

**Address to students and Faculty members of
Shiv Nadar University**

Greater Noida

Gautam Budh Nagar

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Travel in an unexplored path

*Imagination leads to creativity
Creativity blossoms thinking
Thinking provides knowledge
Knowledge makes you great.*

I am delighted to address and interact with the students and Faculty members of Shiv Nadar University. My greetings to the faculty members, students, staff and distinguished guests present here. I am happy that Shiv Nadar University has created an enduring research-led inter-disciplinary university of global standard in this beautiful environment. It is said that good teaching emanates from research. The teachers' love for research and their experience in research are vital for the growth of the institution. Any University is judged by the level and extent of the research work it accomplishes. This sets in a regenerative cycle of excellence. Experience of research leads to quality teaching and quality teaching imparted to the young in turn enriches the research.

I appreciate that the students in this campus have the flexibility to choose courses across engineering, management, social sciences, liberal arts and communications and performing arts and carry out inter-disciplinary research. The

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knowledge base and inspiration created by the Shiv Nadar University will enable the students to face the challenges of the Nation in twenty first century, the results will be dramatic solutions that could be totally inconceivable with today's experience. Hence, I would like to talk on the topic **“Travel in an unexplored path”**.

Research Teaching Research

Technology is the non-linear tool available to humanity, which can affect fundamental changes in the ground rules of economic competitiveness. Science is linked to technology through applications. Technology is linked to economy and environment through manufacture of knowledge products. Economy and environment are linked to technology, which promotes prosperity to the society. We have to use innovation to generate high value added products for becoming a global player. The foundation for economic growth is academic research and creativity leading to the creation of knowledge society.

Unique you

It is said, “History has proven that those who dare to imagine the impossible are the ones who break all human limitations. In every field of human endeavour, whether science, medicine, sports, the arts, or technology, the names of the people who imagine the impossible are engraved in our

history. By breaking the limits of their imagination, they changed the world.” Of course, it is true in India, Sir CV Raman in discovering the Raman effect, Dr Vikram Sarabhai in space research and technology, Dr MS Swaminathan in first green revolution and Dr Verghese Kurien in white revolution, Jamsheji Tata for pioneering in steel manufacture and founding the science institutions have broken the barriers of impossibilities. Dear young friends, question is, are you willing to be the unique personality?

Dear friends, Look up, what do you see, the light, the electric bulbs. Immediately, our thoughts go to the inventor **Thomas Alva Edison**, for his unique contribution towards the invention of electric bulb and his electrical lighting system.

When you hear the sound of aero plane going over your house, whom do you think of? **Wright Brothers** proved that man could fly of course at heavy risk and cost.

Whom does the telephone remind you of? Of course, **Alexander Graham Bell**. He suggested in 1905:

“Don’t keep forever on the public road, going only where others have gone. Leave the beaten track occasionally and dive into the woods. You will be certain to find something you have never seen before. It will be a little thing, but do not ignore it. Follow it up, explore all around it; one discovery will lead to another, and before you know it, you will have something worth thinking about.”

..... Alexander Graham Bell

When everybody considered a sea travel as an experience or a voyage, a unique person questioned during his sea travel from United Kingdom to India. He was pondering on why the horizon where the sky and sea meet looks blue? His research resulted in the phenomena of scattering of light. Of course, **Sir CV Raman** was awarded Nobel Prize.

Do you know an Indian Mathematician who did not have formal higher education but had inexhaustible spirit and love for mathematics which took him to contribute to the treasure houses of mathematical research – some of which are still under serious study and engaging all-available world mathematicians' efforts to establish formal proofs? He was a unique Indian genius who could melt the heart of the most hardened and outstanding Cambridge mathematician Prof G H Hardy. In fact, it is not an exaggeration to say that it was Prof. Hardy who discovered a great mathematician for the world. This mathematician was of-course **Srinivasa Ramanujan** for whom every number was a divine manifestation.

Do you know about a man of science and about a life completely dedicated to innovation, creativity and scientific research? His most famous success was the astrophysical Chandrasekhar limit. The limit describes the maximum mass (greater than 1.44 solar masses) of a white dwarf star, or equivalently, the minimum mass for which a star will ultimately collapse into a neutron star or black hole following a supernova. The limit was first calculated by a scientist while

on a ship from India to Cambridge, England. Yes, I am referring to **Prof Subramanian Chandrasekhar**, who lived his entire life for research, research and research on cosmos.

