भारतीय अंतरिक्ष विज्ञान एवं प्रौद्योगिकी संस्थान
Indian Institute of Space Science and Technology

सातवां दीक्षांत समारोह
Seventh Convocation

05 जुलाई / July, 2019

Convocation Address
Dr. Ajay Mathur

President, GB, IIST Address
Dr. K. Sivan

Chancellor's Address
Dr. B. N. Suresh

Director's Report
Dr. V. K. Dadhwal

Dr. Ajay Mathur
Director General
The Energy and Resources Institute
New Delhi

Dr B N Suresh, Chancellor, IIST
Dr K Sivan, Chairman of the Governing Council of IIST
Dr V K Dadhwal, Director of IIST
Distinguished members on the dais
Degree recipients, and parents of the degree recipients
Ladies & Gentlemen

It is an honour for me to be here with you on this momentous occasion of the 7th Convocation of the Indian Institute of Space Technology (IIST). I am extremely grateful to the Chancellor, the Chairman and the Director of IIST for their kind invitation to be here at this premier institution which is producing our space leaders for tomorrow.

The graduating Convocation is indeed special for each degree recipient – and for their parents. I especially want to congratulate all parents for the success of their children today; and I am sure that their successes of tomorrow will be a source of pride – for each degree recipient, for their parents, for IIST, and for me now, as well.

The degree that you obtain today obviously represents the culmination of a lot of hard work that each degree recipient has put in during their stay at IIST to learn all the information and knowledge that has been provided, and to convince your teachers that you have learnt it. I would not be exaggerating if I say that interaction between the degree recipients and your teachers during the past four years must have resembled – to some extent – an exercise in strategy. In this strategic exercise, both sides must have learnt from each other as your spent more time with each other, and figured out – in each course – what success means; how do you ensure that you are successful; the partnerships – with teachers and other students – that

make success happen; and the hard work that you have to put in to ensure success.

I would like to suggest that this learning – of the strategy of success – may be the most important learning that you take away from here, and which you will repeatedly use in your life ahead. It is also a learning that is becoming increasingly important in the world, as challenges change, as technologies change, and as institutions change. Your successes of tomorrow will be based on successfully overcoming the challenges of tomorrow; not of yesterday. Because….
Tomorrow will not be yesterday.

Forty years ago, when I graduated and received a degree in engineering, most of us in the graduating class joined the civil and engineering services, PSUs, or academic institutions. We did reasonably well – our graduating class includes people who have retired as Secretaries to the Government of India, those who have been CMDs of major PSUs, and a GOC of the Indian Army. I would argue that the rules for success in each of these professions are reasonably well established, and my batch mates excelled at ensuring success.

However, there were others who moved away from these better known tracks. They include the founder Director of a new IIT, a distinguished urban landscape architect, one of the world's foremost transport planners, and India's leading retail business consultant.

In each of these cases, they addressed new problems as they emerged – how do you create a new IIT that has to become, very quickly, as successful as the existing ones; how do you create visually pleasing and welcoming spaces

within the now-overcrowded cities of India; how do you design roads in Indian cities that are safe, inclusive, and yet carry every possible known mode of transport; and how do you create retail success in an economic environment where the cities are changing, incomes are increasing, and new forms of shopping – internet shopping for example – are emerging.

These examples – drawn from a single graduating class of 1979 – suggest that success today means overcoming challenges that did not even exist yesterday, because the reality of today is very different from the reality of yesterday. Indeed, the changes that we are seeing accelerate day on day. In short….
Tomorrow will not be yesterday.

The challenges of tomorrow will be different, and so will be the information, knowledge and technology that you will use to address these challenges. Yet, the fundamentals of learning, which you have imbibed at IIST, will remain the same, and you will use them to address the challenges of tomorrow.

Forty years ago, when I graduated, we were moving from slide rules to handheld electronic calculators to carry out engineering design calculations. Mainframe computers were around, but not easily accessible to undergraduates. Today, the phones that we carry have computing power which is several orders of magnitude more than that of the mainframe computers on which we had to beg, borrow or steal time.

The challenges are also different. In the electricity and transport sectors, the key challenge for consumers – whether households or businesses, was to get enough

electricity, and enough diesel and petrol. And no matter how many power plants and refineries that we built, the shortages kept getting larger – the demand was increasing at a pace which was faster than the speed with which we put up new power plants and refineries. And as a result, the numbers of new light bulbs and air conditioners, and trucks and two-wheelers, were limited, as was their usage, as consumers thought twice about investing in, and using energy-based appliances. This obviously hampered productivity and incomes, and set up a vicious cycle of low supply, low demand and low growth.

Over the years, we licked that challenge. The institutional changes of 1990 brought us on to a path where today, electricity generation capacity exceeds economic demand, and the trucking and two-wheeler manufacturers face insatiable demand, with of course, ups and downs.

But these successes have also brought with them the new challenges of urban air pollution, traffic congestion, and of climate change. These are but a few of the new challenges that you will face, and it is through overcoming these new challenges– and challenges that we do not yet foresee– that you gain name and fame. Again, remember….
Tomorrow will not be yesterday.

