



Dr. Shailesh Nayak
(Former Secretary, Ministry of Earth Sciences)

Chief Guest, Fifth Convocation, IIST



Indian Institute of Space Science and Technology

Fifth Convocation

Hon'ble Chancellor, Indian Institute of Space Science and Technology, Dr. Kiran Kumar, President, Governing Body and Chair, Governing Council, Indian Institute of Space Science & Technology, Dr. V. K. Dadhwal, Director, Indian Institute of Space Science and Technology, Registrar of the Institute, Members of the Governing Body and Council and the Academic Council, Deans, Faculty Members and Staff of the Institute, Members of the Media, Distinguished Guests, and My Dear Students,

Very good afternoon to everybody. It is my proud privilege and honor to participate in the 5th Convocation of the premier educational institute, the Indian Institute of Space Science and Technology, a deemed university. I am extremely grateful to Dr. Kiran Kumar and Dr. Dadhwal for inviting me to participate in the august ceremony and giving me an opportunity to address you.

India has a very robust space program and during last 50 years or so, it has made tremendous contributions for improving the quality of life in India. This is because the Indian space program has always focused on applications of space technology, mainly for societal benefits, as envisaged by Dr. Vikram Sarabhai. To meet the goal, the founding fathers have created institutional and organizational structures centered around applications, not based on technology. Unlike other Space faring nations, where space technology grew from missiles to launch vehicles, to satellites and ultimately to applications. India has started its space program with space science and applications and went on to build satellites, launch vehicles and missiles. This unique model has ensured that benefits of this technology reaches to grass-root levels. It is also very heartening that all successive leadership of ISRO has steadfastly followed this philosophy.



The success of such approach depends not only on technology and infrastructure but on people. An education system that produces scientists and managers is needed to implement such an approach. The setting up of the Indian Institute Science and Technology, in 2007, has been essentially to build such a system. This institute has greatly enhanced our capability to impart education at an individual, institutional and national level. This unique institution is one of the best university in this part of the globe having learned faculty, state-of-the-art infrastructure and excellent students. In coming years, I am sure, it will play a stellar role at regional as well as global level as well. The role of education, capacity building and transfer of technology to developing countries in the field of space applications is vital for the sustained development.

Today, you are going to be graduated and we have gathered here to recognize your achievements. I congratulate all of you for your success and wish you very best for your future. You must always remember a role of your parents and teachers to make you worthy of this distinction. My compliments to all those teachers who have mentored you, to make you capable to step out and set your own goals. In this context, Alexander, the Great, has said is very relevant. I quote. 'I am indebted to my parents for living, but to my mentor for living well.' Unquote.

You will be joining ISRO centers, other research or academic institutions and industries and address issues related to space science, technology and applications or related areas. There will be many challenges as well as opportunities. One of the major challenges today is how we are going to shape the 'Future Earth.' During last two centuries, we have seen unprecedented growth driven by technology and created north-south divide or digital divide. The issues of livelihood, poverty and food security are severe in rural areas not only in India, but throughout the world.



In view of this, the Honorable Prime Minister, during his address to the 104th Science Congress, has asked ISRO and other organizations to join hands to develop and deploy Geo-information Systems essentially space-based systems to meet the development goals of our citizens, Gram Panchayats, Districts and States. Such systems should provide information on natural resources, environment and hazards and develop decision support system for sustainable development. Dr A. P. J. Kalam, former President of India and Chancellor of this Institute, had also advocated to develop the Global Sustainable Development System for Providing Urban Amenities in Rural Areas (PURA).

It is our duty to ensure sustainability of the Planet Earth as it provides us resources, energy and supportive ecosystem to live. One of the major requirements for sustainable development is to understand the Earth system and its components, i.e, atmosphere, hydrosphere, biosphere, geosphere and cryosphere. The study of mass and energy transfer within and across these components has evolved as a major branch of a science and named as the 'Earth System Science.'

The 'Earth System Science' is relatively new and this word was coined in nineties as it was realized that the Earth is a single unit. Satellites or 'eye in the sky ' provided global data of the earth processes in real time in frequencies which human eye cannot see. Observations of these processes in varied time and space scales have enhanced our understanding about global processes. This has revolutionized our knowledge about the earth System, its behavior and change in space and time. Earth System Science has national and global importance. Hence, it is vital to use space technology to address issues of humanity.

We know that human activities had major impact on the Earth system and affected the environment at the local, regional and



global level. Such large-scale global environmental changes, in turn, have threatened sustainability of humanity. It is likely that changes in climate have major impact on food, water, energy and human security, especially in developing countries. This may affect human societies significantly and hence the challenge to sustainable development has to be addressed on a urgent basis. We need to view this scenario as an opportunity to find innovative ways to find solutions to sustain development, and to improve quality of life.