Do you know the technologist who has given [Delhi Metro](#) to the country and has ensured that, all the scheduled sections were completed by their target date or before and within their respective budgets through his technological and programme management skills? The dedicated and transparent leadership backed up with professional competence of this great technologist has given to the nation, one of the best transportation systems of the world at the most economic cost. Of course, I am talking about **Shri E. Sreedharan**.

Friends, so far, we have studied those who walked into unexplored path and strived to be unique and are remembered for their contribution to the human kind.

Inventions and discoveries have emanated from creative minds that have been constantly working and imagining the outcome in the mind. With imagining and constant effort, all the forces of the universe work for that inspired mind, thereby leading to inventions and discoveries. The question is: are you willing to become a unique personality. Let me share an experience.

I have, so far, met 12 million youth in India and abroad, in a decade's time. I learnt, "**every youth wants to be unique,**

that is, YOU! But the world all around you, is doing its best, day and night, to make you just “everybody else”.

The challenge, my young friends, is that you have to fight the hardest battle, which any human being can ever imagine to fight; and never stop fighting until you arrive at your destined place, that is, a UNIQUE YOU! Friends what will be your tools to fight this battle. There are four criteria for building a unique personality, what are they: have a great aim in life, continuously acquire the knowledge, work hard and persevere to realize the great achievement.

Distinctive Profile of India by 2020

Friends, for the past several years, I have been discussing with the young and experienced on the vision of the nation and how each one, whatever be his or her professional orientation, can contribute to the pillars of development. As I envisage, the pillars of Indian development profile 2020 are as follows:

1. A Nation where the rural and urban divide has reduced to a thin line.
2. A Nation where there is an equitable distribution and adequate access to energy and quality water.
3. A Nation where agriculture, industry and service sector work together in symphony.

4. A Nation where education with value system is not denied to any meritorious candidates because of societal or economic discrimination.
5. A Nation, which is the best destination for the most talented scholars, scientists, and investors.
6. A Nation where the best of health care is available to all.
7. A Nation where the governance is responsive, transparent and corruption free.
8. A Nation where poverty has been totally eradicated, illiteracy removed and crimes against women and children are absent and none in the society feels alienated.
9. A Nation that is prosperous, healthy, secure, devoid of terrorism, peaceful and happy and continues with a sustainable growth path.
10. A Nation that is one of the best places to live in and is proud of its leadership.

Integrated Action for developed India

To achieve the distinctive profile of India, we have the mission of transforming India into a developed nation. We have identified five areas where India has a core competence for integrated action: (1) Agriculture and food processing (2) Education and Healthcare (3) Information and Communication Technology (4) Reliable and Quality Electric power, Surface

transport and Infrastructure for all parts of the country. (5) Self-reliance in critical technologies. These five areas are closely inter-related and by progressing in a coordinated way, leading to food, economic and national security.

I have given you, how you have to transform yourself to meet the professional challenges as system technologist and contribute in realizing any one or more of the ten pillars that I have described.

Friends, please look carefully at each of the pillars. You will find some interesting challenge. All of them require convergence of disciplines and technologies. In an engineering system level, optimization of systems takes place with the targets of performance, cost and schedule. In the case of human body, ultimately decisions will involve the overall well being. In the case of the nation, the best decisions happen when everyone puts the nation above himself or herself. The other important aspect is the confidence that innovations can be done and changes can be brought out for the better. The third aspect is, while technologies will be developed and human welfare will be enabled, lasting peace and prosperity will happen only through development of enlightened citizenship. Every individual is responsible for practicing and spreading the message of enlightened citizenship.

Let me start with convergence of technologies.

Convergence of Technologies

The information technology and communication technology have already converged leading to Information and Communication Technology (ICT). Information Technology combined with bio-technology has led to bio-informatics. Similarly, Photonics is grown out from the labs to converge with classical Electronics and Microelectronics to bring in new high speed options in consumer products. Flexible and unbreakable displays using thin layer of film on transparent polymers have emerged as new symbols of entertainment and media tools. Now, Nano-technology has come in. It is the field of the future that will replace microelectronics and many fields with tremendous application potential in the areas of medicine, electronics and material science. I am sure about the use of nano-robot for drug delivery. When Nano technology and ICT meet, integrated silicon electronics, photonics are born and it can be said that material convergence will happen. With material convergence and biotechnology linked, a new science called Intelligent Bioscience will be born which would lead to a disease free, happy and more intelligent human habitat with longevity and high human capabilities. Convergence of bio-nano-info technologies can lead to the development of nano robots. Nano robots when they are injected into a patient, my expert friends say, it will diagnose and deliver the treatment exclusively in the affected area and then the nano-robot gets digested as it is a DNA based

product. I saw the product sample in one of the labs in South Korea where best of minds with multiple technology work with a target of finding out-of-the-box solution.

