. But as a country as a whole, I would say, by 80's, we had funded many institutions, things were happening. Those days objectives of our Council for Scientific Research institutions and like that were more like imports, self sufficiency, self reliance. Ideas were different. But many things were happening. Things were catching up. Even though, we started many universities. We were short of many facilities. I shall come back to that later.

Just about 25 years ago that gap in terms of facilities, institutions in India and in advanced countries seems to be closing up.

But what has happened suddenly? I shall not go to history because I can go on and on what had happened in last 30-40 years. Suddenly in the last 10 to 15 years there is major change in India. Particularly in last 10 years. The so called globalization, if we do not like, call it internationalization has had a very peculiar effect on India. First of all in the world it changed geo-

political scenario. There is no eastern block today. We can not go to Russia every time. The Russians themselves had miserable time. I had very dear friends in Russia. We closely associated in many ways. It is a sad thing the way that country got destroyed. They do not have much to offer in science any more. They are in very bad shape. There is no eastern block today. That is one thing. Today that is not our concern.

What happened was, that suddenly whatever we thought was very important in India was no longer important. At the same time in India, the competition and comparison became different. In fact what Indian technology has to do today or Indian research, development, engineering and other sectors have to do today is different. In fact one has to re-examine. In fact I have tell this to prime minister one of these days.

We have to reexamine why do we need CSIR? What is CSIR going to do now?

We have to reexamine why do we need CSIR? What is CSIR going to do now? No body has looked at that. In fact that is a very serious matter. What is that it can do today for the country in today's situation? So things have changed suddenly in last 5-10 years. Slowly it has changed in such a way that it is not encouraging for India. In the mean time, in last 15 years, I remember, when Mr. P.V. Narsimharao was the minister of education, we wrote the first national policy of education. So called policy, whatever. Many of us contributed. I think many of us in the audience must have been party to that. I did certainly lot for science part of it. I remember G.K. Menon was involved to some extent. We all wrote all kinds of things. That policy states that India will invest in education at least 6 percent of GDP. Of which reasonable

So in the last 20 years because of various forces the education scenario had bigger blow than any other time.

fraction will come to higher education. But Indian investment in education being still 3 percent gave very little for higher education. So in the last 20 years because of various forces the education scenario had bigger blow than any other time. Because the investment in higher education with that half percent, whatever you get for higher education, we could not cope with the competitive world that we are dealing with.

I am not talking about IITs. They could in principle compete but have failed to do so. I shall come to IITs later. Universities particularly have suffered immensely. The best of our universities are in bad shape. I go to my own alma mater in Banaras, there those buildings, Madan Mohan Malviya had built, are still used for chemistry and physics. No body can do research in those buildings. They are unfit for the scientific work. They are still the same buildings. In last 20 years suddenly this poor investment, you can see the effect, suppose the old world had continued without the globalization, may be some little thing people could have continued same way. But suddenly your frame of references and comparisons are different. Suddenly you are telling people you must do that kind of research and development which is comparable to best in United States and Japan when it comes to R & D. When it comes to basic research, thanks to IT, thanks to internet, and also thanks to ISI, not that ISI in Pakistan, but ISI in Philadelphia, which does all kinds of comparison of scientific performances, impacts and indexes and so on, every thing is global. Nothing is great. You

In Banaras, there those buildings, Madan Mohan Malviya had built, are still used for chemistry and physics. No body can do research in those buildings.

just press a button and you know all. Every thing is available to every one. No secrets possible today. No body can say I am doing great science. That is not possible. If you are doing great science you will know how much you are quoted? How much you are cited? So we can compare where India is in last few years?

If you are doing great science you will know how much you are quoted? How much you are cited?

