Twenty Fourth Convocation held on December 18, 1990

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Mr. Chancellor, Vice-Chancellor, Members of the University Bodies, Distinguished Invitees, Graduates of the Year, Other Students of the University, ladies and Gentlemen :

I have heard a great deal about the culture, heritage and tradition of this region. This is one of the most beautiful regions of our country. The near rural setting of this university is congenial for academic activity and one can derive lot of inspiration through communion with Nature. In Tagore's words.

"If a man lives alone on the bank of a river or in free surroundings, he develops a free vision. There is unprecedented peace and beauty in nature".

I feel greatly honoured to be asked to deliver the convocation address this year. I seek your forgiveness for not presenting you a printed convocation address.

This university and its authorities deserve our praise and admiration that they generally invite teachers and scholars to address the convocation. This tradition of honouring teachers and scholars should spread to other institutions in the country too because Plato has said **"What is honoured in a country will be cultivated there"**.

Teachers and their Role

I have been a teacher for nearly four decades. Teaching has a fascination and charm of its own. To me no other profession appears as satisfying as teaching. It is a great pleasure to deal with a new batch of talented students every year. I have been active in research while I was a teacher and I disagree with those researchers who consider teaching

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to be a bugbear of academic life. In my quest for teaching of solid state physics in a more logical way, many new ideas came to me. To me teaching and research are two sides of the same coin. Rabindranath Tagore said, **"A teacher can never truly teach unless he is still learning himself; a lamp can never light another unless it continues to burn its own flame"**.

Teaching can be a creative activity and introducing a new course can give immense satisfaction. We teachers have to seek methods of instruction which emphasize logical thinking and problem solving. Often in our curriculum we try to push in everything and in the end we mess up the whole teaching process. I would like to tell you this better through an animal story which some of you might have already heard. Some animals like a rabbit, bird, fish, squirrel and duck collected together and decided to start a school. They met to decide on the curriculum. The rabbit insisted that running had to be in the curriculum, the squirrel insisted perpendicular tree climbing be in the curriculum and so on. As always happens in such committee decisions, they put everything in and then made the glorious mistake that all animals take all the courses. The rabbit was magnificent in running but they insisted that the rabbit learn to fly. They put him on the branch of a tree and asked him to fly. The poor rabbit jumped off, broke a leg and fractured his skull. Similar fate met other members of the animal school and all of them were decapacitated in one way or the other after attending the school with such a curriculum. There is a message for us here.

Teachers should have an infatuation for their work and possess a robust optimism. Teachers have to inspire students, guide them, advise and help them, encourage and sustain them. We have to believe in students, praise them when they perform well, and criticize and correct them when they go wrong. It is no exaggeration to say that the destiny of the nation is being made in classroom. We have to prepare these young men and women for future and influence them in the most formative stage of their life. We teachers must take trouble to located

ability wherever it is found. Objective appraisal is certainly not our national trait. Many times the light of reason and rationality is coloured by caste, creed, region and kinship.

I would also like to point out here that a significant barrier to our progress is the set of structures of academic departments we have erected. The current system seeks to fill all the square holes with square pegs. In what department would one put Darwin: genetics, geology, taxonomy or ecology?. Darwin considered himself a geologist but the world remembers largely his biology. Should Geothe be in the literature, biology, physics or philosophy department? He actually was most proud of his work on optics. The current rigid departmental structure is confining to the truly creative person and discourages the vitally important cross-fertilization of models, data, techniques and concepts between disciplines. The path of creativity is strewn with bones of those consumed by the vultures of rigid procedures, mediocrity and accountability.

We teachers have to encourage young people. Teacher bridges the gap between two generations and establishes communication with young. Lord Rutherford was not only a great scientist but also a great teacher. That is why so many outstanding physicists were trained in his laboratory in Cambridge in twenties. Rutherford's attitude to young students in clear from the following quotation taken from Kapitza's recollection of Lord Rutherford.

"Once Rutherford called me into his study and I found him reading a letter. It appeared that the letter was from some Ukrainian schoolboys. They had written to say that they had organized a physics club and were proposing to continue Rutherford's fundamental work on the study of nucleus of atom and ask him to be an honorary member and to send them reprints of his scientific work. He sent the boys a reply, thanking them for the honour of being elected a member of the club and promising to send them reprints."

Again the concern of Rutherford for this students is clear form another quote from the same source,

"The last time I saw Rutherford was in the autumn of 1934, when I went as usual to Soviet Union to see my mother and friends and unexpectedly was deprived of the possibility of returning to Cambridge. I did not hear his voice again, nor hear him laugh. For the next three years I had no laboratory to work in and was unable to continue my scientific work and the only scientist with whom I freely corresponded was Rutherford. At least once every two months he wrote me long letters which I greatly valued. In these letters he gave me good advice and invariably cheered me up in my difficult position. He understood that the important thing for me was to start my scientific work. It is due to him that I was able to obtain the scientific installation and apparatus of the Mond Laboratory and in three years time I was able to renew my work in the domain of low temperature physics."

