

INDIAN INSTITUTE OF SCIENCE EDUCATION
AND RESEARCH MOHALI



6th CONVOCATION ADDRESS
BY
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Convocation address, May 27, 2017

Anil Kakodkar

Dr. Madhuchanda Kar, Chairperson, Board of Governors, Indian Institute of Science Education and Research Mohali, Professor N. Sathyamurthy, Director, Members of Board of Governors present here, Members of Senate, distinguished invitees, faculty, students particularly those graduating today, members of their families, staff of IISER Mohali, ladies and gentlemen.

① At the outset, let me express my gratitude to IISER Mohali, for the invitation to be a part of this 6th Convocation being held today. Convocation is a special day in the calendar of any Institution of learning. It marks the culmination of a phase of learning and after having satisfied that the students are now ready to move on further in life and contribute to the world at large, as worthy individuals in the chosen domain of learning and training, the teachers give the final advise and blessings for further journey that students are embarking upon. It is a solemn occasion for the students as also for the teachers. The bond between the teachers and the student, that is supposed to have been built through years of mentoring, brings in an emotional content to the Convocation day. I wish to use this occasion to thank all members of the faculty who in their own way have contributed to shaping the young minds while they are with the Institution.

② My heartiest congratulations to all students who are graduating today. Some of you, who are being specially recognized, deserve our highest appreciation. All of you have gone through your respective programs of learning and studies and have been adjudged to be worthy of the degrees that are being awarded to you. As a scientist or a technologist you have to be an important contributor to the ongoing efforts to better understand our surroundings and indeed ourselves and leverage the new knowledge so created for improving the quality of life of mankind at large. I wish all of you graduating today a very successful career ahead. May all your dreams be fully realized.

Mission IISER

③ IISER Mohali is a part of the chain of IISERs that have been established to create a special emphasis on high quality science education and research in India, that should in my view, create an impact on our society

and our youth, in a manner similar to what has happened with IITs in the context of engineering and technology. One does hope that over a period of time IITs would embrace basic sciences in a manner that would enable them to create new technologies based on new science discoveries ahead of others and likewise IISERs would embrace applications and technologies to become leaders in user inspired research that is aimed at addressing key problems before India and the world even as they must be in the forefront of curiosity driven voyage in discovery science. All of you, the past, present and future members of IISER Mohali family are key participants in this historic endeavor of key importance to our country.

④ “Global Trends 2030: Alternative Worlds”, a recent report of U.S. - National Intelligence Council identifies the period between the years 2015 and 2050 as demographic window of opportunity for India. We have the most favorably placed demography among all countries of the world. Our ability to positively leverage our demographic dividend to the fullest extent possible, would clearly require us to make very rapid progress towards addressing the twin challenge of excellence and access in our education system. IISERs which occupy the lead position in science education and research must remain conscious of this broader role and lead the march of India's scientific and economic progress from the front.

Science Education and Research : Indian Context

⑤ Education is clearly the key ingredient in character building, enlightenment and socio-economic transformation. Done properly, education can empower our huge human capital to be a major constructive force to propel inclusive growth of the nation as a whole. High quality higher education that empowers our youth, has the potential to cause a quantum jump in socio-economic status of poorer families in a single generation. Inclusive access to such higher education can thus transform our strong demographic advantage into significant enlightenment of the society and wealth generation being added at the base of the pyramid.

⑥ India is, by and large, a resource poor country when seen in per capita terms. There is a growing concern about sustained access to some of the key resources, including essential things like water, food, energy and many others. India's human capital, duly educated and trained to leverage technologies and add value, is therefore the key factor in wealth creation that would be sufficient enough to make average standard of living of her people comparable with that in the advanced countries of the world. With appropriate efforts to build capacity and capability of our people, consistent

with the challenges and opportunities of the emerging era of knowledge driven economy, India can legitimately aspire to be the leading country in the world.

7 Talking about research, which must go hand in hand with higher education; thanks to interventions implemented by DST in recent years, research output as measured through research publications from India has significantly gone up. There is however a question about efficiency of our investments in R&D in terms of economic value realized. We, at the moment invest around 0.8% of our GDP in R&D. While there is a strong case for enhancement in this level of investment and take it to a level of around 2-2.5% of GDP to make it comparable with countries we would like to compete with; we need to also be conscious of the fact that, in absolute terms, we actually spend more or comparable money on R&D as compared to countries like Israel, Canada, Sweden, Switzerland, Finland and even UK. Further, our expenditure per full time equivalent S&T professional is actually comparable (in \$ppp terms) with the best in the world. We thus need to question our not being able to compete with the countries listed above in terms of technological capability that can dominate the market place. Clearly, we need to devise strategies that would make our investments in R&D much more productive.