In both these sectors – electricity and transport – major changes are in the process of happening. In the electricity sector, renewables are nudging coal as a possible key source of electricity. Already, solar and wind electricity, at less than Rs.2.8 per kWh, is cheaper than coal electricity at Rs.3.5 per kWh. However, solar and wind electricity are available only when the sun is shining and the wind is blowing. On the other hand, the demand for electricity, as we become richer, peaks at about 8-11 PM at night in the

and humid days of August and September when we switch on our ACs as we come home, and proceed to go to bed. This is when only 10% of households in Delhi, the richest state in the country, have ACs. Clearly affordable electricity storage – through which electricity generated in the day can be stored for use at night – is the answer.

The space sector has been a leader in electricity storage technology, which has been at the heart of our ability to operate in space. I look at you, the graduating class of 2019, to provide us answers to this new challenge. You may also pivotal in providing space-based applications to manage, in real time, an electricity system that will become increasingly dependent on natural resources such as sunlight and wind, and more and more based on the digital management of information from both demand and supply points. Remember….
Tomorrow will not be yesterday.

In the transport sector too, changes are beginning to happen. Electric buses and two-wheelers are now cheaper than diesel or petrol driven options, but challenges remain. Electric vehicle, or EV, options are already cheaper than the internal combustion engine – or ICE – options, but only over the lifetime of the vehicles. The outright purchase cost of an EV bus or EV two-wheeler, with batteries, is still more than that of the ICE options. However, over its lifetime, the cost of charging the battery is much less – possibly a third – of the cost of refueling aICE bus or two wheelers to move over the same distance.

I believe this is a battery cost issue – the batteries have to cost less than half of what they do today; a business model issue – the cost of batteries has to be decoupled from the cost of a new EV; and a management issue – EVs and

charging points will need to find each other, optimized in real time geographic and financial information. These are new challenges, waiting for you and your cohorts, to address them, so that we can move on to the next steps in our search for a cleaner world. Tosummarize….
Tomorrow will not be yesterday.

I congratulate you and your parents, and the IIST family on your degrees and wish you well as you go out into the world with the learning that you have attained, and more importantly, the strategy to obtain learning and move towards success because, as you know….
Tomorrow will not be yesterday.

Thank you

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Dr. Ajay Mathur

Director General, The Energy and Resources Institute, New Delhi

Ajay Mathur is the Director General of The Energy and Resources Institute (TERI), New Delhi, and a member of the Indian Prime Minister's Council on Climate Change. He earlier headed the Indian Bureau of Energy Efficiency, and was responsible for main streaming energy efficiency in houses, offices and industries through a number of innovative initiatives. He was a leading climate change negotiator, and was the Indian spokesperson at the Paris climate negotiations. He served as the interim Director of the Green Climate Fund during its foundational period.

At TERI, he has spearheaded the move to accelerate action towards a low-carbon and cleaner economy through the adoption of renewable energy in the Indian electricity sector, enhancing efficiency in buildings and industry, and promoting environmental quality through recycling of material wastes and biotechnology-based solutions.

He co-chairs the global Energy Transitions Commission.

Dr. K. Sivan

President, Governing Body, IIST
Secretary, DoS / Chairman, ISRO

Honourable Chancellor of IIST, Dr BN Suresh, Chief Guest of the day Dr. Ajay Mathur, Director, IIST, Dr VK Dadhwal, Director, VSSC Shri. Somanath, Director, LPSC Shri. Narayanan, Deans, Professors and other members of teaching and non-teaching community, distinguished invitees, dear students and their proud parents, friends from the media, ladies and gentleman, a very good afternoon to you all.

I consider any opportunity to visit Trivandrum as a call from my karma bhoomi.In addition, convocation is such a happy occasion to visit. I can see in front of me the next generation of scientist and engineers who will give shape to the dreams and aspirations of a billion people.

The vision behind IIST was to create a unique learning environment enriched by the challenges of the Indian Space Programme while nurturing the spirit of innovation and creativity, which are the bedrock of our Space Programme. Moreover, let me tell you that IIST alumni are doing great work in tackling innovative challenges of the Indian Space Program.

All of you have gone through your respective courses of studies. You are now ready to face the exciting world out there. You have to be an important part of the nation building process. I wish all of you graduating today a very successful career ahead. I would also congratulate the teachers who in their own way have contributed in shaping the young minds. Most importantly, I would want to

congratulate the parents. Actually, the parents remember convocation day much more than students.

As I distinctly see the sparkling eyes in front of me eagerly waiting to be bestowed as Graduates of this University, and behind these sparkling eyes, I see the energy of hundreds of youth. This energy is capable of creating thousands of paths with millions of opportunities for national development. National development will not only require effort but also knowledge and wisdom, which this college has given you.

I come from a humble farming family from Nagercoil, Tamil Nadu. I studied in Tamil medium government schools. All my college education was also in Government colleges. And, I have spent more than three decades in ISRO. One thing, which I can tell you from my experience, is that ***life and career is not about making best choices in life but is about making the best of the opportunity available to you. I also understood that when something is denied to you, something bigger is waiting for you***. As Dalai Lama has said " Sometimes not getting what you want is a wonderful stroke of luck."

Tomorrow, when you roll-up your sleeves to take on the challenges of the Nation building process, there are three things which will play major role in your life

- Asking the right questions
- Innovation or lateral thinking
- And ability to take calculated risk

Voltaire famously said,"Judge a man by his questions rather than by his answers." Asking questions is an important element of ISRO culture. Right question at right time can make a big difference in design stage or in a project. When you ask a question, you have to know what you want for an answer

- Do you want a factually correct answer?
- Do you want an expert opinion?
- Do you want a well-reasoned judgment?