I do not know about 20 years ago, I would say 15 years ago our universities could still make up, something, if given some more money, some more facilities, may be they could have come up. Today I do not know whether they ever be able to compete unless you make very massive investment not only in money but in other aspects of building a university. In fact, I can say now, I always said, that even 30 years ago that there is not a single education institution in India comparable to some of the best in the world including IIT. I can not say Oh! Our IIT is just like MIT; our university is like Harvard, Cambridge, whatever you want to compare with. I am not fabled by this foreign university. But we need some where any boy or any girl goes, can get best of the education, comparable to anywhere in the world. We do not have it today. We never had it before. It did not matte at one time so much as it matters today because this absence of a facility also encourages large amount of migration of young people. Some 3000 people going to Australia, meaningless, people going paying high fees to relatively second grade education else where. Whole bunch of things have happened because of that. Our university system has gone to terrible situation. At the same time with due respect to IT revolution and all that, we have accomplished in India, has given rise to tremendous imbalance in the way

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student take up science or engineering. I will come back to that a bit later to this aspect which affects our way of life or affects one's philosophy in life.

What IT has done? It has created unusual situation. Very young people getting very large salary. It has distorted all purpose of education in India. Lots of people rushing towards some engineering degree or MBA. Every college or every street in Bangalore gives an MBA degree associated with some bogus Australian university or British university. I do not even know their names.

Very young people getting very large salary. It has distorted all purpose of education in India.

Do you know last year we admitted four lakh students in the first year of engineering in India compared to 75 thousand in US? Of which same IT industry now says only about 25 percent are employable. Others are not very good. Unusual imbalances have been created in the present day globalization scenario. Lots of people go into colleges, very poor education. Lots of universities are there, not very high level. No competitive thing in a university. No one is comparable to best of the institutions. I just looked at our performance. Let me tell you what has happened in science. India in science till 10-12 years ago was reasonable. We were doing about 10 percent of world science research in terms of publications. I am just getting latest reports from United States National Academy of Science and many others. Our American Chemical society and British Royal Society of Chemistry have just put up very beautiful report on chemistry. Where each country stands? This is really something you have to see. Some one like me or Indirasan (Prof. P.V. Indiresan, IIT D) or Anandkrishnan (Prof. M. Anandkrishnan Chairman, board of Governors,

India doing about 10 percent of world science research in terms of publications.

IITD)can appreciate that. You know, I suffer when I see the reports. I feel like crying because of the numbers. These numbers I want you to know.

First of all India is now all of science put together about 2.5 percent of the world and not 10 percent. China has just gone to 10-15 percent. In two years there is jump. China was at 5-6 percent. It is extra ordinary jump. Do not worry about china. Let us not compare. Let us worry about our present state of affairs. We may say 2 percent or 2.5 percent of that, does not matter. We are great scientists doing high level of science. Well, let us look at the top one percent of publications. One of my very good friend, my colleague in Cambridge, Sir David King, he is science advisor to Tony Blair wrote very nice article in 'Nature' few months ago. There he compares top one percent publications of the world. There India is less than 0 .5 percent. So it is not that even if that 2.5 percent of the world science we do, out of that we have published great papers.

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Balram (Prof. P. Balram) was telling me. Balram does lots of this analysis. He spends enormous time analyzing each one index. He knows me, my work more than I know. He was telling me, if we take out forty scientists out of India, Indian science performance will become zero. I am not worried who those forty are? That is not important. Point is that it is very dangerous situation. This is what you have to realize. Do not make it laughable or easy proposition. "What is there? We will increase. We will make it 10 percent. What is there?" general talk like that and go away. Do not do that. It is very serious problem. Engineering looks

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much worse. Engineering research is much worse than science. In science chemistry is the

best and that is also not very good. Recently we had to generate new international journal. I hope you know that, all Asia put together we decided to create new chemistry journal. It was sponsored by German Chemical Society. I was requested from them, who will go from India? I did not want to go. A younger colleague went to discuss with them. There they wanted to give different credit rights to different Asian countries for their efforts in journal. They gave 25 percent to Japan, 25 percent to China, when it came to India, this group said, "India will get 12 percent credit rights in this journal". South Korea was at 12 percent. I called up those people. I felt very upset. Why India 12 percent and China 25 percent? They said,"Mr. Rao, you are very dear friend. You have published in all our journals. It is not based on that It is based on the amount of chemistry India does. Tell me the amount of the research in India in chemistry in last ten years; it can only get 12 percent. It is nothing to do with personal likes and dislikes." We accepted it. What do we do? There we are.

Engineering research is much worse than science.

"India will get 12 percent credit rights in this journal".