University teachers should also interact with outside institutions. It is desirable that we make use of a variety of schemes for visiting appointments instituted by CHIR, UGC, Indian National Science Academy for visits of university teachers for short duration to national laboratories and other institutions of higher learning. This kind of interaction would lead to collaborative research and would enable the university teachers to make use of sophisticated and costly facilities which are available in these institutions. We have to learn to help each other and learn to work in a more cooperative manner. As individuals we are all very good, but when it comes to building up groups we generally fail. More often we ourselves prove great hindrance to the growth of our colleague, co-worker or sometimes even a student !.

Universities represent the apex of pyramid of learning, of which schools and colleges are the base. Universities, therefore, have to set the standards and tone of education. In India often universities feel hampered by dealing with the problems of large enrolments, large number of affiliated colleges and associated problems of management

and conduct of examinations. Over the years, the financial support for universities has been woefully inadequate and is shrinking further. The conduct of high quality research in universities is suffering because of lack of support. University research is cost-effective and we in India have not taken advantage of it. All this will affect the quality of manpower coming out of our universities which the various developmental programmes will need in future.

Illiteracy

Today many grave problems are plaguing the nation population, illiteracy, health, food, communication, communal strife, terrorism, rising prices and falling trade and investment. We have enormous human resource in this country which can be used as a real resource if we can improve the value of this. We can make our population a productive resource if we impart it education and practical skills. In a society illiterates are suppressed and exploited. Disease and poverty are widespread in such sections of society. We in universities and colleges have a responsibility to share our knowledge and education with those in need of literacy. A Chinese proverb said, " If you plan for one year, plant rice, if you plan for ten years, plant trees, but if you plan for 100 years, educate the people". Therefore if we wish to plan for the progress of the country; all of us should participate in our own ways in the adult education and literacy programmes.

Environmental problems

Environmental problems present the most important dilemma of our times, i.e., how to reconcile the urge for growth and development with the need to preserve and improve the environment and enhance the quality of human living.

Problems of environment are due to need of the poor, the greed of the rich and improper use of technology. Our planet is beginning to look small and vulnerable in the face of growing numbers and our

tendency to use natural resources in an utterly profligate manner. Through a series of technological innovations that include farming, sanitation and the control of many epidemic diseases, we have found ways to reduce the rate at which we die, creating a population explosion. We live on finite land. India has nearly 15% of the World population on 2.4% of World's area. We are already seeing the effect of consuming non renewable fossil fuels and other mineral resources. Our growth is destroying our vital resources like deep fertile agricultural land, ground water, forests and many species who share earth with us.

Our environment and ecosystem regulate our climate, the make-up of the atmosphere, maintenance of the soils, control of crop pests, viruses and pollination of many crops. With our development we have to take care that we do not destroy the very system which sustains us. The level of carbon dioxide and methane in our atmosphere is rising. These gases trap heat near earth's surface and these lead to global warming about which you might be reading in your newspapers. The major reasons for gradual increase of carbon dioxide in the atmosphere are burning of fossil fuels and destruction of our forests. The prospects of such continued increase of green house gases like carbon dioxide and methane are real, and consequences frightening. Computer calculations based on models have shown that many parts of the world would turn semidesert, forests would decline and the wild life would migrate or perish. As ocean water gets warm and expands, and the ice on Greenland and Antarctica melts, the sea level would rise and low lying areas around sea coasts would get submerged. These predictions leading to catastrophic results are based on approximate models which with our fuller understanding of the process and phenomena may turn out to be untrue, but we cannot afford the luxury of sitting back and waiting for full understanding of the global warming. The longer we wait to attack this problem the less able we would be to combat it. Since carbon dioxide emissions are directly related to the consumption of fossil fuels - the world's's chief energy source - the root of global warming is human activity including economic growth and pursuit of

leisure.

Environmental problems are global. All of us should be aware of the problem. If we do not protect our environment today, it may be too late for us to do anything later. Even inspite of number of meetings, developed nations, specially U.S.A and U.S.S.R are not ready to accept restrictions on emission of greenhouse gases. Industrialized nations should agree to reduce emission of carbondioxide so as to leave room for industrialization of developing countries.

Information Age

In a world of rapidly changing technologies, perhaps the most rapidly changing technology is information technology, the technology which handles information. This technology is not new. The communication of information has been there throughout the history of man. However, in last few decades, rapid developments in microelectronics, computers and communications have converged to make information far more readily stored, processed and distributed. The rate of development of these technologies is really amazing. World is now entering an "information age". Given the right information at the right time will enable us to take better decisions. Modern technology can now make information available almost immediately. In India we are still lagging behind as far as these developments are concerned, but we cannot afford to do it for long.

We use information for almost every activity like solving problems and making decisions for planning and managing. Information is of key importance to an industrial society. Unlike other resources, it is unlimited. It can be transmitted at great speed and over vast distances. If acquired at the right time and carefully selected to meet the individual needs, there is no limit to its value. The expansion in information technology is characterized by sustained growth in telecommunication network capacity and the computing power per unit cost.

