

Dr. Shilesh Nayak

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Hon. Prof. Pawar, Vice-chancellor,

Shivaji University, Distinguished Members of the Academic Council, Management Council and Senate, Members of the Faculty, Ladies and Gentlemen and my dear students,

Good afternoon to all.

I am really honored and privileged to participate in the 48th Annual Convocation of the Shivaji University. I am extremely grateful to Prof. Powar for inviting me to deliver the Convocation address. This university is named after one of the greatest patriot of our country, Chhatrapati Shivaji, a great warrior and icon of courage and wisdom. I am sure the you will show similar commitment to our country to bring about development. My heartiest congratulations to all you for achieving a major milestone and wish you very purposeful and productive future. You will be awarded a degree recognizing your hard work, dedication and sincerity. This is really matter of pride for you, your parents and most importantly your teachers. My sincere thanks to all the teachers who have made immense contributions to impart knowledge to you so that you are ready to step out and set your own path.

You know that India is on the path of economic development and progress has been phenomenal, especially during the last decade. India is an emerging power. We have major challenges in the field of energy, water, food, health and climate change. We all know that education plays a major role in not only in bringing about economic growth but also sustaining growth. Science and technology drives innovation and facilitates to create a knowledge-based economy. It is now well recognized that access to higher education is not only important to sustain economic growth but also to improve quality of life. We need to ensure that increasing number of population is provided higher level or post-school level education. The target is to increase of about 40 million students by 2020. This is going to be really challenging task. Many new educational institutes, including IITs, IISERS and universities have been created, but we will need many more.

We will need universities, where scholars and students, would like to come from all over the world. In the past, we had premier educational institutes in Nalanda and Takshashila, which attracted the best minds. Recently, the Ministry of Human Resources Development has announced the setting up of 14 ‘innovation’ universities of ‘world class’ nature. It takes time to build universities of international repute.

The question is why ‘innovation’ is crucial? It is well recognized that innovation is the key driver of science, technology and economic development in changing environment of the technology (Science Advisory Council to the Prime Minister, 2010). Why USA is continued to be world leader? It is because innovation-based science and education that led to birth of companies like Microsoft, Apple, Google, etc. In all developed countries, it is the university based research which has led to new scientific discovery, inventions, understanding of phenomena, processes, which ultimately converted into new technologies, products and economic benefit.

We also need to look whether our education system is geared up to meet these challenges? I am afraid, it is not. We do produce masters or experts on specific fields. But we do not encourage creativity or independent thinking. Our system do not allow our students to have an opportunity to embark upon multidisciplinary learning. Such system do not produce innovative entrepreneurs having broad perspective. I agree that our system has produced highly successful mid-level engineers and scientists but not leaders and thinkers. We need to look seriously at our curriculum and teaching methods. Should we have a system which allows our students to explore different subjects, say couple of years, before they decide on specialization? I think this question can be best addressed by social scientists. We should develop a system that allows assimilation of new knowledge, problem solving capability and adaption to new technology. We should encourage interactive seminars, discussions to develop independent thinking and questioning as well as defending a point of view.

What do we do? First and foremost is, we need to attract best minds to our universities and educational institutes. But they will come only if we have state-of-art research facilities, sufficient funding to carry out frontline research, bright students and of course adequate remuneration. I think remuneration is quite alright by our standards, but not for those to attract who are in developed countries. We have initiated a scheme to attract such people, at least periodically, say one to three months, and teach a course. This has been introduced on a limited scale as an experiment in IIT Delhi, for atmospheric sciences. I have been

told that this course has been very successful and attracted students from other disciplines such as mechanical and civil engineering. We are going to expand such system in other institutions as well. We know this is not enough to attract back diaspora, but beginning has been made.

Secondly, We need to create excellent research facilities. We are supporting existing inter-university centers to procure state-of-art instruments for scientists to carry out their research. The funding can be as high as Rs 8-10 crores, if requirement is justified. We are also considering to set up new such centers in the field of Earth system science, analytical geochemistry and water cycle research.

The adequate research funding is the critical need. We are encouraging universities to set up Earth system science and technology cells to carry out research on a particular theme. About ten such cells have been set up in various universities looking at complex issues in marine biology to autonomous vehicles. We are in process of setting research cells in field of Cryosphere, atmospheric science, ocean science and technology, etc. The system of research funding should be very efficient and transparent. The funding should be basically for basic science. Research proposals should be competitive and should be judged based on their scientific merit alone through peer review process.