The threat to human security from weather and climate variability can be episodic such as cyclones or droughts which are slow and inconspicuous, but are more damaging in the long run. We know that such fluctuations in climate in the past had an impact on civilizations. It is believed that the Harappan civilization was lost due to climate change. Around 1800 BCE, the climate in the Indus Valley and neighboring region became cooler and drier due to weakening of monsoon. The changes in courses of rivers also took place due to tectonic movements. These changes probably led to scarcity of food and ultimately to migration of population to other areas. In recent times, the most remarkable example of climate change has been witnessed in the Sahel region of the Africa. This semi-arid region has witnessed prolonged periods of below average rainfall since 1960s and suffered by multi-year droughts and shifted to drier climate and turned into a desert in last eighty years. This has led to migration of farmers which also affected it's economy as well. Of course, international efforts are going on to curb the advance of desertification. Recent scientific studies based on satellite images revealed that desert is receding and farming is now viable.

Such effective response to global environmental change depends on quality of knowledge, expertise of the organizations who respond to such event and consciousness of the communities



involved. Hence, the building of effective resilience to climate change needs to be addressed in an integrated manner at the three levels of the systems - global or earth system, social and human. The dynamics and interactions of the Earth System affect at various spatial and temporal scales to humanity within the boundaries of the Earth system. Hence we need to create a social system - political, economic and industrial structures - to provide base for fulfilling human existence. The social system depends largely and affected by our lifestyles and values which allows us to live healthily, safely and securely. The inequities in the social system, will not allow human system to survive. Hence we need to develop human and social system to tackle the issues related to the global climate system, so that human beings continue live sustainably. Thus, we need to link the earth system with the social system or governance structure, industries, infrastructure and human system or citizen response and awareness to attain resilience to climate change. In this regard, based on recommendations at the Rio+20 Earth Summit, a set of Sustainable Development Goals (SDG) by integrating environmental and developmental needs of all countries have been developed. Such goals has been set on our current knowledge of the Earth system, and expected to attain goals of sustainability by 2030.

In order to address these goals, we need to understand how Earth, as a whole, is changing due to natural as well as anthropogenic activities or how fluctuation in global system affect human activity. We also need to consider how anthropogenic activities have influenced hazard processes in generating extreme events. A changing climate leads to changes in frequency, intensity, spatial extent, duration and timing of extreme weather and climate events. Though it difficult to relate individual events to climate change, we are experiencing increasing events of heavy rain and snow falls, heat and cold waves, droughts as well as increasing



frequency or intensity of tropical storms. In a recent study, it was shown that increase in air pollution and other particulate matter in the atmosphere can affect cloud development in ways that reduce precipitation in dry regions or season, while increasing rain, snowfall and intensity of severe storms in wet regions or season.

Space exploration has been one of the greatest scientific advancements of the 20th century, not because discoveries about universe, or unraveling secrets of the Moon, the Mars and other planets, but it provided a great impetus to understand the planet Earth in a manner which was not possible earlier. Space has provided a new perspective to humanity and to view the planet Earth as a total system. With its ability to integrate diverse aspects, such as weather and climate, natural resource management, navigation, communication, education, etc. that impact quality of life, it has brought an intense awareness of our interdependence on a global system. Space should be seen as a common resource of the entire humankind, which requires a balanced approach between social priorities and commercial interests. The accessibility to space benefits to larger community of people needs to be ensured. Late Prof. U. R. Rao, Former Chancellor of this institute has said in 1989 that the fullest exploration of this powerful technology can transform the entire society touching every aspect of human endeavor, education, communication, environment, habitation, agriculture and industrial productively. How true it is today! It is worth mentioning that Socrates, the great philosopher, realized almost 2500 years ago. I quote.

“Man must rise above the Earth,
To the top of the atmosphere and beyond,
For only thus will he understand,
The World in which he lives.”



Satellites have provided capability to observe and connect even the remotest part of the globe. It have provided data for applications in the field of environmental changes, conservation of biodiversity, energy exploration, food security, sustainable use of water resources, human habitats, etc. Earth observations from space has helped to monitor and quantify vital signs of earth system and provided long-term, consistent, calibrated, global set of observations. Significant achievement in acquisition, processing, interpretation and analysis of satellite data have been achieved. These observations / measurements have helped to establish how the Earth is changing and helped to build Earth system models.

Satellite communications have transformed the Society, by facilitating imparting education and health services as well as entertainment in the remotest corner. Communicating the information about weather, climate and hazard time-bound manner to all stakeholders is another very critical area. The effective communication through web-based and location-based services with local administrators, media as well as people at large is vital. The development of decision support systems on resources, hazards etc. are the most crucial need today. Such system has been built for tsunami and cyclones to provide information within minutes about impending danger. We need to build effective decision support systems for all other hazards.