You have to ask your questions in a manner that gets the right response. Asking great questions is a skill, which requires you to be well informed on the subject matter.

Innovation and lateral thinking is essential in leapfrogging to achieve greater heights and success. All the discoveries, inventions and benefits we are enjoying now are the outcome of lateral thinking, innovations and accidental discoveries at one point. And, the initial outcomes of innovation are imperfect. – I need not tell you, how many times Edison failed in inventing the light bulb. Trying out new things for the first time always comes with a risk of failure. If we are afraid of failure and don't want to take risk, innovation cannot happen.

Therefore, my advice to all of you is to take risk of innovation without being afraid of failure. Failures will be there, but each failure will be a learning opportunity to take the next step of innovation. The choice is between remaining in the comfort zone or to come out and take risks.

If you select to be always in the comfort zone, then in the end you will be losing the game.

If you observe closely, you will notice that ISRO's philosophy has always been to grow by leaps and bounds. This growth is not possible by conventional methods but only through risks and innovation. The very business of launch vehicle and satellite is extremely risky. Calculated risk along with innovation are must if you want to be a major player in space industry.

On 15th July, this year Chandrayaan-2 will be launched on-board GSLV Mk-III. It is a lunar soft landing mission and has a rover. The landing site close to South Pole is a place where no one else has gone before. We know that more than 50% lunar soft landing missions have failed. Over and above, GSLV-Mk-III is also a new launch vehicle. But, we are taking a calculated risk and are confident that mission will be a success.

Prime Minister has given a very stiff schedule to demonstrate human spaceflight capability. To accomplish this, ISRO created a new vertical on human spaceflight. A new Human Spaceflight Centre has been established for the task. All of you have great opportunity to work on many exciting things.

Similarly, indigenization of avionics used in launch vehicle and satellites is an area where there is a big opportunity for all you budding engineers to contribute.

In addition, there is vast scope in application development for NAVIK, Remote sensing as well as communication domain where there is an urgent need to scale-up the services, which requires not only application development but also readiness of the ground segment.

While opportunities may excite you, you must always keep the National demand from Space technology in your vision. **Our country is facing many challenges and space technology offers many solutions to ensure the safety, security and quality of life of people of India.** All of you from different disciplines can contribute equally in nation building. Only you will have to adopt a multi-disciplinary approach in solving these problems.

Do not throw your crazy ideas away. Those "crazy" ideas are where most of the world's most successful innovations come from. The people who succeed in realizing their crazy ideas do so because they let themselves believe that a crazy idea could be a reality.

Moreover, keep learning. Education is a lifelong process. Never ever, think that you have learnt it all and you know everything.

In the end, I will again say, shoot for the moon. Even if you miss, you'll land among the stars. Spread joy. Chase your wildest dreams. And now go, and make interesting mistakes, make amazing mistakes, make glorious and fantastic mistakes. Break rules and make the world a more interesting place. Thank You All.

--------Jai Hind-------

Dr. K. Sivan

Born on April 14, 1957 in Sarakkalvilai, Nagercoil in Kanyakumari district, Tamil Nadu and hailing from a humble family background, Dr. K Sivan is the Secretary, Department of Space / Chairman, Space Commission & Indian Space Research Organisation since January 15, 2018.

After obtaining Mathematics Honours degree from Hindu College, Nagercoil, 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. Since then he has significant contribution in PSLV, GSLV and GSLV Mk-III Vehicle design. He has more than 30 years' experience in the systems engineering of space transportation system, leading diverse project teams for large and complex projects and experience in technology development and infrastructure set-up for ISRO's launch vehicle programs.

He revived GSLV Program after two consecutive failures. Now the GSLV program is on track with consecutive successful launches using indigenous cryogenic stage.As Project Director of Re-usable Launch Vehicle Program, he contributed significantly in all aspects of vehicle and mission design including successful flight demonstration.The SCRAMJET engine flight test under

hypersonic conditions was successfully flight tested under his leadership.He led the mission team in the planning of historic launch of 104 satellites in PSLV C37.

He is the chief architect of 6D mission simulation software SITARA and also Day of Launch Wind biasing strategy. This enables launch in any wind condition.He has established many strategic facilities for supporting the launch vehicle development program, some of these are Mission Synthesis and Simulation Facility, Parallel computing facility and Hypersonic Wind Tunnel Facility. He has contributed significantly in improving the mission versatility of PSLV as well as improving the robustness of GSLV Mk-III.

Based on more than 30 years of experience in Launch Vehicle systems, he has authored a book "Integrated Design for Space Transportation System" published by Springer which highlights the end to end integrated design aspects and interactions between various systems of launch vehicle systems.

Dr. K Sivan is a Fellow of Indian National Academy of Engineering (INAE), Aeronautical Society of India (AeSI), Systems Society of India (SSI) and Indian Systems Society for Science and Engineering (ISSE).