The amount of the research in India in chemistry in last ten years; it can only get 12 percent.

In fact US National Science Academy established a committee. They came out with a report both for physics and chemistry. These reports are on my table in Bangalore. They have plotted how India has done? How China has done. India's performance is at zero level in terms of publications. You can hardly distinguish it from zero. What they did is very interesting thing. This is what I wanted to share. They have analysed

number of submissions just number of submissions to all the leading journals and then number of papers accepted. I will give one example only. I do not want to give too many. In physics for example, America is a big block. America has always been leader in physics. But not any more. European Union, all Europe put together has slightly improved above America together. All Asia put together not as good as Europe, slightly lower but it will become higher very soon. Asia will be number one very soon. America will definitely go down further.

In that Asia, India is very small. It is mainly Japan, China, South Korea, Taiwan and Singapore. India is very low. For example India published 67 papers last year in the best journal of Physical Society of America. So small. Entire India. In my own field, I am on editorial board of that, this is very famous chemistry journal, Impact and Assessment, it is very difficult to publish in that, last year Chinese submitted 532 papers. Ninety percent got rejected and 10 percent got accepted. Indians submitted 130, ninety percent rejection, only 11 papers are there. Of which six are mine. No, no wrong clap, I am not talking about me. This is the situation in science.

For example India published 67 papers last year in the best journal of Physical Society of America. So small. Entire India.

In education, Sudeep (Shri Sudeep Banerjee, chancellor of NUEPA) is here, he can tell you, we struggled with the idea of foreign university. Of course many of my ideas did not find favour eventually with parliamentarians and politicians. With due respect to our foreign friends, who ever they are, education is not a commodity. It should not be sold for

Education is not a commodity. It should not be sold for price.

price. I hope it will not happen. The reason we are in that position is that we are so weak in university education. How come the same people are not going to china and opening campuses there. China is becoming very strong. I got a honorary professorship of the university in Changchun. I had gone there for a meeting. I shall give you one example, one university only. There is no time to discuss what the whole china has done. Go to physics department of that university, how many post graduates and Ph.D students are there? Six Hundred Seventy Five! , 675? Yes and 320 professors. Yes, of course, their way of counting professors is different. They include senior doctoral fellows and others. By our way of counting may be 250. There may be 250 faculty in one department and 600-700 research students. This is all over China. And to this extent, China will very soon have largest number of post graduates in science education. They are even offering post doctoral scholarships to Indians, to everybody. They want to increase number of post doctorates. They want 1000's of doctorates working in China. Three of my very best friends are having their second research laboratory in China. They train Chinese students and publish papers from that.

Let me take one subject in Nanoscience, China is number one in publications. Japan is at number two. America is number three. India is not to be mentioned . Taiwan is way ahead of India. Brazil is ahead of us. Brazil had produced last year 10,000 Ph.Ds in science. We produce about 4000 roughly. China produced 16,000, and America 23,000.

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Brazil is ahead of us. Brazil had produced last year 10,000 Ph.Ds in science. We produce about 4000 roughly. China produced 16,000, and America 23,000.

What do we do in this peculiar situation? We are in this terrible soil where we are sinking. What can an old man like me do? Though still young in spirit. I am subjected to tremendous agony because of that. This is my talk all about.

National Policy of education, I told you, said 6 percent of GDP for education. But still it is at 3 percent. Narsimhan Rao (Mr. Narsinhan Rao, Prime Minister) forgot that he wrote that report. He continued with 3 percent of GDP. He was terrible Prime Minister for science and atomic energy. Today I am going to be honest. I am going to say what I feel like. If people do not like it, does not matter.

Globalisation is another thing to me, which is more serious. The value system is higher than education or university. What I see in my native town in Bangalore. I was born there 73 years ago. That Bangalore is a city without a soul. It has destroyed the city. The same Narain Murthy (Infosys) gives lectures. Why he can not create a new university by donating few billion dollars, instead of criticizing higher education in India. We can have Indian private university investing few million dollars. No body has done that. They are only criticizing Bangalore for not having roads, that facility, this facility. So called IT and BPO has given very little for cultural value of our country or spiritual value of our country at least in Bangalore. Bangalore is a good example. It will happen to madras. Hyderabad is already catching up. No life. These young girls go at 8.o clock and come back at 5.o clock.