In India, we have seen benefits in terms of improved productivity or efficiency or both by effective use of space technology which have reached to grass root levels, such as agro-meteorological services for farmers and potential fishing zone service for and fishermen and many others. We need to identify early warning satellite-based indicators that allows to detect and monitor changes in environment by developing innovative sensors and processing techniques. Such indicators affords monitoring and



determination of the status and condition of natural and managed ecosystem and thus, environments at risk.

We need to build international partnership of academia, governments, business community and civil society to support such kind of generation of scientific knowledge and integrate with natural and social science and humanities. Such knowledge will help to address the challenges of environmental change and sustainability. We need to encourage both disciplinary and interdisciplinary excellence in collaboration with public, private and voluntary organizations.

The emphasis should be on solution-oriented science in order to anticipate or predict and manage global environmental change through research on transformative pathways, scenarios and innovation. Such approach will facilitate to understand the requirement of to what kind of institutional, economic, social, technological and behavioral changes are required to attain global sustainability. I am sure by building global capabilities for long-term, sustained observing systems and network, Earth system models, data management systems and infrastructure, we can achieve global sustainability.

I congratulate all of you for graduating today and receiving your degrees. Your achievements and accomplishments has been rewarded with medals. As you embark upon a new journey and try to carve a niche for yourselves in the world, you shall carry the values that the IIST has instilled in you and that you shall make a valuable contribution to society and make the world a better place to live in.

I like to remind you what two of our great scientists have advocated. First, I Edison, the great inventor, has said about success, and I quote, “I have learned fifty thousand ways it



cannot be done and therefore I am fifty thousand times nearer the final successful experiment.” Unquote.

Dr. Vikram Sarabhai, the great visionary had very aptly defined leadership. I quote, “There is no leader and no led. A leader, if one chooses to identify one, has to be cultivator rather than manufacturer. He has to provide the soil and over whole climate and environment in which the seed can grow.” Unquote. I think these are very important messages you need to follow in your future journey.

Further, as you prepare to pursue different careers, I wish you success in all your endeavors. That you will realize most of the potential that you have within you, that you will be prepared to take risks and have the courage to face the challenges that come your way. I am sure you shall make a positive change in the society around you and contribute to the nation building. I wish you a bright and prosperous future.

In the end, I would like to thank, Dr. Kirankumar and Dr. V. K Dadhwal for bestowing this honor on me.

Thank you very much.



Dr. Shailesh Nayak

Dr. Shailesh Nayak is currently Distinguished Scientist in the Ministry of Earth Sciences. He was the Chair, Earth System Science Organisation (ESSO) and Secretary to the Government of India for Ministry of Earth Sciences (MoES), between August 2008-2015. He provided leadership for the programs related to science of climate change, weather services, polar science, geoscience, ocean science and modeling, ocean survey, resources, and technology.

Dr. Nayak obtained Ph. D. degree in Geology from the M.S University of Baroda in 1980. He joined the Space Applications Centre, (ISRO) in 1978 as a scientist, and subsequently elevated as the Group Director of Marine and Water Resources. He was mainly responsible for conceptualizing, formulating and executing many national level projects related to application of satellite data on ocean color, integrated coastal zone management, snow and glacier studies and water resources and developed potential fishing zone services.

Dr. Nayak was appointed as the Director, Indian National Centre for Ocean Information Services (INCOIS), Hyderabad, an autonomous institution under ESSO, in May 2006. At ESSO-INCOIS, he set up a state-of-the-art Early Warning System for Tsunami and Storm Surges in the Indian Ocean. He was responsible for the conceptualization and development of Marine GIS. He made outstanding contributions in improving advisory services related to potential fishing zones, ocean state forecast, and Indian Argo project.

Dr. Nayak is the Chair, National SCAR Committee, Indian National Science Academy, New Delhi, Research Advisory Committees of the CSIR-National Environmental Engineering



Research Institute, Nagpur, ESSO-National Antarctic and Ocean Research Centre, Goa and Defense Terrain Research Laboratory, Delhi. He has chaired an expert group and conceptualized to establish National GIS in the country and been member of many national committees related to earth science, coastal protection, mangrove, coral reef, and coastal zone management.

Dr. Nayak is Fellow of the Indian Academy of Sciences, Bengaluru, the National Academy of Sciences, India, Allahabad, the International Society of Photogrammetry and Remote Sensing (ISPRS), and Academician of the International Academy of Astronautics, Paris. He has been awarded honorary degree of Doctor of Science by the Andhra University, Assam University and Amity University. Dr. Nayak is recipient of IGU - Hari Narain Lifetime Achievement Award in Geosciences-2013, the ISCA Vikram Sarabhai Memorial Award 2012, the Bhaskara Award for 2009. Eleven students have obtained Ph.D. under his supervision.