He has received numerous awards in recognition of his contributions. Some of the major awards are ISRO award for outstanding achievement for the year 2016,

Shri Hari Om Ashram Prerit Dr. Vikram Sarabhai Research award for the year 1999, ISRO merit award for the year 2007, Dr. Biren Roy Space science award for the year 2011, The Distinguished Alumnus Award 2013 from MIT Alumni Association, Chennai and The Distinguished Alumnus Award 2017 from IIT-B, Mumbai. Besides this he has been conferred with Honaris Causa from many prestigious universities.

Dr. B. N. Suresh
Honourable Chancellor, IIST

Chief guest of the Convocation Dr. Ajay Mathur, DG TERI, Delhi, Dr K. Sivan, Chairman, ISRO, Dr VK Dadhwal, Director, IIST, Members of IIST Management Board, Directors of ISRO Centres, invited guests, Deans and Faculty members of IIST, my dear young friends and their proud parents, Ladies and Gentlemen; To stand before you today and preside over the 7th Convocation of IIST is a very special honour for me. It was almost nine years back i.e on 15th August 2010 we moved to a new campus of IIST at Valiamala by hoisting a flag on Independence Day with a big dream that this Institution would grow as a world class Institute.

Hearing to the report of Director IIST, I feel extremely gratified to notice that the Institute has been making great strides all round, particularly in the area of Space Science and Technology. The institute has distinguished itself as a pre-eminent institution for technological study and research. It is the hard work, devotion and dedication of the all students, faculty members, staff and vision of the management, responsible for this notable achievement. I feel quite satisfied that several batches of students who graduated from this Institute have been contributing very effectively in many of the complex programmes of ISRO including the Chandrayaan 2 which is slated for launch in the next 10 days and also for the very exciting Gaganyaan and thus fulfilling the original objectives. Not only many of our alumnus have made considerable impact in various programmes of ISRO but quite a few have moved out and have been making significant contributions in several

widely varying fields all over the globe including a few successful start-ups .

Let me take this opportunity to convey my warm greetings and congratulations to all of you who will be receiving your graduation certificates today. Those of you who graduate today will join a band of alumni who will continue to remember your joyful four years spent here, your academic experiences, your friends and favourite teachers. Sometimes it is amusing too when you recall your tantrums, tough courses, surprise quizs and many more such exciting activities, which are no doubt essential ingredients for acquiring your degree and at the same time it has been a formidable obstacles race for all of you. But we all know that it will not end here, until you feel fully confident of meeting uncertainties of future challenges, dealing with successes and failures that you may face in future with a positive attitude.

Learning has to be a continuous process and that learning should lead to application of our knowledge for the upliftment of down trodden and betterment of society. Swami Vivekananda, one of the great sons of India, too stresses the same in his teachings. He stipulates that I quote "the experience is the greatest teacher in this world. The learning should continue till our last breath. Gaining knowledge should be our prime aim as we move on, in our lives" unquote. We are aware that mere accumulation of basic knowledge is of limited practical use, unless we translate our learning into tangible output, providing economic or social value. Hence, we need to seriously think how to transform the knowledge gained over a period into

practical use. It is also told that education which does not enable a person to stand on his own feet, does not teach him/her self-confidence and self-respect, is not of much use. Positive education is the catalyst to learn newer and newer things. When it happens it helps us to gain self-confidence; self-respect and ultimately helps us to use our learning effectively for nation building.

No doubt each one of you has different dream, but surely you should never give up your dreams and aspirations, which will drive you to higher levels of achievements. You have many choices ahead, like embracing a career, entering into management or administrative services, becoming an entrepreneur etc where you would like to shape an excellent and bright future. Ultimately, one should choose a path where one derives an eternal satisfaction and bliss. To achieve the same we need to have perseverance and continuously perspire. I want to recall the words of Dr. APJ Abdul Kalam our beloved first Chancellor I quote "in order to shine like a sun first we need to learn to burn ourselves like a sun" unquote.

As you enter into a new world, which is an unknown territory, it will be certainly more exciting but at the same time challenging too. It is natural that as we take up new assignment we are bound to face a number of challenges. Any such new challenge is a new opportunity. One can treat a challenge in two ways, either run away from a perspective of helplessness or take head on based on one's own belief. But when we put our weight on our belief, we remain consciously optimistic and gives us courage to face the challenges. Once we accept a challenge, we step into the world of the unknown and it provides opportunity to learn new things. It has a potential to change us forever. We need to seek the right solutions to

the challenges we face. With the right mental attitude, one can certainly succeed in meeting the challenges.

My dear young friends, You will be shaping the future of this nation. We have a very healthy growth profile in the country for the past several years and as we march towards becoming a developed nation, the role of youth becomes increasingly important. One of the mental hurdles we have is that we rarely aim to set higher targets and bigger goals. Again in the words of our first Chancellor: I quote "All technological advancements we have today are the outcome of scientific exploration of scientists of several decades and centuries. At no time, man was beaten by problems. He strives continuously to subjugate impossibility and then succeeds" unquote. Therefore, if we consider the targets set for the country like eradication of poverty, health for all, education of all, power for all and higher standards of life for all our fellow countrymenetc. are to be achieved in shorter period the active role of youth is imperative.

My young friends, one question which bothers all of us is how to achieve the success as we proceed. In India we keep on complaining on many of the problems we face and also on scarcity of certain things. Instead of complaining, why not we consider them as plenty of opportunities and attempt to find the right solutions. This certainly helps us in setting a goal. To achieve the goal we need to have aspirations coupled with the hard work. Let us all make sincere attempts to achieve the goal silently. No doubt we achieve success as and when it happens it creates noise.