We can have Indian private university investing few million dollars.

In fact it is such a sad thing. As a joke I tell you, one of student did Ph.D. with me. He went for the post doctorate and came back. He said, "Sir, I am going to get married." After a year I asked him, "Did you get

married?" He replied, "No, I am still unmarried, I am unable to find a girl." It is symbolic of things. He said, "Any girl I want to marry goes to work in the night and comes back in the morning. I want to have a wife who is at home when I come back at least." I was only joking. Jokes apart. It is very sad. Seriously speaking, IT has given about half a million new middle class people. Bangalore is full of malls, shopping malls. We do not need Wal-Mart in India. Government wants FDI in retail sector. Why? The best way to buy vegetable is in that little shop in Yashwantpur where they sell on roadside.

This cultural change that has occurred in last five years in India is more frightening than what we have had depressing side of the university education. What will happen? Everybody wants money. Every parent wants visa, passport, when he finishes his bachelor degree or good IT sector and make money. Nobody talks something higher today in India. Nobody talks about education, poetry, and philosophy economics no matter what subject. Any creative Endeavour that young people should be excelling. No body tells a child do something you like. Do your best in that, shine in that. Everybody says, "No, no, do this, do that, make money." We have created a bunch of mindless youth in India. Very well dressed. In fact in your honor, I have put on jacket. Normally I do not put on such clothes. I do not put on tie normally. These young people are very well dressed. I always say, briefcase in hand, tie, and nothing in head.

This cultural change that has occurred in last five years in India is more frightening than what we have had depressing side of the university education.

Is this the India you want? I wrote a small article, Hindu published it, some time ago. I did not write for Hindu. I just wrote and sent it to few friends and to Sudeep Banerjee so that they can get in touch with prime

minister. I tell him all the time, you are talking about FDI, Sensex. Why do not you some time talk about future or vision for India? What type of India? India is going to be centre of knowledge world. Is this the India you want? IT professionals making money or you want something more.

No body talks about value system. This is more frightening to me. Because I always felt that in the world we valued those countries which contributed the cultural heritage of the world such as Roman civilization or Greek civilization. We do not remember for all the extra activities of the senators in Rome. But the civilizations it created the Egyptian civilization or Indian civilization. We do not talk of the people who made lots of money those days. We do not talk of the rich senators of the Rome. We talk of something else. Same thing in India, we do not talk about the rich Indians who existed, the kings, as much as we talk of Aryabhatta, great scriptures of India, great traditions of India. So, are we going to loose that part completely from India? Are we going to talk about all the new rich guys? The people who are going around destroying our value system, what little it may be in future? I think we should worry about that. This is also part of education. The education system seems to fail to have done that.

We do not talk of the people who made lots of money

Now what is it we can do? I think I should end to come to reality check. In the education sector whatever you do, I think it will take about 10 to 15 years before India comes out of this little minimum. Which ever profile or area you are, we are at global minimum. We are at very major global minimum right now in India. To come out of that, it is going to take lot of effort in education. I will come to what I will do in this area.

We are at very major global minimum right now in India.

I wrote a paper to prime minister. Some body got hold of that and published it in Indian Express and Times of India. I did not give it to them. Some how they got it. I did tell the prime minister, we made a presentation to him as well. How things are in terms of publications, research and so on. We did tell him in science how bad it has gone. It is not only in number of papers. The number of paper is one thing. We are only criticizing universities. That is very big mistake. They are bad. I feel bad. We all came from universities. They are the centers, fountain of young people's future.

What about our good institutions. I will make one comment on that. Performance of our good institutions is very bad including IITs. The best of IIT produces eighty hundred Ph.Ds with three to four hundred faculty. Two to three hundred papers for four hundred faculty. The best is IIT Kanpur with three hundred papers for three hundred faculty. One paper per faculty.

The best of IIT produces eighty hundred Ph.Ds with three to four hundred faculty. Two to three hundred papers for four hundred faculty.