My experience in Harvard University: Convergence of science is reciprocating. Let me give an example. Recently, I was in the Harvard University where I visited laboratories of many eminent professors from the Harvard School of Engineering and Applied Sciences. I recall, how Professor Hongkun Park, showed me his invention of nano needles, which can pierce and deliver content into individual targeted cells. That's how nano particle sciences is shaping the bio sciences. Then I met Professor Vinod Manoharan, who showed on the other hand bio sciences is in turn shaping nano material science as well. He is using DNA material to design self assembling particles. When particular type of DNA is applied on a particle at the atomic level, he is able to generate a prefixed behavior and automatic assembly from them. This could be our answer to self assembly of devices and colonies in deep space without human intervention as envisioned by Dr K Erik Drexler. Thus, within a single research building, I saw how two different sciences are shaping each other without any iron curtain between the technologists. This reciprocating contribution of sciences to one another is going to shape our future and industry needs to be ready for it. The curriculum

designers of Shiv Nadar University may like to take this aspect into account while formulating new courses.

Now, a new trend is emerging. The aspect being introduced is that of Ecology. Globally, the demand is shifting towards development of sustainable systems which are technologically superior. This is the new dimension of the 21st century knowledge society, where science and environment will go together. Thus the new age model would be a four dimensional bio-nano-info-eco based.

Let us take another example, how governance is enriched by information networks and technologies. They enhance efficiency, instant connectivities, better cross reference and transparency. They enable the unreached to be reached. There are plenty of opportunities in this area for entrepreneurship of individuals and small organization working along with Government, private sector and large organizations. Of course many older processes of working together need to be re-engineered for speed, efficiency and transparency. When technologies and systems converge, obviously one important aspect is “systems thinking and implementation”.

Friends, any establishment, any organization, you will be joining or you create, your own enterprise becoming an employment generator, always one demand that will come in front of you, that is: the experience of system design, system integration, and system management of the assignment or the task to be undertaken by you. I would like to present my

experience of learning system design, system integration and system management while I was studying aeronautical engineering in MIT, Chennai, (1954-57) during the third year of my course.

Learning integrated system design

I was assigned a project to design a low-level attack aircraft together with six other colleagues. I was given the responsibility of system design and system integration by integrating the team members. Also, I was responsible for aerodynamic and structural design of the project. The other five of my team took up the design of propulsion, control, guidance, avionics and instrumentation of the aircraft. My design teacher Prof. Srinivasan, the then Director of MIT, was our guide. He reviewed the project and declared my work to be gloomy and disappointing. He didn't lend an ear to my difficulties in bringing together data base from multiple designers. I asked for a month's time to complete the task, since I had to get the inputs from five of my colleagues without which I cannot complete the system design. Prof. Srinivasan told me *"Look, young man, today is Friday afternoon. I give you three days time. By Monday morning, if I don't get the configuration design, your scholarship will be stopped."* I had a jolt in my life, as scholarship was my lifeline, without which I cannot continue with my studies. There was no other way out but to finish the task. My team felt the need for working

together round the clock. We didn't sleep that night, working on the drawing board skipping our dinner. On Saturday, I took just an hour's break. On Sunday morning, I was near completion, when I felt someone's presence in my laboratory. It was Prof. Srinivasan studying my progress. After looking at my work, he patted and hugged me affectionately. He had words of appreciation: *"I knew I was putting you under stress and asking you to meet a difficult deadline. You have done great job in system design"*.

Through this review mechanism Prof Srinivasan, really injected the necessity of understanding the value of time by each team member and brought out engineering education has to lead system design, system integration and system management. I realized that if something is at stake, the human minds get ignited and the working capacity gets enhanced manifold. That's what exactly happened. This is one of the techniques of building talent. The message is that young in the organization, whatever is their specialization, be trained to systems approach and projects, which will prepare them for new products, innovation and undertaking higher organizational responsibilities. Friends, you should get ready to acquire knowledge in an integrated way for using multiple disciplines towards product development and its management. On this occasion, I have one suggestion, Can you consider establishing of a forum in the University with all departments, students, administration and parents to identify technological

research to move forward towards “**India development profile 2020**”. This may lead to several projects with specific targets for sustainable development in the neighbourhood of this University. Education system in Shiv Nadar University should concentrate on developing the spirit among the students “**I can do it**”.