The failures should not deter us. Use the failures to learn great lessons which you would not be able to learn otherwise. Again working in the space department we

learnt everything only through failures. I recall the frustration we went through when we failed successively in two of our ASLV launches in the initial stages of the development. We were able to learn most of the rocket science lessons through these two failures and laid a firm foundation for all the successes we are witnessing today.

Most of you are going to work in the area of rocket science soon. The very word rocket science signifies that it is highly complex and difficult to achieve success. Whenever we launch a satellite from Satish Dhawan Space Centre, Shriharikota, it takes about 18 to 20min for the vehicle to travel approximately about 6000 plus KM across the globe carrying out thousands of operations autonomously before injecting the satellite in the precise orbit. The success is possible if only we master the art of visualizing the invisible. In other words we need to visualize all failure possibilities and make necessary provisions to overcome the problems. We can always make seemingly impossible into possible. But it demands, creative thinking, systematic planning and addressing all eventualities.

In the present world almost every domain demands working in multidisciplinary environment. Geographical boundaries between disciplines have vanished. Therefore to achieve success we need to develop necessary skills to easily bridge the gaps between disciplines.

Team work is another buzz word. Debate and discussions amongst our peers, colleagues are highly essential. Never run away from the difficulties; I am reminded of Albert Einstein, who observes; “In the middle of difficulty lies opportunities”. Also it is important to be optimistic and Winston Churchill says; “The pessimist sees difficulty in every opportunity, the optimist sees opportunity in every difficulty”.

It is truth, when I say that the future is not so predictable. The real truth is the change is certain and that change should lead to enable us to have a sustainable living on earth. Our forefathers have left a beautiful Earth planet for us to enjoy. We need to shape a sustainable future for our next few generations. Hence, it is our moral duty that we should optimally use the available resources through a sustainable development model which demands conservation of resources and creating healthy environment for future generations. It is equally important to have a balance between economic growth and industrialization and ensure that they are sustainable. Therefore, one of the biggest challenges to all our young friends is to prepare a an action plan for a sustainable development. We need to create a blueprint to bring in significant progress in every domain of agriculture, industry, infrastructure, information technology, so on so forth and ultimately guarantee a healthier society.

These are all difficult propositions and we need to face such tough situations with grit, determination and our own imagination. So my young friends, choose to uphold the legacy of this Institute which has moulded you all these years. Choose a destiny close to your heart, contribute in your own way which will aid to change India. Also take an oath to reach where no one has before, but at the same time your action has to be such that which no one has attempted to do before.

My young friends, this is the message I want to convey to exemplify the spirit of this august occasion. Finally I conclude by conveying my very best wishes to each one of you and I earnestly hope that all of you will have a very bright career in ISRO or anywhere else in India so that you become instrumental in transforming the country as a developed nation very soon.

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Dr. B. N. Suresh

Dr. BN Suresh is presently, Chancellor, Indian Institute of Space science and Technology, Thiruvananthapuram and President, Indian National Academy of Engineering (INAE), Delhi, a premier Engineering Academy of the Country. He is also Honorary Distinguished Professor at ISRO HQ, Bangalore, member of Board of Governors, IIT Madras, Chairman, Governing Council, MVJ College of Engineering, Bangalore.

After his degree in Science and Engineering from Mysore University he took his Post Graduate degree from IIT Madras. He got his Doctorate under Commonwealth Scholarship in Control Systems from Salford University, UK. He joined Vikram Sarabhai Space Centre, Trivandrum in 1969 and discharged several responsibilities before taking over as Director, Vikram Sarabhai Space Centre in 2003 and served four and half years till end November 2007. He took over as Founder Director for the newly established Indian Institute of Space Science and Technology (IIST) at Trivandrum in 2007 and served for three and half years till Nov 2010. He was instrumental in establishing this world class Institution. He was Member, Space Commission for four years. He served as Vikram Sarabhai Distinguished Professor for 5 years from 2011. He was also distinguished Professor at IIT, Bombay and MIT Manipal.

He is a fellow of several professional bodies like Indian National Academy of Engineering (INAE), Indian National Science Academy(INSA), Delhi, Astronautical Society of India(ASI), Aeronautical Society Of India (AeSI) Indian Society of systems for Science and

and International Academy of Astronautics (IAA) at Paris. He is also Fellow and past President for System Society of India (SSI).

He was well recognized in the internationally too. He was Head of Indian delegation for the United Nations Committee for space on Peaceful Uses of Outer Space at Vienna, Austria during 2004-07. He was elected as Chairman of the prestigious United Nations Scientific and Technical Committee for the year 2006 from the Asia Pacific Countries. He was Vice-President for S&T Committee for International Academy of Astronautics (IAA), Paris and Chairman for the selection of members in S&T area for IAA for five years.

He has delivered several prestigious guest lectures like, Ramanujam memorial, Vikram Sarabhai memorial, Dr. Srinivasan memorial, Satish Dhawan memorial and many more in prominent Institutions and national conferences. He has given invited lectures at several International Institutions like, California Institute of Technology, Pasadena, European Space Policy Institute, Paris, Space Institute at Strasbourg, United Nations conferences at Vienna, NASA conference on Project Management at Houston, USA and many more.

