SPEECH OF SHRI RANDEEP SINGH SURJEWALA, MINISTER FOR SCIENCE & TECHNOLOGY, GOVERNMENT OF HARYANA ON LAUNCHING OF DOCTORAL DEGREE PROGRAM AT DEEN BANDHU CHHOTU RAM UNIVERSITY OF SCIENCE & TECHNOLOGY, MURTHAL ON 24TH FEBRUARY, 2010.

It is, indeed, a rare honor to be here today at the launching of Research Degree Program, leading to the Degree of Doctorate of Philosophy at Deen Bandhu Chhotu Ram University of Science & Technology, Murthal. On behalf of Government of Haryana, I applaud this endeavor of University, especially its Vice-Chancellor, Dr. Chahal and Faculty, for initiating valuable new research programs in emerging areas of higher education with focus on all new frontiers of Science, Engineering, Technology, Architecture and Management Studies under various teaching departments of the University for the first time in Session 2009-2010.

Necessity of harnessing new frontiers of Science & Technology for the 'Emerging India' as also 'transforming unfathomably large potential of rural India' can not but be emphasized. As early as 1935, **'BAPU'** i.e. Mahatma Gandhi called for a movement i.e. 'Science for People' in All India Village Industries Association. India's first Prime Minister, Pt. Jawahar Lal Nehru, the great Nation Builder, conceived independent India as a scientifically mature and technologically advanced country. Major thrust on education in Science has reached new heights in recent years with greater funding by Central and State governments. Consequently, number of students attaining Science education at Graduate, Post-Graduate and even at Doctoral levels has reached at an all-time high. **INSPIRE** (INNOVATION IN SCIENCE PURSUIT FOR INSPIRED RESEARCH) program offers Science as a career option by providing necessary opportunities to youths with aptitude of Science and desire to innovate. Science & Technology infrastructure has grown from Rs.10 million at the time of India's Independence in 1947 to Rs.30 billion now. I also understand that India has the third largest scientific manpower in the world with 162 universities awarding 4,000 Doctorates and 35,000 Post-Graduate degrees.

It is true that commendable work done by our Scientists and Technologists have resulted in changing the 'PAST' of the country to a new 'PRESENT'. May I briefly enumerate:-

(i) **'Food Sufficiency'** in India was the result of the first Green Revolution undertaken by our agricultural scientists.

(ii) India witnessed a new revolution in **'Dairying and Animal Husbandry'** with introduction of new cattle breeds, increase in milk yield and improvement in cattle health and feed. All this happened on account of hard work of scientists across agricultural universities, National Dairy Research Institutes and National Animal Germplasm Institutes.

(iii) In **'Bio-technology'**, our scientists have implemented 'Gene based tools' to study animal and plant diversity. Genetic energy, stem cell research, development of vaccines, cattle herd improvement through embryo transfer technology, in vitro propagation of disease resistant plant varieties for obtaining higher yields are some of the new technologies used and are being perfected.

(iv) Our Software engineers are among the most sought after at the National and International level. Application of Electronics and Information Technology in areas as diverse as agriculture, weather forecasting and service sectors has been receiving particular attention from the government.

(v) Indian Space Scientists of **'ISRO'** have attained perfection in designing need based satellite and placing them in the correct orbit. **'INSAT'** series of satellite launched earlier are performing well, providing vital service in the areas of tele-communication, television, meteorology, disaster warning and distress detection. Our scientists have placed India in the field of 'Missile Launch Technology' as among the top five nations of the world. Recent unmanned mission to the moon and finding traces of water on the moon has again established our scientific credentials.

(vi) In **'Nuclear Technology'**, India has successfully run its heavy water reactors based on indigenous technique despite sanctions and boy-cotts. Pursuant to the exceptional waiver by International Atomic Energy Agency **(IAEA)** and its subsequent ratification by U.S. and other developed nations has opened gates for nuclear technology to be harvested for meeting our energy needs.

Growth of science has to be not only at quantitative level but also at qualitative level. On this solemn occasion, I want to raise some fundamental questions with the scientific community present here. These are:-

(a) Despite being the third largest scientific manpower of the world, why has India not contributed effectively and commensurately towards new developments or innovation in science compared to countries like U.S.A., U.K., Germany, France and Japan? Why do these countries provide us a large amount of technology that is used in our everyday life? Are we proceeding towards producing 'Technical Labour', rather than 'Ignited Scientific Minds'?