He is the President of the Federation of Indian Geoscientists Associations, Indian Geophysical Union, Indian Society of Remote Sensing and Indian Mangrove Society. He was the Chair, Regional Integrated Multi-hazard Early Warning System, the Vice-Chair of the Inter-Governmental Coordinating Group on Indian Ocean Tsunami Warning System; Indian Ocean–Global Ocean Observing System and Indian Ocean Observing System Resources Forum. Dr. Nayak was the President, ISPRS Technical Commission IV on 'Geo-databases and Digital Mapping' for the term 2004-08.

Dr. Nayak has published about 150 papers in peer-reviewed journals and delivered about 190 invited talks in national and international forums.





Dr. K. Sivan
Director, VSSC

Guest of Honour, Fifth Convocation, IIST



Indian Institute of Space Science and Technology

Fifth Convocation

Honorable Chief Guest, Dr. Sailesh Nayak, Former Secretary, Ministry of Earth Sciences, Dr. A. S. Kiran Kumar Chairman/ISRO, and Chairman/Governing council IIST, Dr. V K Dadhwal, Director IIST Members of IIST Governing Body, Governing Council and Board of Management, former Director of IIST Dr. K S Dasgupta, Degree recipients, Distinguished Guests, Ladies and Gentlemen Very Good afternoon to all of you;

It is indeed my privilege to address this august gathering on the occasion of 5th convocation and 10th year of inception of Indian Institute of Space Science and Technology. At the outset, let me congratulate the graduating students. This moment is the culmination of years of study, hard work and effort which all of you are going to cherish and be proud of in the rest of your life. It is a proud moment for your parents, teachers and all those who played one or the other role in leading you to success. The graduates of this institute over a period of time, I am sure would realise and recognise their competencies acquired during your stay in IIST. These capabilities would go a long way in the development of our nation, as space science and technology has an innate linkage with all walks of life.

Over the past five decades, DoS/ISRO has spear headed the achievements of modern India in science and technology especially in satellite communications, earth observations, navigation, disaster management and monitoring of climate and environment changes. Activities of Dos in these areas have aided the aspirations of our country in the fields of agriculture, forestry, communications, manufacturing, infrastructure, education, sanitation, tele-health care, management of natural resources etc. IIST which started functioning on Sept 14, 2007 in the campus of VSSC, is the youngest autonomous body under Dos. I am happy and proud that during its initial days, VSSC could extend all the



support needed for its functioning and expanding. In 2009, the institute shifted to its own beautiful campus in Valiamala. The institute was established with the mandate of grooming young talents in Space science and Technology who can contribute to future ambitious space programmes of the country. 'Catch them young and Watch them grow' was the moto that inspired the founders of this institute. Brilliant and enthusiastic students from across the country would converge here for learning and thereby would be equipped to transform India using Space Science and Technology as a medium. About 600 students of IIST have already been absorbed in various Dos centres and have started contributing directly to space programmes of the country. I am happy to see the creative minds forging ahead, building a great career in space science and technology. I am sure, these young talents will bring pride not just to IIST and ISRO but for the entire country.

I am glad that in the short span of 10 years, IIST has grown significantly in terms of various academic programmes relevant to space sciences, space technology and in basic sciences as well. Currently, IIST offers 15 post graduate programmes and PhD programmes apart from the three under graduate programmes. I am optimistic that graduates of these programmes will make significant contributions to different fields in Science, Engineering and Technology. Many young talented engineers and scientists from Dos/ISRO are being given opportunity to enrol for post graduate and Ph.D programmes of the institute. This is a boon to those who aspire for updation of their professional knowledge and improve on their career prospects. In addition, the institute is in the process of establishing excellent research facilities. I am happy that several research projects in high priority areas of ISRO, such as electric propulsion, high temperature materials, Li-ion batteries, sensors, robotics, remote



sensing, weather forecast, societal penetration of space technologies are in progress in collaboration with various ISRO centres. The road map for the institute for the coming decade has already been chalked out and I am sure, the institute with its rich intellectual resources and scientific enthusiasm is all set to achieve the goals within the stipulated period.

With great confidence, I would state that with its unique education model, IIST has created a niche for itself in terms of the quality of the academic programmes and the academic and research excellence of its faculty members. I am sure that with the continued support and encouragement from DoS, the institute will continue to grow and will occupy the rightful position with the elite educational institutions of the country.

My dear graduating students, country has assigned you the great responsibility of building an economically strong, scientifically progressive and technologically advanced nation. You have a great, exciting and challenging future ahead. Life is all about chances and opportunities. Never leave anything to chance and never let an opportunity get away. You must be the change you wish to see in the world. Let me quote Swami Vivekananda 'Take risks in life, if you win you may lead, if you loose you may guide. Fill the brain with high thoughts, highest ideals, place them day and night before you and out of that will come great work.'