He has won several awards & honours and prominent among them are "Dr. Biren Roy Space Science design Award" from Aeronautical Society of India, "Agni Award" from DRDO for achieving the self reliance, "ASI Award" for contribution to space technologies, by Astronautical Society of India. "Distinguished Alumni Award" from IIT Madras, "Ramanujam Award" by PSG Institute of Technology for System Engineering, "Outstanding Achievement Award" by Department of

Space, Govt of India, “Lifetime Contribution Award” in engineering by Indian National Academy of Engineering (INAE) for his significant contributions for space technologies, “National Systems Gold Medal” for lifetime contributions to large systems from System Society of India , “Aryabhata Award” by Astronautical Society for his invaluable contributions for aerospace developments, “Karnataka State Rajyotsava Award” for Science & Technology, the top award from Government of Karnataka, “MR Kurup Endowment Award” by Centre for Indian Consumers Research, Trivandrum, for outstanding contributions in space education and research and “Life time Achievement Award” from Karnataka State Science the and Technology Academy,"Sir M Visweswariah Science Award”,by Karnataka Vijnana Bharathi for his outstanding contributions to Space research and education and “Lifetime Achievement Award” by ISRO, Government of India, in 2016, in recognition of lifetime contributions to the Indian Space Programme. Recently he was awarded “Global Pioneer Award” at Washington DC, for his pioneering contributions in system engineering by International Council of System Engineering.

In recognition of his meritorious contributions for Science and Technology, Govt. of India conferred on him third highest National Award “Padmasree” during the year 2002 and Second highest Award “Padma Bhushan” during the year 2013.

Dr. V. K. Dadhwal

Director and Chairman, BoM, IIST

Most Respected Chancellor, Dr. B. N. Suresh, Chief Guest of Seventh Convocation, Dr Ajay Mathur, Director General, TERI, Dr. K. Sivan, President of the Governing Body of IIST Society and Secretary Department of Space and Chairman Space Commission, Guest of Honor Shri S Somanath, Director Vikram Sarabhai Space Centre (ISRO), Dr V Narayanan, Director, Liquid Propulsion Systems Centre (ISRO), 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.

It is my privilege to welcome you all to the 7th Convocation of our Institute. As we march into the thirteenth year, we take this occasion to recollect some of our notable achievements and progress over the last one year, and to share with you our goals. This year the convocation has been advanced nearly a month, to confer on you the well earned degrees and give you the early start to the next phase of your professional career.

It is an honor to have amongst us Dr Ajay Mathur, Director General of The Energy and Resources Institute, widely known by its acronym TERI. Dr Ajay Mathur is a very distinguished technocrat with many accomplishments and contributions in his career. He obtained his BTech in Chemical Engineering from IIT Roorkee and Masters and PhD from the University of IIlinois in USA. He worked at TERI during 1986 to 2000 in the Energy Engineering

Division. Subsequently he headed the World Bank Climate Change Team in Washington. He was President of Suzlon Energy Limited, also headed the interim Secretariat of the Green Climate Fund. As Director General of the Bureau of Energy Efficiency in the Government of India from 2006 till February, 2016, he is singularly responsible for bringing energy efficiency into our homes, offices, and factories, through initiatives such as the star labelling programme for appliances and many other innovative programs. He has been awarded the distinguished alumnus award by the University of Illinois as well as IIT Roorkee. Dr Ajay Mathur was key negotiator and Indian spokesman in Paris negotiation on Climate in 2015 and currently a member of Prime Minister's Council on Climate Change, co-chair.

Academic Report

IIST currently offers BTech in Aerospace Engineering and BTech in Electronics and Communication Engineering , each with 60 seats annually and a dual degree program with MTech in Engineering Physics with 20 seats. The first batch of students of the Dual degree program who have successfully completed the BTech in Engineering Physics and MTech either in Optical Engineering or Earth System Sciences, or Master of Sciences in Astronomy or Astrophysics, or Solid State Physics are receiving their degrees today.

Admission for all three undergraduate programs is open to Indian nationals based on their performance in JEE(Advanced) conducted by the IITs. A total of 140

students were enrolled in July 2018. In this 7th convocation 142 students will be conferred with B Tech degree, out of which 56 students will be graduating in Aerospace Engineering, 56 in Electronics and Communication Engineering (Avionics) and 30 students of the Dual degree program. The Institute has 99 faculty members on rolls, many of them globally acknowledged for their research contributions. IIST has recruited 4 new faculty members since the last convocation in the departments of Avionics, Earth and Space Science (ESS) and Physics. Our student to faculty ratio remains under 10 in comparison to AICTE norm of 1 to 20.

IIST continuously strives to introduce new areas and innovations in its academic programmes. The departmental Board of Studies (BoS) review, monitor, evaluate and revise the pedagogy. Choice based credit system (CBCS) has been implemented, where the students have the option to choose specified number of electives from other Department in their 6th and 7th semester. New institute electives on (i) Bio-Astronautics, (ii) Space Economics and Policy and (iii) Entrepreneurship and Innovation are planned to be introduced in this academic year.