The advantage of this system is it allows post-graduate and research students to have first hand exposure of the new science and technologies being developed. Such exposure will help them in their future career. Such students, in turn, will bring name and fame to such university. Once this circle will be completed, it will attract experts, funding and bright students. Success breeds success.

We are also proposing cutting-edge projects where India can lead. One such project is to carry out deep scientific drilling in Koyna, not very far from here, to study earthquake processes. You know that earthquake is one natural hazard which is yet to understand fully. In Koyna, earthquakes are occurring since last forty five years or so, in a very small area, and are shallow in depth about 4-6 km. Hence, Koyna is the ideal site to study earthquake processes and mechanics of faulting in intra late zone. Apart from earthquake processes, the project would also provide an opportunity to study petrology and geochemistry of Deccan Lava flows, geophysical studies, drilling technology, many more. India will lead this global project and thus Koyna will attract many international scientists to study various aspects apart from large number of Indian scientists. We are in process of setting up lab to support this activity near Karad. It will provide opportunity to the Shivaji university to participate in this prestigious project.

Water is going to be a major issue and the changing water cycle is major challenge. The prediction of monsoon in various space and time scales is major program being launched. Recently, in the 99th Science Congress, the Prime Minister announced the Monsoon Mission, where major efforts to improve monsoon forecast will be made. This mission will facilitate participation of all concerned towards common goal of improving forecast. The variability of monsoon on different space and time scale is very complex. Though we have been doing reasonably good forecast for next 4-5 days at the district level, forecast at medium, seasonal and climate scale is still challenge. This project will allow participation of scientists from developed world as well. The experiments will be done using selected models to improve its physics or assimilation techniques or observations requirement, etc. We had First meeting yesterday in Pune and we will be start process of identifying principal investigators very soon. One of the major factor of this mission is that we will allow an access to our high computing system, one of the best in the country, to various experiments.

Climate change is going to be a major challenge of 21st century. To understand climate change, the Earth should be viewed as single interlinking unit. The material and energy transfer between different components and within each component need to be understood and quantified. We need to create strategic knowledge of climate change. We know temperature is rising, sea level is rising, extreme events are increasing. What will be their impact on other sectors, such as agriculture, water, health, etc.? We need to build models to project how our climate would be in future at decadal scale. We have set up Centre for Climate Change Research in Pune to develop such models and provide information. Such information will be used to study the impact of likely climate change on agriculture, water resources, health, etc. It is necessary that earth system and its impact on social and human systems as well as impact of human and social system on earth system is well understood. We need multidisciplinary system to get insight in to understanding likely impact of climate change on society as a whole. The Harappan Civilization was lost due to climate change.

We also need to look at our oceans more closely. Ocean is going to be major source of resources, both living and non-living. Today, we are depending on ocean for petroleum and gas. Ocean also houses cobalt, hydrosulphides, polymettalic nodules, gold, silver, etc. Also there are microbes around hydrothermal vents, which survives temperatures of 350 degree centigrade. Such microbes can provide valuable drugs. We have been working on exploration and assessment of such resources. The challenge is to build technologies for

harnessing these resources from ocean depths of 5000 m and higher. We will have to depend even for freshwater on ocean in future. We have build three plants providing drinking water about 100,000 litres per day, from ocean for the Lakshadweep Islands. We need to scale such plants to 10 to 100 million liters per day to provide freshwater to our coastal cities. These are the challenges you will be facing now.

To face such challenges, we should view science education, including social science education as an agent of transformation. We need structural reforms and flexibility and autonomy in decision making. India has resources and strengths to transform but potential is yet to be realized. We need to tap scientific, technical and social knowledge available for developmental purposes. This will lead to new ecosystem which encourages innovation. I am sure that Science, technology and humanities education should be mainstay in the next stage of national development.

Dear Students, you have great challenges ahead, and I am sure that you will serve with great dedication and achieve excellence in whatever field you may choose. I wish you very best and great success in your career.

In the end, I would like to thank his Excellency and Dr Powar for giving me the opportunity to share my thoughts with you and bestowing this honor on me.

Thank you very much.