I wish all of you a great future and may you be blessed with professionalism, courage, integrity, diligence, and wisdom to work towards the betterment of the people of our country and the whole world as well.



Indian Institute of Space Science and Technology

Fifth Convocation

Dr. K Sivan

Dr. K Sivan graduated from Madras Institute of Technology in Aeronautical engineering in 1980. He took his ME in Aerospace engineering from IISc, Bangalore in 1982. Subsequently, he completed his PhD in Aerospace engineering from IIT, Bombay in 2006.

He joined ISRO in 1982 in PSLV Project and has contributed immensely towards end to end mission planning, mission design, mission integration and analysis for all the launch vehicle programs.

During his career at ISRO, he has held many responsibilities like Group Director, Mission Simulations and Synthesis Group, Project Director, RLV-TD, Deputy Director, AERO and Structures and Chief Controller, VSSC. He was Director, LPSC from July 2014 till May 2015. He is Director, VSSC from June 2015 onwards and Member, Space Commission since August 2016.

He has contributed significantly in establishing a Parallel computing facility and Hypersonic wind tunnel facility. He evolved novel strategies for launching India's MARS mission endeavour through PSLV, ISRO's work horse. He also established a world class mission simulation facility which is being used for all the launch vehicle programs. He devised a novel day of launch wind biasing technique which has made rocket launch possible under any wind conditions.

He joined GSLV Project in April 2011 as Project Director after two consecutive failed launches with a mandate to demonstrate



the robustness and reliability of GSLV as well as flight demonstrate the Indigenous Cryo Stage. His leadership led to the historical achievement of most successful GSLV flight with indigenous cryogenic stage.

He has numerous publications in various Journals and is a Fellow of Indian National Academy of Engineering, Aeronautical society of India and Systems society of India.

He has authored a book “Integrated Design for Space Transportation System” published by Springer which highlights the end to end integrated design aspects, interactions between various systems and interdependencies of various launch vehicle systems. There is no other book published till date which presents the space transportation system design in an integrated manner.

He has received numerous awards throughout his career which includes Doctor of Science (Honoris Causa) from Dr MGR University, Chennai in March 2017, The Distinguished Alumnus Award 2017 from IIT Bombay in March 2017, Doctor of Science (Honoris Causa) from Sathyabama University, Chennai in April 2014, The Distinguished Alumnus Award 2013 from MIT Alumni Association, Chennai, Dr Biren Roy Space science award for the year 2011, ISRO merit award for the year 2007 and Shri Hari Om Ashram Prerit Dr. Vikram Sarabhai Research award for the year 1999.





Dr. Vinay Kumar Dadhwal
Director and Chairman, BoM, IIST



Indian Institute of Space Science and Technology

Fifth Convocation

Honorable Chief Guest, Dr. Shailesh Nayak, Distinguished Scientist and former Secretary, Ministry of Earth Sciences, most respected Shri A S Kiran Kumar, President, Governing Body, IIST, Chairman, Space Commission and Secretary, Department of Space, Dr K Sivan, Member, Governing Body IIST, Director VSSC and Guest of Honour in the convocation, Shri Somanath, Dr YVN Krihnamurthy and Dr P G Diwakar, members of the Governing Body of IIST, Dr K S Dasgupta, former Director, IIST, members of IIST Board of Management, Directors of ISRO Centers, Distinguished Guests, Degree Recipients and their proud family members, faculty of IIST, invitees including from media, Ladies and Gentlemen, a very good afternoon to all of you.

I deem it a unique privilege to welcome you for the Fifth Convocation of Indian Institute of Space Science & Technology on this special day which marks 10 years of our remarkable journey. In the forenoon IIST held a Consultation Meeting with all distinguished participants, stakeholders and faculty to take a stock of our accomplishments, lay down a road map for next decade and to rededicate ourselves to realization of the vision of IIST, namely, to be an educational and research institution of highest standards in the field of space science, space technology and space applications, and contribute to India's space endeavors. At this moment we also acknowledge great contributions by previous President and members of the Governing Board and Board of Management, former Directors, Deans and faculty, staff and in no less measure the past students.