Initiated in the year 2010, with two MTech programs, IIST currently offer 15 Master of Technology/Master of Science programs. Admission 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 68

non sponsored and 9 sponsored students were enrolled for MTech and Master of Science programmes. Today M Tech degrees will be conferred on 71 students of which 23 students are from three M Tech programs of Aerospace department, 25 students from five M Tech programs of Avionics department, 5 from Dept of Chemistry, 8 from the Department of Earth and Space Science, 6 from Mathematics department, 1 from Physics and 3 students from a Master of Science program from the Department of Earth and Space Science. The Institute encouraged MTech students to take up MHRD - Massive Open Online Courses (MOOCs) where classes are delivered through NPTEL online portal.

Admission to PhD program were held in January and July based on test and interview and is restricted to those candidates who have qualified GATE/UGC/CSIR NET-JRF/JEST or equivalent exams. During this period, 35 regular students have registered for PhD, and 17 ISRO scientists are pursuing their PhD along with their regular responsibilities at their respective centres. Ph D degree will be conferred today on 12 students from all the seven departments.

Institute gold medals are given to the best academic performer of the undergraduate and postgraduate programs and excellence certificate and a cash award is given to the topper of the other BTech branch and also for the best outgoing student. Garima Agarwal of BTech in Aerospace Engineering is awarded the coveted Gold Medal

for topping all BTech. branches and Rwitika Chatterjee of the Dual Degree program who has completed her Master of Science in Astronomy & Astrophysics is awarded the Gold Medal for topping all PG specializations. Excellence certificate and a cash award for the student who has secured Best academic score in ECE(Avionics) goes to Sri Ankit Verma, while Garima agarwal, BTech in Aerospace Engineering is selected as the best all-round performance in the UG Programmes. The toppers of Aerospace Engineering and ECE(Avionics) are also offered an opportunity to undertake their Masters' at the world renowned California Institute of Technology (Caltech), USA. The above 9-months Masters' course is financially supported under the DoS-Caltech Professor Satish Dhawan Endowment Fellowship. On return these students would be absorbed in ISRO.

The cumulative enrollment of the institute as on September 1, 2018 stood at Undergraduates 1724, post graduates 506 and doctoral enrollment 294. After degrees are conferred in this convocation, the total degrees awarded by the institute will be 1677, comprising of 1154 BTech, 30 dual degree, 424 MTech and 69 PhD. A total of 845 graduates from the institute have joined ISRO so far and placement of the next batch would be of 104 BTech scheduled for tomorrow i.e., July 6, 2019. This would take cumulative ISRO absorption from IIST to 949.

Governance and compliance

IIST is committed to adopt various directives from UGC

and AICTE. Thus digital payment has been enabled. UGC guidelines for PhD through common entrance test introduced. MoU has been signed with NSDL as part of National Academic Depository (NAD) of MHRD and all degrees of 5th and 6th convocation are available for digital verification. MoU was also signed with INFLIBNET and uploading of PhD thesis on web portal Shodganga has also been initiated. Consequent to approval of AICTE for BTech and MTech of IIST, PG student registration on AICTE portal has become operational and last year MTech students were awarded fellowship by AICTE. Induction program was conducted for freshers based on the guidelines of AICTE.

Peer review committee visit

A peer review committee constituted by Chairman, ISRO and Secretary DoS visited IIST from 31st October 2018 and 1st November 2018 to review its 10 yrs of work and to suggest new path ahead. The committee was headed by Dr. P S Goel, Former Secretary, Ministry of Earth Sciences, Govt. of India and had Prof. P Majumdar, Deputy Director, IIT Bombay, Prof. K P J Reddy, Dept. of Aerospace, IISc, Bangalore, and Dr Ganganprathap , Outstanding Scientist, CSIR as members. The Expert Team visited the concerned Departments, laboratories and other facilities, interacted with the faculty, staff, students and alumni. The final report of the Committee was submitted to President IIST GB/Secretary DOS has been discussed in great depth on 19 March 2019 in 3rd Governing Council and on 27 June 2019 in the 20th Board of Management meeting. Enhanced research, closer collaboration with ISRO, more participation from all stakeholders, improved infrastructure and next level of achievements are expected after implementing these recommendations.

Space Technology and Research

IIST has established a number of advanced research laboratories as well as Centers of Excellence. With completion of first phase new and upgraded laboratories in form of Centers such as Advanced Propulsion and HIgh Speed Flows, Nano-science and Energy Materials, Small Spacecraft and Payload Centre (SSPACE), Nano-MEMS Optoelectronics and Multi-disciplinary Computing Centers are at various stages of realization. While a ground station with UHF and VHF antenna has become functional for receiving data from satellites. A new HPC with GPU, servers and parallel computing power of 18 teraflops has become functional in multi-disciplinary computing centre.

With a focus on being academia support to Indian space program IIST has very close linkage with various centers and units of ISRO which also provides unique opportunity to our students undertake internships in ISRO centers. In all 42 IIST-ISRO projects have been taken up since 2016. I mention only a few of the very near completion and successful projects, "Design and Development of High Performance Hydrogen Sensor" in collaboration with IPRC. The fabricated sensor has very low response time and superior performance as compared to the available sensors in the market. Similarly discussions are on with SAC and SCL to develop a QM module of Gas sensors with multiple gas measurement capability for upcoming Human Space Program.