Many of the trends that have revolutionized computing in 1980's can be attributed to innovation at hardware component level. We are clearly working our 5 million transistors on a chip of the size of finger nail. Such high level integration on a chip has opened doors to massive mainframe computers and powerful personal computers. More and more information today is being processed electronically and this will have implication on the working of offices, our schools and business circles. Today we are used to having a piece of paper on a book and scan it from top to bottom. In USA and other developed countries people are getting used to looking information on a computer screen as we do look at information on a piece of paper. Sales and marketing type documents contain 3-D image of a product and whole new application avenues open up. One can now have integration of voice, data and image, and in countries like US and Japan any combination of these services would soon become as common as telephone service is today.

The growing demand for knowledge, news and entertainment from the expanding world population combined with scientific and technological advances, instant worldwide communication and access to vast data bases of computerized information are fuelling an information explosion. All the information in all the libraries of the world could now be at your services instantaneously. We can not for long remain silent spectators to this dramatic development.

Never be Afraid to Risk Failure

After telling you what is in store for us as a gift of science and technology, I would like to say a few words of advice to students.

I would advise young students to remain willing to take informed risks. You can never achieve success in life if you are not ready to risk failures. If you are excessively cautious to avoid all risks, I would say you are mediocre and would never be able to achieve anything worthwhile. The more difficult the task you undertake, the higher would be the risk of failure. When one is doing a new experiment one can

never predict for certain what the outcome would be. In difficult and new programmes the initial progress is slow and we should not loose heart quickly if one is taking time to achieve the goals. Normally we tend to keep our goals low because of the fear of the failure. Here I am reminded of Thomas Alva Edison, who after 10,000 unsuccessful experiments with a storage battery said **"I have not failed. I have just found 10,000 ways that won't work"**. In our struggle in every day life we face hardships, we find hurdles in our way, we should never give up our efforts to move forward along whatever path that becomes available to us. We may need new ideas, we may need to explore new avenues with fresh challenges, we would need courage but we should go on pushing forward. We have to pay the price of success through continued and sustained efforts in the face of risk of failure. John Givvson who was primarily responsible for developing heart-lung machine started his work with an idea in 1929 and persisted for 24 years until the first successful clinical operation in 1953.

To succeed you have to be curious, courageous and willing to explore the unknown with its hazards and uncertainties. Self-confidence with persistence in continuing work despite intense criticism, obstacles and failures would be needed. The top traits which one needs for excelling in any sphere are enthusiasm, persistence, discrimination, hard work, faith in oneself and a sense of national pride. You should say, you are an Indian and you would do it better than anyone else.

Look at the life of Galileo. He was 70 years of age, going blind, convicted by the inquisition and sentenced to house arrest for the remainder of his life, he continued to investigate and write for over 5 years.

Some More Advice

I would like to draw the attention of students to what Buddha said,
Believe nothing
merely because you have been told it

or because it is traditional
or because you yourselves have imagined it.
Do not believe what your teacher tells you,
merely out of respect for the teacher
But whatever after due examination and analysis
you find to be conducive to the good, the benefit
the welfare of all beings,
that doctrine believe and cling to,
and take it as your guide"

This is a fine and nearly complete description of the scientific attitude as we know it today.

Be critical in your approach to what you read and learn. One could say that there were truly eight great men of science, all others chiselled away on the ideas of the eight great leaders. These eight great prophets of science are; Pythagorus, Aristotle, Ptolemy, Copernicus, Galileo, Kepler, Newton and Einstein. Copernicus proved that Ptolemy was wrong. Kepler proved that Copernicus was wrong. Galileo proved that Aristotle was wrong and Einstein proved that Newton was wrong.

Whatever profession you adopt, you must have a dream worth working for. I would also encourage you dream and to have high aspirations. The greatest thing in life is not the achievement but the desire to achieve - it is the striving that is worthwhile. Don't be afraid of doing what you consider right and just. Emerson said "Do the thing you fear the most and it will be the death of fear itself".

I would also advise you to cherish certain ideals and values like honesty, truth, integrity, discipline, courage, humility and humanism. In sticking upto those values would be severe trials and frustrations but they ought to be faced. Life without an ideal or values is a ship without a rudder drifting aimlessly in the mid sea. Great men are those who in the face of privation, gloom and ridicule keep alive a core of values.

Dear students who are graduating and getting degrees today, let us hope that wherever you go, through your actions you would add to the lustre of your Alma Mater. Bend all your energies to the attainment of proficiency in your calling, work as closely as possible at the boundary of your abilities. Do this, because this is the only way how you can move these boundaries forward. If you remain idle and wasteful of your time, you can not succeed however intelligent you may be. Therefore, resolve and resolve firmly that you would not waste a moment of the precious time which is before you. I offer you my sincere congratulations and wish you all success. Few things are impossible to skill and diligence.

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