It is indeed an honor to have amongst us a very distinguished Dr. Shailesh Naik, as Chief Guest to deliver the convocation address. Dr. Nayak started his career in 1978 at Space Applications Centre and after making immense contributions in use of earth



observations data in coastal zone management, water resources, snow and glacier studies, ocean colour and fisheries and succeeded Dr. K Radhakrishnan as Director, Indian National Centre for Ocean Information Services in 2006. He was instrumental in establishing a state-of-the art Early Warning System for Tsunami and Storm Surges in the Indian Ocean. He assumed the charge of Secretary to the Government of India for Ministry of Earth Sciences (MoES) in 2008 and also served as Chair, Earth System Science Organisation (ESSO) till 2015. He provided a dynamic and visionary leadership to scientific programs of ministry covering climate change, weather services, polar science, geoscience, ocean science and modeling, ocean survey, resources, and technology. He is Fellow of Indian Academy of Sciences, National Academy of Sciences, International Academy of Astronautics, International Society of Photogrammetry and Remote Sensing and has been conferred many awards, including Bhaskar award in 2009, Vikram Sarabhai Award in 2012 and Hari Narain Lifetime Achievement Award in Geosciences in 2013.

I am privileged to submit, on this Fifth Convocation day a brief report on the activities of the institute. However, before I do so, permit me to dedicate a moment in the memory of our former Chancellor, Padma Vibhushan Professor Udupi Ramachandra Rao, who passed away on 24th July this year. Dr. Rao was a technologist of highest caliber. He was a distinguished space technologist, with a fascinating grasp over a wide variety of subjects. Although his role as a Chancellor was brief, his association with IIST goes back to its foundation days. Prof Rao had a critical, yet silent, role in shaping our Institute, both in research and education, over the years. With his passing away the Institute has lost one of its guiding lights, as much as the nation has lost one of its leading lights in space research. IIST is fortunate to have had two illustrious technologists and visionaries as its chancellors. Much like our first Chancellor, Bharat Ratna



Dr. APJ Abdul Kalam.

The institute continues relentlessly on path of dedicated hard work and academic excellence. It was ranked **28th among all Engineering Institutions in the country (35th among all Indian Universities and 56th among overall category)** in April 2017 by the National Institutional Ranking Framework, set up by the Ministry of Human Resource Development (MHRD), Government of India.

It may be recalled that institute started its functioning on 14th September 2007 at its alternate campus at ATF area of VSSC. Since August 15 2010, it moved to its campus at Valiamala, on the foothills of the Sahyadri mountains. I am glad to share with you that two more academic blocks of the institute were inaugurated this morning by the Chairman, Governing Council, Shri A S Kiran Kumar. With this the academic blocks of the campus as per Master Plan are now complete.

Academic Report

The undergraduate programme forms the lynchpin of our academic activity at IIST. Currently, the undergraduate program comprises of BTech in Aerospace Engineering and BTech in Avionics, each with 60 seats annually and a dual degree program with BTech in Engineering Physics with 20 seats. Students of the Dual degree programme spend an additional Fifth year to acquire either Master of Technology degree in Optical Engineering or Earth System Sciences, or Master of Sciences in Astronomy or Astrophysics, or Solid State Physics.

Admission for all three undergraduate programs is open to Indian nationals through direct counseling of students, based on their performance in JEE(Advanced) conducted by the IITs. A total of 140 students were enrolled in July 2017.



The Institute started its post-graduate programs in the year 2010 with two programs. We are currently offering 15 Master of Technology/Master of Science programs. Admissions to the programs are based on the performance in national level examinations such as GATE or JEST, followed by an interview. This year a total of 85 students were enrolled for MTech and Master of Science programmes.

In order to enhance research output, the institute continues to strengthen PhD programme. Admissions are held in January and July. A total of 27 scholars were admitted to PhD and includes 4 sponsored candidates from ISRO.

A unique feature of the undergraduate program at IIST is availability of merit scholarship of all students who maintain a high CGPA, and an opportunity to be considered for absorption as Scientists/Engineers in ISRO. To encourage meritorious students, and to recognize their performance and hard work, a select few who have outperformed the others are chosen to receive the following awards, namely, the (i) the Chairman, Governing Council's Gold Medal, awarded to one student for best academic performance, (ii) the Director's Gold Medal for best All-Round performance covering academics as well as in extra-curricular activities, and (iii) Gold medals to the academic topper of each of the BTech programmes.

The cumulative enrolment of the institute on September 1 this year stands at 2016 with program-wise distribution as. Undergraduates 1582, post graduates 465 and doctoral enrolment 220. After degrees to be conferred in Fifth convocation, the total degrees awarded by the institute will be 1259, comprising of 931 BTech, 290 MTech and 38 PhD Out of successful BTech students 104 (out of 151 conferred degrees) were offered placement in ISRO in 2017. Thus a total of 775 BTech graduates from the institute have been placed in ISRO.