Last year fifty PhDs were awarded, may be eighty Ph.D.s, does not matter if you do not like fifty make it hundred, still it is very - very small. Major issue is that two hundred faculty one hundred students, less than one student per faculty. We are funding two hundred crore per year on that institute. The best performing institute, Indian Institute of Science Bangalore is under forty. No, no, this year it is one hundred sixty with four hundred faculty. Not Much.

Oxford publishers average four papers per faculty. They published last year 500 research papers

I used to be the director of Indian Institute of Science many years ago. Indian Institute of Science published twelve hundred papers in good journals like ISI. When I left the

directorship, it has come down to seven hundred fifty now. It is coming down gradually for last several years. In fact Govedhan Mehta and Balram were telling me the same thing, number has come down, and quality is so - so. The reason is in Indian institute of Science there were old guys like me, I do not want to mention their names, standard you can be sure, like our Mudgal, Aditya Ram Sharma, does not matter who. In fact in what department, they would publish three papers every year. They all have retired or died, the younger generation is not doing that. Therefore, the issue is how to manage these young guys, they are not contributing those two-three papers. Why three papers I am mentioning? I am talking about good Institutions. I am no longer talking of universities being in bad shape. I was in a review committee of Oxford university last year. How is Oxford University doing in Science? I had wonderful experience working on that committee. It was very powerful committee; two other members were noble laureates with me.

You know Oxford publishers average four papers per faculty. In chemistry they are highest, seven per faculty, they are the biggest publisher in the chemistry in the world, they published last year 500 research papers from the chemistry department. Harvard I looked at where I worked, Purdue and Barbara where I am working now, Cambridge every where it works out to be three to four average paper per faculty.

So when I say that three, I am not saying that I want exactly three. One publishes zero, another publishers six, average works out to be two or three. If that is not there in good institution why they are getting high Budget? Why IIS should get Budget of 100 crore, IIT gets 120 crores. I do not want to say that the entire fault is with Universities system, no, our great institutions are also doing so-so. IITs are only doing well in undergraduate

teaching. That is all. I will not consider them top Institution in science and research except a few individuals. Individuals are there in the Universities also. Avoid individuals, we are talking of intuitions. They are not top world class any more as they were. When we were young faculty members of such IITs, we thought we were as good as in the world. In fact competition was there, people had spirit. Some thing was slightly different. Some thing has gone out of our system.

O.K. Now coming back to what can be done? I will take very little time. In science there are many things, we have to do massive funding but money is not enough. There are no people. For any top positions in India there is no candidate. We were looking for Directors for some institutions. There are no people. Not enough. So we have to create them. So far, next few years, we are going to have tough time in India, the biggest crunch in India. If you ask me, next fifteen years, I do not know whether I shall be alive. I am not sure. Doubtful, that is when, may be some of things which we are doing, may see the results. In fifteen years, I may not be there to see if such a thing is happening. We are creating new science institutes. New institutes are not enough. We have to improve the universities we are doing something, I hope in next plan universities have to change completely. How to do that? In fact when Mr. Sciendia become education Minister, he met me, I don not know why he asked me, I told him, we may do one, two or three things. Do not do everything in the universities, every thing in education. Do two, three things

We have to do massive funding. For any top positions in India there is no candidate. Do two or three things which will bring major change in India.

which will make major change in India. What are those three things? I wrote a one page note since he had asked me. Later he said, “Prof. Rao you are asking for something very difficulty, I do not think we can do it”. I said, “then do not do, easy things you and I and every fool will do”. What are those three things, I would do for universities? Completely restructuring universities system, unfortunately everybody is restructuring. What I mean is as following: you cannot have universities having 4 lakh students 5 lakhs students, these things are borrowed from old British systems. I have been professor in both Oxford and Cambridge. There college system means something else. The Cambridge/Oxford college system is not what we are in Calcutta or in Bangalore, 100 college affiliating. That is not the way. We have to do something that is restructuring. UGC and government have to do to save Universities. So university become centre of learning, post graduate education and the examining bodies. You cannot go on giving degrees – BA/B.Sc. for one lakh students. Immediately it can be changed. There are ways of doing that. Today I am not going to talk how it is to be done.

Three things to be done:
Completely restructuring university system.
Every university must have some research support.
Do something about teacher recruitment.