8 On taking a closer look at say top 15 items of our imports and exports, one finds that most of the goods/product categories in both lists are common with imports dominating the exports. Total balance of payment corresponding to these 15 items even after excluding oil imports amounts to around \$ 60 billion. Clearly competitiveness of our value addition activities needs to improve a lot with cutting edge technology having to play a major role. There are of course notable exceptions like the vehicles, pharmaceuticals and clothing. However, industry duly supported by Government policies seems to have played a far greater role here. Clearly again, there is a need to focus on translation of our knowledge and research to technologies that would make value addition in high import areas globally competitive.

9 Recently Technology Information Forecasting and Assessment Council (TIFAC) has come out with a Technology Vision 2035 that looks at Indians in 2035 and their needs and prerogatives. The exercise has identified a spectrum of technologies for meeting the prerogatives and also has worked out road maps in different technology areas for the country. Our R&D efforts thus need to be geared up to ensure that the future technology needs are met through made-in-India products specific to our needs.

10 Quest for fundamental understanding and benefits in terms of better quality of life must go hand in hand. Very often, clues to disruptive transformations can arise while pursuing fundamental research. Our ecosystem must be able to recognize such potentials and facilitate translation of potential ideas to their logical end. Thus, on the “fundamental research – addressing societal needs” work space, we need to locate much of our research effort in the so called ‘Pasteur Quadrant’ that focuses much of the effort on research in an area of basic scientific ignorance that lies at the heart of a social problem. Such need inspired basic research should be a significant part of efforts at IISERs along with curiosity driven discovery science. Science research that neither takes us significantly forward on our quest for fundamental understanding nor adds value to the society should have no place in our research effort.

The way forward

11 There are several transformations that we need to bring in to make our R&D investments more productive and enhance our national competitive edge. Presently, by and large, a restrictive silo mind set dominates us in most of our institutions. This has to change. We need to build strong linkages between education/teaching and research. Further a higher education and research institution should become a confluence of academia and industry/society where one seeks original achievement and knowledge creation through individual research on one hand and at the same time promote translation of new knowledge to development of technologies and solutions for industry and society through group research on the other. Pursuing fundamental research devoted to knowledge creation and applied research necessary for sustained technology evolution together, would need a major cultural shift to be brought-in into our organizations. This would need sustained and painstaking efforts over a period of time. While the design of the research framework within a knowledge institution has to be based on institutional mandate, the framework must enable translation of outcome of research efforts across the full spectrum of potential benefits ranging from a forward push to knowledge frontiers to creating a sharper technological edge and larger economic gains for the nation/society. Such translation could be done within the institution or in collaboration with closely linked sister institutions or through other modes of broader networks among institutions. A degree of hand holding over a period of time is however essential in all modes. In any case the nation cannot be deprived of the potential benefits out of investments in R&D simply because of lack of interaction among people or institutions across the research translation chain.

12 The institutional value system thus should create a motivating environment for such translation without in any way diluting excellence with respect to primary institutional mandate. The yardsticks of measuring excellence in diverse set of activities involved would need to be evolved carefully. Basically, we need to be able to account for impact on peers in core area of the individual researcher, impact of applied part of his/her research on downstream partners and impact of his/her efforts in technology translation on the society/industry. The overall assessment should then integrate these impacts with due recognition of overall institutional mandate.

13 We often hear people lamenting on low global ranking of our higher education institutions. In this context, it is important to recognise, and we should in fact celebrate, the fact that IITs ranked fourth in terms of producing founders of start-ups worth more than a billion dollars. Equally important is to recognise that India ranks first among countries that provided immigrant founders of billion dollar start-ups companies in United States as per National Foundation for American Policy brief – March 2016. The flip side, of course, is the fact that this happened outside India. The point is, while we need to improve our education and research framework, there is also much more that needs to be put in place in terms of translation of research accomplishments to national value.

14 While encouraging the startups and more broadly the culture of taking university research to market place, we need to recognize that such translations have to negotiate a number of valleys of death. This invariably requires efforts which at times are much larger than demonstrating a proof of principle in the laboratory. Our support system for such translation is however much smaller in proportionate terms. While we need larger support systems for this purpose, more importantly such support must be characterised by synergistic symbiosis between academic and commercial domains with the commercial domain playing increasingly greater role as we move from research to development to commercialisation. Academic domain should however remain connected through out although the level of participation may progressively decrease.

15 The socio-economic scene around us is transforming itself at an accelerated pace as a result of demographic shifts, impact of new technologies, the growing economy and several other developmental initiatives. Knowledge is now an important factor in economies world over, a trend that is likely to be increasingly dominating the global and national scene. We thus need to quickly align our education system to the needs of

changing knowledge driven paradigms in the best interests of our socioeconomic development; while remaining consistent with our cultural values and traditions. The A3 connected society, that is fast emerging on one side and the digitally illiterate across the digital divide on the other, both constitute major socio-economic challenges that can be handled only on the basis of widest possible access to appropriate education delivered urgently. Our higher education and research domain should now be able to provide advice to policy makers in a fast-changing scenario driven by new technologies in a proactive and timely manner rather than our reacting as a society or a nation after it is too late.