Dear friends, let me take you to the type of society we are entering and challenges.

The knowledge society in 21st century

The world in the 21st century will be a knowledge based society with multiple opportunities. I was reading a book, “Empires of the Mind” by Denis Waitley. This book gives, what type of the new world which we are facing now? What was yesterday and what is today. I have modified certain points of the author to suit our conditions. I have also added a third line which relates to action of educational institutes.

It specially says that “**what worked yesterday, won’t work today**”.

1. Yesterday – natural resources defined power
Today - knowledge is power
Educational Institutions will be a powerhouse for knowledge
2. Yesterday - Hierarchy was the model
Today- synergy is the mandate
Educational Institutions will be enabler of intersection of multiple faculties towards mission goals

3. Yesterday – leaders commanded and controlled
Today – leaders empower and coach
Potential Leaders will be empowered through exposure to the needs of sustainable development
4. Yesterday - shareholders came first
Today – customers come first
Education should inculcate sensitivity to “customer” needs
5. Yesterday - employees took order
Today – teams make decision
Educational Institutions can inject team spirit
6. Yesterday - seniority signified status
Today – creativity drive status
Educational Institutions is the breeding environment for creativity
7. Yesterday – production determined availability
Today – Competitiveness is the key
Competitiveness is powered by research and university has to have the motto of “teaching-research-teaching”
8. Yesterday - value was extra
Today – value is everything
Objective Value judgment to be introduced in education
9. Yesterday – everyone was a competitor
Today – everyone is a customer
Educated customer is also from Educational Institutions
10. Yesterday - profits were earned through expediency
Today – Work with integrity and succeed with integrity.
Education with value system is the need of the hour.

Conclusion

Finally, I would like to ask you, what would you like to be remembered for? You have to evolve yourself and shape your life. You should write it on a page. That page may be a very important page in the book of human history. And you will be remembered for creating that one page in the history of the nation – whether that page is the page of invention, the page of innovation or the page of discovery or the page of creating societal change or a page of removing the poverty or the page of fighting injustice or planning for better water management.

Dear Friends, I would like to recall a great clarion call of indomitable spirit, which was given by Sir C V Raman, at the age of 82. The message is still reverberating in my mind: “I would like to tell the young men and women before me not to lose hope and courage. Success can only come to you by courageous devotion to the task lying in front of you. I can assert without fear of contradiction that the quality of the Indian mind is equal to the quality of any Teutonic, Nordic or Anglo-Saxon mind. What we lack is perhaps courage, what we lack is perhaps driving force, which takes one anywhere. We have, I think, developed an inferiority complex. I think what is needed in India today is the destruction of that defeatist spirit. We need a spirit of victory, a spirit that will carry us to our rightful place under the sun, a spirit, which will recognize that we, as inheritors of a proud civilization, are entitled to a

rightful place on this planet. If that indomitable spirit were to arise, nothing can hold us from achieving our rightful destiny."

My best wishes to all the members of Shiv Nadar University in the mission of producing life long learners who will be well adjusted and become great contributors of our societal transformation.

May God bless you.

Oath for the Youth

- 1 I will have a goal and work hard to achieve that goal. I realize that small aim is a crime.
- 2 I will work with integrity and succeed with integrity.
- 3 I will be a good member of my family, a good member of the society, a good member of the nation and a good member of the world.
- 4 I will always try to save or better someone's life, without any discrimination of caste, creed, language religion or state. Wherever I am, a thought will always come to my mind. That is "What can I give?"
- 5 I will always protect and enhance the dignity of every human life without any bias.
- 6 I will always remember the importance of time. My motto will be "Let not my winged days, be spent in vain".
- 7 I will always work for clean home, clean planet Earth and clean energy.
- 8 As a youth of my nation, I will work and work with courage to achieve success in all my tasks and enjoy the success of others.
- 9 I am as young as my faith and as old as my doubt. Hence, I will light up then, the lamp of faith in my heart.
- 10 My National Flag flies in my heart and I will bring glory to my nation.