Well, every university must have some research support. There is no research budget in the universities. Even IITS doesn’t have. They get money from outside.

Lastly do something about teacher recruitment. Teacher recruitment is completely based on parochial, nepotism, and corruption is very high. Recruitment is so faulty. It is all based on communal basis, various basis. Karnataka is full of that I remember I used to be chairman, selecting vice-chancellor for Andhra Pradesh for a while. The Chief Minister used to tell

me in telgu or whatever language – this is for kamma, this is for Naidu, this is for Reddy. Even before the meeting we were told how these are to be appointed. I don not mind, nothing against that. We got good Kamma for one university and good Reddy for another university. There was no problem. Suppose you do this, I do not want to say Reddy, take 'Singh' some other name. I went to BHU once, I went to a department myself and Rajaramanan I never forget that visit. I was on one committee, I asked this man, he said sir, I am singh, head of the department, this is KP Singh, this is LP Singh, that is BP singh. Everybody was singh. As if it is singh department.

Jokes apart, forget about singh department or Reddy Department. I just took an example I do not mean literally what I said.

We cannot have this in universities. This is what universities are having. All universities at least in Karnataka it is like that. It must be worse elsewhere.

I wrote a not some time ago. They should form a high power committee with a one month time only to write what are those three things that we should do in next two years. It should not be another Kothari report. Another report with big bunch. No such report should be again written in India, it is all known. Three things should be done, and it should be done in next five year plan. We are sitting on the verge of Eleventh Five Year Plan. It should be written by any three people. I do not want to be there this is the time probably looking at all higher education together. It is one thing Government should think Medical education has nothing to do with Science education. Science education has nothing to do with engineering education. How can you have AICTE doing its own way? There is another body

NAAC. All have failed I do not want credit any body with great things. They give ABCDE, each one gets something in that letter.

It has nothing to do with real quality. In India I want to look at the product and not that ABCDE.

In India I want to look at the product and not that ranking of ABCDE.

I think you should have Higher Education Commission in India. Looking at all of the education. It has nothing to do with universities alone, what about Medical education. They are the worst. Out of 250 Medical institutions only ten of them do so called research. There is no research in Medical institutions in India. How can you have no research in medical science in India.

There is no research in Medical institutions in India.

India is a country full of diseases. India has special diseases, incurable diseases. India has largest number of least wanted diseases. We have to do something about it. This is all I want to say about education.

Well GDP, we can work on this now. We should not decide like Knowledge Commission. They said something. I do not read that because nobody sent me a copy either. It said start hundred universities. It is not the way to do that. I do not know how they fixed it. They are all arbitrary numbers to me.

Let us say if we can make existing 20 universities world class universities. Suppose you decide twenty. Do whatever is required to do that. You work that backwards. May be you require six percent GDP, of which 2-3 percent they go to higher education. Two percent, I think, we should do that in the next five year plan. I do not know what next plan plans to do.

Lastly I told you about the tremondous salary my students get. A Rotton Ph.D. from my lab not a very good one, he starts with minimum of 60,000/- in Bangalore. You do not have to go to America. There is a young girl, who did her Ph. D. with me some years ago. She gets 22 lakh in Bangalore. Right in Bangalore. You do not have to go anywhere. You have to do something about the emoluments of scientists, engineers, and technical people. The reason is that 85 percent of education and science is in public sector under government. It is not like only 30-40 percent in government and 60-70 percent in private.

You have to do something about the emoluments of scientists, engineers, and technical people.

Public sector dominates education still; we have to do something about it. How we are going to improve salaries I have no idea. There are ways of doing it India. What Pakistan did is very interesting. This fellow, Attaur Rehman, whom I know very well; old Cambridge, student, he is now adviser in Higher Education and Science to minister under Musharraf (General Pervez Musharraf). He did very simple thing. He tripled the salaries of all teachers and scientists. A professor like me there will be getting Indian equivalent about 1.8 lakh per months. It is unbelievable change they have brought. Unfortunately all of them are not very good scientists.

Attaur Rehman, Higher Education and Science adviser to minister under Musharraf tripled the salaries of all teachers and scientists in Pakistan.