(b) Why are University – Industries driven research projects and innovations at an all time low in India vis-à-vis western countries? What is the reason for a nearly insignificant number of patents being registered in India based on University research projects? Why have Universities-Government not targeted 'Strategic Area Research' as a priority research program for government and governmental institutions? What is the reason for non-sharing of information regarding ongoing research projects across institutions and Universities in order to avoid duplication and wastage of time on replication of similar processes, rather than gaining from each other's experience and building on the same?

(c) Why is original side research in Universities and related institutions not guided towards 'Core Areas' like bio-technology, genetic engineering, capturing non-conventional energy resources, bio-fuels, multiplying productivity levels for agriculture, conversion of waste into useful energy resources, nano-technology and nano-engineering etc.?

Are doctoral programs becoming more like Post-Graduate degrees rather than tools of recognizing and honoring original thought and research?

These are some of the questions that scientific community present here today including the researchers need to ponder over for the new generation of Indians in the 21st Century.

I appeal to our scientists and technologists as also to academicians and researchers that front line science and technology has the potentials of ushering in a new era of prosperity – economic as also social and most importantly equitably humanitarian. Potentially life-altering technology lies around the corner. Can we sample them? Can we reach it? Can we empower the entire humanity with our intellect, our research and our effort? May I take this opportunity to mention some of these potential technologies. These are:-

(i) **BIO-ENGINEERING –** A merger of engineering and biology can generate new technology that will impact the economy through generation of better medicines, agriculture and materials. Both the production of materials and foods can be increased manifolds by biologically based processes.

(ii) **ENERGY SECURITY –** To secure our energy future should be treated as our biggest challenge. Radical solutions need to be found. Nature has already made efficient photo synthesis molecular nano-machines in thermophillic photosynthetic bacteria, algae and plants. Can we isolate or emulate them is a challenge? Can we make a low cost and flexible bio-solar energy nano device as against the present day solar cells, which are expensive and not affordable? Such **'Bio-Solar Cells'** will drive the **'Clean Energy'** needs of tomorrow with no carbon emission vehicles and other modes of transportation besides meeting multiple energy needs.

(iii) **ELECTRO-CHEMICAL ENERGY –** For years, it has been a challenge to manipulate materials on the nano-meter scales. A front line area is electro-chemical energy devices, such as solar cells, fuel cells, batteries. Electro-chemical energy essentially involves reduction and oxidation of materials to either generate energy or to store it. This can and will lead to change in our life system by producing more efficient photo voltaic devices, batteries, fuel cells.

Users could be everyday energy, fuel cell vehicles and many such life-altering solutions.

(iv) **EMBEDDED ELECTRONICS –** This transformation is possible in the near future. Solution is to embed a low cost electronics into every object that we encounter on a day-to-day basis. A pair of sun-glasses may have the ability to project a visual display assessing the internet, have an embedded cell phone and start other devices by just glancing at them. Similarly, everyday object may sense, detect and constantly adjust to our environment, controlling temperature, lighting, noise level etc.

(v) **LIFE EXTENSION –** Extension of the human life span is theoretically possible by disease-preventive and nano-regenerative technologies. This would mean introduction of nano or micro scale devices to whole organ replacing technologies using stem cells. Of course, cost benefits of these technologies, legal and ethical concerns etc. would have to be met.

(vi) **ROBOTS -** One day, Robots will be able to provide manual labour and real productivity at practical prices. Just as cell phones, PDA's, i-pods, laptops, desktops have transformed our life over last 25 years, Robots can transform our life over next 25 years.

(vii) **DIGITAL IMMORTALITY –** Aristotle, Shakespeare, Mozart, Ghalib, Einstein etc. are immortal - or at least their ideas are. Their ideas were recorded in forms, images, music, writings etc. and survive. What if a person's entire life experience including every single word heard or spoken was digitally recorded and secured. May I tell you that it will require about only one terabyte of space. One day, this may only cost a few hundred dollars.

These examples can be multiplied over and over.

Challenge really is to ensure use of science and technology for **'pragmatic programs', 'core areas', 'strategic needs'** and most importantly **'the needy'.** This is

a task, onus for which lies on the shoulders of this august gathering as also the entire community of scientists and technologists across this great Nation.

May God give you the strength of purpose and vigor of deeply meditated insight to achieve this goal. I once again thank the Vice-Chancellor, the Faculty and the research scholars for having given me the opportunity to share my few humble thoughts.

JAI HIND