Students Activities

A Student Activity Board (SAB) under guidance of Dean (Student Activities) and with active participation of students through various committees and clubs provides a unique opportunity to showcase their talent and acquire soft skills. The students organize and manage an inter-collegiate cultural festival named “Dhanak” as well as an inter-collegiate technology festival named “Conscientia” every year. Conscientia2017, the eighth Annual Technology and Astronomy fest of IIST was organised in March 2017. Over 500 students from various other institutions participated in these two events. IIST also organised the Model United Nations with 50 participants, and an exclusive music and dance event called “Konchords”. IIST also publishes three creative magazines --- “Drishtikon” our annual newsletter, “The Sounding Rocket” a quarterly newsletter by the students, and “Surabhi” a magazine with contributions from the larger DoS community. Our students are also committed in social outreach programs --- “Nirmaan” is one such program under which a group of our students visit local schools to teach over the weekends.

Research Highlights

IIST utilizes a significant proportion of its resources in supporting research by its faculty under various schemes under watchful eye of Research Council which is Chaired by Dean (R&D). These schemes are Fast Track for newly joined faculty, IIST Projects and IIST-ISRO Projects. The last being coordinated by Advanced Space Technology Development Cell (ASTDC), which was established in September 2015, and is headed by a Chief Research Scientist.

With facilitation and coordination support by ASTDC, IIST faculty are currently engaged in 48 projects in collaboration with



and of interest to various ISRO centers. All these projects have shown considerable progress, let me name a few which have reached a stage of maturity. These include:

- Intrinsically conducting polyimide composites with CNT or graphene with good optical properties. (with VSSC)
- Flexible Wiping Substrate for SERS detection of explosives. (with VSSC)
- Development of carbon foam – CMC sandwich composites. (with VSSC)
- Comprehensive stationary plasma thruster diagnostics instrumentation. (with LPSC)
- Design and Development of High Performance Hydrogen Sensor (with IPRC)
- Development of Novel N₂O₄ scrubber system. (with IPRC)
- Design and development of a Ka band antenna system to be used for Cartosat 3 data reception. (with NRSC)
- Design and development of two ASICs. (with SCL)
- Surface engineering techniques for improving the life performance of ball bearings in ISRO spacecraft mechanisms. (with IISU)

In order to further augment research funds IIST has started applying for and attracting grants from scientific agencies through various competitive projects. I am glad to share with you that this portion of our research budget is seeing a steady growth, and in the last one year we have received approval for grants to the tune of 357 lakhs from agencies such as DST-SERB, MoES, and DBT.

As a result of all these efforts, the faculty and students published 150 peer reviewed publications and also filed 2 new patent applications, thus taking cumulative patent applications to 12.



I am happy to report that in response to Announcement of Opportunity by ISRO for Mars Orbiter Mission 2, one of the proposals by faculty and students of IIST, namely the Advanced Retarding Potential Analyzer for Martian Ionospheric Studies has been shortlisted to fly on the mission. The institute has earnestly started development and infrastructure activities to realize the payload.

I take this opportunity to congratulate our faculty whose contributions have been recognized in the scientific community, notably Prof. A Chandrasekar, Dean (Academics) & Registrar who has been awarded by the Aeronautical Society of India for the year 2014, Dr. Seena V, received the Young Scientist award of the Kerala State Council for Science Technology & Environment (KSCSTE), and Dr. Ambili K M for the Young Scientist award of URSI-APRASC, Seoul.

International Collaborations

IIST views international collaboration as a major step in enhancing our competence. I am happy to report addition of 3 international MoU. IIST and University with participation of ISRO centers would study design of an advanced space telescope in Visible and IR region. As part of MoU with University of Colorado, a consortium of Universities will build a nano-satellite with ionospheric payload and also establish a data reception centre at IIST. Specific role of IIST is to contribute C&DH sub-system. During a review at Colorado, last month, IIST students were able to participate and present their designs to the review team. The third MoU is for establishing a a Partner Group in IIST in collaboration with the Max Planck Institute for Radio Astronomy (Bonn, Germany) in the area of Galactic star formation with research funds provided by Max Planck Society...



The institute is in advanced stage for concluding a MoU with CalTech, USA for AAReST. This is a technology demonstration project for next-generation space telescopes which aims to demonstrate hardware and software solutions for the in-orbit, autonomous assembly and reconfiguration of modular spacecraft, carrying identical, active mirror segments.

Continuing Education

As a responsibility towards Continuing Education, IIST regularly offers short term courses in specialized areas to targeted participants from industry and academia with available expertise on campus, besides conference and workshops. These are usually held during our winter and summer vacations, so as to avoid any disturbance to our regular academic programs. To this end, last year we organized 12 such events in various topics, such as Nonlinear Control System Design, Deep Learning, Star & Planet formation, Applied and Adaptive Optics, to name a few.

Acknowledgements

IIST family would like to acknowledge the support received in abundant measure from the Department of Space, Government of India. I personally acknowledge the guidance and encouragement I have received from our beloved President, Governing Body and Chairman, Governing Council Dr A.S. Kiran Kumar, Members of the Governing Council, Members of our Board of Management, our Academic Council, the Boards of Studies of each department, and from all my colleagues, and extend my appreciation to the students for their academic



excellence, exemplary behavior and their contributions towards enriching the campus life.