Here, however good you are. I always crack a joke. Suppose you end up with five Nobel prize and you are professor with IIT, MHRD or anywhere, Sudeep Banerjee! I know there is no way you can give me more than the salary of a secretary. What is the Secretary Salary? Rs.30,000/-. It

'Look how we avoid corruption and promote good performance'. There is a linear combination, wave function.

is so small I forget it. You cannot be globalised in economy and localised in salary. Global objectives require global outlook in everything. You have to compete reasonably. I was looking at Singapore's experiment. This was done ten years ago. Singapore had same problem. Suddenly they started seeing corruption in Government. In Singapore, if you are corrupt they cut off your head. If you write wrong they cut off your hand. Singapore is very regimented society. I shall never live there. My relatives live there. I pity them. How do they live in that place? Lots of Indians are going there. Do not forget Indians love regimentation. There they formed a commission. This minister who formed the commission was telling me, 'Look how we avoid corruption and promote good performance'. There is a linear combination, wave function. That is what I was doing in quantum mechanics all the time. He took the wave function of coefficient of private sector salary, a coefficient of banking and a coefficient of government/public sector salary. What should be the salary of a scientist or an engineer? Which is somewhat reasonable? This cannot be equal to private sector or banking salary, of course not, much lower. So they worked out a reasonable thing. Today, for example Mahender, who is my Ph.D. student, is getting 30,000 dollars (Singapur dollar) per year. That is the kind of thing they have come up with. I do not think we shall ever be able to give 30,000/- to a lecturer in India. But give something reasonable that is to be worked out. It is not a trivial thing. But unfortunately they have formed one pay commission. I have been telling Prime Minister and of course Mr. Chidambaram, our finance minister. He is very negative about things. He does not listen. He says, "No-no. Prof Rao, our judges also want higher salary, army wants salary, everybody wants special salary". I said, "look this is not the way to look at

it". When I come to you with a problem do not give me three other problems. I used to tell a joke to my very dear friend Satish Dhawan. I used to tell him never to be like that. He had a tendency to do like that. The joke is like this. You ask for a pin - Director of the Institute or Vice Chancellor asks, "I want a pin". I think, "it is very good idea. I should think about this, Let me see the steel position of India, and let's work backwards". Chidambaram has a tendency to do that. If you want a salary he would say, "No-no, let me see all the poor men in India and all the rich. We have to find a way". Very difficult situation. Even judges, I do not know about other sectors, you may be able to find people. But a good engineer would not be available. He would work as roadside contractor rather than to become IIT professor. Roadside contractor gets more than IIT. What IIT's are you talking about?

But a good engineer would not be available. He would work as roadside contractor rather than to become IIT professor.

Similarly I keep telling the Prime Minister. He says, "Prof. Rao why do you tell me? Tell this to pay commission". He tells me to tell to pay commission. He should be telling, right? It is not a criticism. Somebody has to take a personal interest in it. For those who do not know, I am having meeting with pay commission on 9th. I am going to argue anyway. I do not know whether I shall be successful. That is not the point. The point really is nobody is concerned. See I am going to end my lecture there.

Three major issues are: Sad state of Education system, total value system, lack of finances, lack of infrastructure.

I am talking about three major issues – The sad state of our education system, not just because of money but total value system, lack of finances, lack of infrastructure. The

pathetic state, we are at potentially at bare minimum. We have to get out of that. Sad state of science, again at the minimum, very poor performance, very poor publications. Highly unresponsive bureaucracy, highly unresponsive government. All governments are unresponsive. But this one, when it comes to salary and benefits, nobody responds.

Value system in society, nobody responds. Nobody worries. So, if you have indifferent society and slightly indifferent government, issues like science and education becomes the casualty. If that happens, my own reading is, India will be facing a very severe problem in about five years. I shall be alive. Five years, I hope, I do not know how we will come out of that. All this knowledge society and IT revolution all that will become secondary. Or say nobody around. No engineer will be around, people roaming in Australia, everywhere except in India. Please think about it.

Thank you.