16 While future holds great potential if we are able to manage the challenge of providing quality education to all, there are serious threats on the horizon if we are not able to do so quickly. Urgent actions are thus necessary on this front to quickly reduce the disparity gap as we move up the economic growth path, lest serious problems as a result of frustrated aspirations surface and create potential threats that might become difficult to contain and our youth force, which is a powerful engine of growth and development could well turn into a major destructive force. Our large youth force must be provided with opportunities for constructive engagement in a manner that fulfils their aspirations. Luckily the possibility to widely use modern technologies in education does provide an opportunity to create such wider access to good quality education at a fast-enough pace to overcome these challenges successfully.

Rural Development

17 More than two thirds (68.8%) of our population, according to Census 2011, lives in rural areas. The Centre for Monitoring Indian Economy has estimated the average income of rural households in the year 2012-13 at Rs. 116,672 which was about half of the income of average household in urban areas at Rs. 240,172. According to socio-economic and caste census 2011 (SECC 2011), manual casual labour (51%) and cultivation (30%) constitute the main source of income in rural households. About 9.7% of rural households run on salary income. 56% households are landless. Land holdings have got fragmented making agriculture largely unviable. Soil quality of farmlands is constantly degrading and the agricultural productivity has remained low.

18 Urban India on the other hand is characterized by a highly-stressed infrastructure and a very rapid migration that is taking place to our cities. Indian cities are perhaps the fastest growing cities in the world. According to

McKinsey Quarterly (July 2010), "Urban expansion in India will happen at a speed quite unlike anything that the country or the world has seen before. It took nearly 40 years (from 1971 to 2008) for India's urban population to rise by nearly 230 million; it will take only half that time to add the next 250 million. This expansion will affect almost every state. For the first time in India's history, five of its largest states will have more of their population living in cities than in villages." Clearly rapid urbanization, which has been a challenge in terms of livable urban infrastructure, will become a much bigger challenge in years to come. In spite of the great emphasis on urban infrastructure development, it is unlikely to keep pace with the rising demands. Life is thus very stressful both in urban as well as in rural India although their reasons may be very different.

19 A notable feature of this migration dynamics is shifting of organic matter from farms to cities and inorganic matter from factories to farms in increasing quantities. This is already causing considerable problems in terms of depletion of organic carbon in farm soils and bacterial pollution in water and air in urban areas. This is leading to lower water retention, poorer nutrient uptake and lower productivity at our agricultural farms on one hand and un-sustainable urban solid waste management, higher transportation costs and heavy public health management burden in our cities, on the other. Another notable feature in the rural socio-economic scene from the data given above is the fact that more than half the number of households in rural areas are landless and 51% of the households are dependent on manual casual labor for their main source of income while cultivation offers main source of income only in case of 30% of rural households. Clearly, we need to look at a development model for rural areas that goes well beyond agriculture and is capable of providing earnings comparable to urban areas over a much broader spectrum of activities including manufacturing and services segment.

20 An attempt is being made to experiment on evolving a model for sustainable rural development and growth through a network of technology and innovation hubs linked to an integrated education, research and development complex. A beginning towards evolving ecosystems comprising of the following is being made in a progressive manner at a few places.

- 1) livelihood promotion framework that enables and empowers people at the grass roots through knowledge, skill (both hard and soft) and technology inputs along with financial inclusion as well

as backward and forward integration of their activities; and

- 2) education and training activities in rural areas that are focused on the resources of the region and are integrated across different layers of learning like clearer structured understanding of available knowledge, advanced knowledge activities involving progressive expansion of knowledge envelope, exposure to procedural knowledge that enables knowledge based practices in the society as well as related training and development of hands-on-skills capability through structured training and apprenticeship.

21 The above two elements of such an eco-system have been christened **AKRUTI** (Advanced Knowledge based Rural Technology Initiative) and **CILLAGE** (A knowledge ecosystem for bridging City and village gaps). This is being experimented upon at Gopalpur near Pandharpur in Maharashtra. The experiment has yielded very positive results so far. Higher education and research institutions such as IISER Mohali could significantly contribute to development of rural India through engagement with such an eco-system.

Closing Remarks

22 I do wish that all of you would give some serious thought to these issues and decide your respective course of action. It should be our collective efforts to progressively move towards making the world a better place to live. Through a lifelong learning process and maintaining knowledge institutions, industry and society interconnected with each other, each one of us, regardless of career we decide to pursue, can meaningfully contribute to this objective. After all we are all in this world to play our respective roles. Our happiness and joy of life depends on how well we play our roles.

23 To dear students, I once again wish all of you well in your respective further pursuits. I am certain you would rise progressively in your respective careers. I do hope that as you rise, you will retain in you a spirit of trusteeship and contribute substantially to your roots, the society around, the institutions that brought you up and the nation at large. It is this spirit of trusteeship and the desire to support others who were not as fortunate or successful as us that makes this world a better place. We must remember that our happiness depends on the happiness all around us.

Once again, my best wishes to you all.

Thank you.



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