Before I conclude, it is my duty to profusely thank our esteemed Chief guest Dr Shailesh Nayak, the President of Governing Body, Shri A S Kirankumar, the degree recipients and our distinguished guests for their presence here today.

To our passing out students, I would like to convey my heartiest congratulations and best wishes to each one of the 151 BTech graduates, 83 MTech and 11 PhD degree recipients, and the student toppers receiving the gold medals for their special achievements. The world awaits you and we remain eager to learn and applaud you on your future successes and achievements.

Thank You...



Indian Institute of Space Science and Technology

Fifth Convocation

Dr. Vinay Kumar Dadhwal

Dr. Vinay Kumar Dadhwal is Director, Indian Institute of Space Science and Technology (IIST), Trivandrum and Chairman, Board of Management IIST since July 2016. Previously he worked in ISRO (1983-2016), including as Distinguished Scientist & Director, National Remote Sensing Centre (NRSC) during 2011-2016. Other positions held by him include Associate Director, NRSC (2010-11), Dean, Indian Institute of Remote Sensing (IIRS), Dehradun (2004-2010), concurrently he was Director-in-Charge at UN Centre for Space Science Technology and Education in Asia and the Pacific (UN CSSTE-AP) as Director in Charge (2005-06; 2009-10) and Head, Crop Inventory & Modelling Division, Space Applications Centre (SAC), Ahmedabad (1998-2004).

He was associated with major achievements at NRSC in the area of earth observation applications including National Geospatial Portal BHUVAN, National Database for Emergency Management (NDEM), National Information System for Climate and Environmental Studies (NICES), Space-based Inputs for Sustainable Development & Planning (SISDP), Water Resource Information System (WRIS), Disaster Management Support Program, etc and in satellite data, acquisition and processing including realization of IMGEOS and ground station at Antarctica. He was responsible for strengthening field based and quantitative application and EDUSAT based certificate program in field of remote sensing. His scientific contributions include as Project Director, National Carbon Project (NCP, 2007-2016) in biogeochemistry of Carbon and in as diverse EO applications areas as agriculture, crop simulation models, forestry, geo-hazards, geo-informatics, hydrology, land cover/land use, land surface processes, meteorology and oceanography and has more than 270 peer reviewed papers as a co-author. His early studies on crop discrimination, mapping, crop yield



modelling was major contributor ISRO program on agriculture forecasting (1986-2004) and to final acceptance and establishment of a national centre by Ministry of Agriculture in 2012. He has co-guided 10 PhD students.

He has extensive international cooperation experience, as member/leader of Indian delegation to UN Committee of Peaceful Uses of Outer Space (UNCOPUOS), Vienna (2013, 2014, 2015), to Science & Technology sub-committee of UNCOPUOS, Vienna (2013-2015) and was Chair of UN COPUOS S&T subcommittee in 2016. He has been member/co-chair of Indian delegation in international cooperation meetings with US, Japan, ESA and China.

His scientific program management experience includes Co-Chair, National Spatial Data Infrastructure (NSDI) of DST (2011-2016), Governing Body/Council of Indian National Centre for Ocean Information Services (INCOIS, 2011-2016) and many State Remote Sensing Centre.. He was ISRO representative to the Board of Antrix Corporation (2013-16). Currently, he also serves in Board of Governors of APJ Abdul Kalam Technology University, Trivandrum, Member, Indian Institute of Management Society, Kozhikode, Governing Body of Indian Institute of Tropical Meteorology (IITM) Pune.

He is Member, International Academy of Astronautics (IAA) (2015), Fellow of Indian Society of Remote Sensing (2014) and Fellow, National Academy of Agriculture Sciences (NAAS), New Delhi (2007). He is past president of Technical Commission VIII of International Society of Photogrammetry & Remote Sensing (ISPRS) (2012-2016), Indian Society of Remote Sensing (2012-14) and Indian National Cartography Association (2013). He is serving as Editor of Journal of Indian Society of



Remote Sensing (Springer Publication) since 2010.

He is a recipient of many awards including ISRO Outstanding Achievement Award (2016), Satish Dhawan Award, ISRS (2012), ISRO Merit Certificate for contributions to application of remote sensing to crop forecasting (2006), ISRO-ASI Award for Space Applications by Astronautical Society of India (2005), Hari Om Ashram Prerit Dr Vikram Sarabhai Award for Space Applications by Physical Research Laboratory, Ahmedabad (1999), Indian National Remote Sensing Award of ISRS, Dehradun (1999), Young Scientist Medal of Indian National Science Academy, N Delhi (1989) and ISCA Young Scientist Award, Indian Science Congress Association, Calcutta (1987).