PRESIDENTIAL ADDRESS

Shri Sudeep Banerjee

It is not going to be any presidential address. We are grateful to Prof. Rao for giving such a passionate speech in the new university that we are trying to build in NUEPA

One of the ideas we started on is this that everyone who is involved with Education on some level to come and speak to us on this. And we are happy that this lecture series has got started with Prof. Rao's address this morning.

It has been my considerable privilege to have known and been mentored by Prof. Rao for almost fifteen years. The day I came back to the MHRD ministry, first as addl. Secretary and later as Secretary immediately he adopted me and reclaimed. And that I have been able to do full justice to this relationship or have been able to come up to his expectations. Many ideas we have worked together on. I have seen Prof. Rao in several forums, committees, cabinet committees and things like this. Of course without divulging many details I must say that he has not minced words. He could have been more diplomatic today. But in those meetings also I have not seen him less than forthright and more frank than this. We are all living through extraordinarily difficult times. Prof. Rao's speech was only highlighting that with several of you here very distinguished academics. We have worked on several other situations and you have also seen the considerable difficulty that we face in persuading people to see what can be clearly seen in black and white because they

We are all living through extraordinarily difficult times. Prof. Rao's speech was only highlighting that with several of you here very distinguished academics.

refuse to see. We meet more people like Prof. Rao to speak out because education like so many other sectors of our national endeavor are increasingly falling prey to those people quantificating laid down policies who understand least about those things.

Education is one sector I often said is where anyone who has made or earned money in whatever walk of life, he must have made or sold shoes or soaps, he can come and quantification. Unfortunately within the governance structure there are people who are giving them more importance than the voices of sanity like Prof. Ro and several others who are speaking out. In NUEPAwe are trying to provide forum to all and this is not the solitary intervention we have done. There are several other things. We want NUEPA to emerge as clearing house of ideas where all these things can reclaim for educationists all over the country and their legitimate role in laying down the policy on Education. To see to this, that we are able to respond to these challenges, Prof. Rao is not one person whom we want.

There are several other things. We want NUEPA to emerge as clearing house of ideas where all these things can reclaim for educationists all over the country and their legitimate role in laying down the policy on Education.

Prof. Ved Prakash, my friend talked about his individual contribution in the field of Science. They are of course great but he is the greatest institution builder that we have today. Even in the last couple of years the initiatives we have taken under his leadership, under his guidance, I think are quite phenomenal. I cannot think of anyone after Tagore, Madan Mohan Malviya and people like that in modern India who has thought through institutions and has tried to impress like Rao.

Several things we have initiated and are in the process of initiation, and several other things which were thwarted, if we are able to implement them, I have no doubt that in the decades to come we will be equally proud of them as we were in the past. We are legitimately proud of those institutions which were set up as part of our freedom struggle. As I often say that British did not set up any major institution after Lord Curzon in India. It is only national struggle which gave rise to good great institutions whether it is BHU, AMU, Jadavpur, Shantiniketan or any other institution set up in princely India. British after the turn of the century did not encourage University Education in India. So it is the same thing in free India. In free India Of course in fifties and sixties we did reasonably well. We did remarkably well in setting up and imagining several institutions. But after that Eighties and Nineties particularly is a peculiar decade and I hope that is over when we faced with a collapse of national imagination or our attention was caught some where else. We have not really imagined anything great or anything new.

We faced with a collapse of national imagination or our attention was caught some where else. We have not really imagined anything great or anything new.

We do hope that there are many people who are equally concerned and will gather courage to speak up by the forum we have provided. Who will be able to influence policy. Policy making is extremely complicated and it is becoming even more difficult where newspaper talk of new value system as Prof. Rao said they will tell us what Narain Murthy thinks of Education or what Hindustan lever person thinks of education. But they will not report on what IIT director or what our scientists are speaking about education. It is peculiar, we are living in extra ordinary times, therefore we all must get together and create as many forums like this where we are able

to debate and we do hope there are. We are encouraged by the participation of people from other institutions here. We do hope that they will also be encouraged to start this process of introspection. This process will bring to gather people who are concerned with the future of India.

Indeed I am grateful to Prof. Rao for agreeing to give this very passionate speech and we do hope with this beginning we will be able to fulfill our modest role in this.

I am grateful to Prof. Rao for agreeing to give this very passionate speech.

Thank you, very much.