Project with IISU on "Surface Engineering Techniques for the improved life and performance of ISRO Spacecraft Mechanisms", is aimed at investigating the performance of ball-bearing systems used in spacecrafts after surface modification techniques. For this, IIST has fabricated an atomic Layer deposition (ALD) system.

Projects with LPSC include (a) feasibility of laser-based ignition systems for the cryogenic engines which has crossed the feasibility phase of successful demonstration, and (b) developing low-power surface discharge semiconductor spark plug for the cryogenic engines.

Other ongoing projects include studies on 'Laser Speckle for small Deformation measurement' and 'Development of MEMS Accelerometer with Ultra-Sensitive Transductions for Space Applications'. IIST is an integral part of ISRO project on electric propulsion and there has been larger involvement of IIST faculty in various design and performance review conducted in ISRO.

ARIS

1st April 2019 became a very important day in the history of IIST. It was on this day IIST had its first space mission, launched on PS4 stage of PSLV C45. An advanced retarding potential analyser for ionospheric studies (ARIS) was designed and built by IIST faculty, project fellows and students at a very short notice with support from IISU and VSSC, ARIS was realized in a short time of just 49 days from the first clearance. The probe functioned

during the life of the mission and provided valuable data on electron and ion temperatures, density and mass distribution. A follow sensor for one of the upcoming PSLV missions is under testing and its advanced versions have been shortlisted by ISRO to fly in forthcoming missions to Mars and Venus.

Human Space Flight Program

IIST responded to ISRO announcement of opportunity (AO) for microgravity experiments on low earth orbits by submitting 8 proposals. After presentations and rigorous evaluation the proposal by Dr K Sreejalekshmi jointly with Dr R Hosnani of University of Agricultural Science, Dharwad, on "Spaceflight induced changes in kidney stone formation in Drosophila melanogaster" has been selected to be flown in the first development flight of Gaganyaan scheduled for the final quarter of 2020. Another proposal on monitoring gas environment in crew module proposed by Dr Palash Basu is under consideration for joint implementation with SAC and SCL.

ExoWorlds

As a follow up of successful Astrosat mission of ISRO, IIST and the University of Cambridge had proposed for a space telescope ExoWorlds, designed to study the atmosphere of exoplanets. IIST hosted the ExoWorlds Team Meeting form January, 4 to 6th , 2019. The largest dedicated Exoplanet mission in the world, the mission is expected to make major scientific breakthroughs in Exoplanet science and bring India to the forefront in this emerging field.

Currently, 15 extramural funded research projects are being undertaken in IIST, of which 4 were sanctioned during last year. In past two years funds to the tune of Rs 9.00 crore has been utilized by IIST faculty for research

International Collaborations

Space enterprise remains to be a global human endeavour where international collaboration plays a very important role. IIST through its international collaborations is committed to provide the best opportunity to its students and faculty to undertake frontline research and be part of the international teams.

International Satellite Program in Research and Education (INSPIRE)/ InspireSat-1

IIST and Laboratory of Atmospheric and Space Physics (LASP), University of Colorado, Boulder, USA have signed an MoU in the area of space science and spacecraft engineering. IIST students undertook internship and Semester project at LASP and also worked at IIST to participate in design, fabrication and test of InspireSate-1. This mission will carry out studies of the Earth's ionosphere measuring the ion velocity, density and temperature using a small satellite of approximate dimension 300mm x 200mm x 200mm and mass around 10 kg. IIST would be building the OBC, flight software and EPS as part of this mission.

Autonomous Assembly of Reconfigurable Space Telescope (AAReST)

IIST has signed an MoU with Caltech University, USA and University of Surrey, UK to design and develop

AAReST. IIST is contributing one of the mirrorsat and design and test of hardware as per project schedule is underway to realize the spacecraft by December 2019.

Implementation of activities under the MoU with Nanyang Technical University, Singapore has been initiated. Two IIST students undertook a 3 month internship in early 2019 and 3 students will be hosted by NTU in early 2020. Discussions have also commenced on an NTU funded small satellite joint project InspireSat-4 slated for 2020 realization.

As a prelude to MoU signing with The Institut Supérieur de l'Aéronautique et de l'Espace (ISAE-SUPAERO), one of the most prestigious aerospace institutions in France a joint student project was undertaken. PG students from both institutes (6 from ISAE and 2 from IIST) successfully undertook a phase A study for a CubeSat mission to Mars under the guidance of faculty from the two institutions.

Discussions and approval process is underway for MoU with National Central University (NCU), Taiwan and Nigata University Japan.

This year 19 faculty members of IIST, undertook 25 visits abroad either for conferences/seminars, research discussion, joint research or on sabbatical and 14 students for their internships or under flagship programmes. 5 of our students are currently in Australian National University as part of their internship program and 4

students are pursuing their internship at Laboratory of Atmospheric and Space Physics (LASP), for the InspireSat1 project at the University of Colorado, Boulder.

Research publications & Intellectual Property

With great satisfaction I report that institute has filed a total of 18 patent applications and during last year 4 of these applications were granted Indian patents. Faculty members and scholars of IIST published a record 359 articles in peer reviewed journals, as well as 290 publications in conference proceedings and 33 chapters in edited books. The faculty also published 4 books in areas of engineering, literature and mathematics during last year.

Students Activities

An active Student Activity Board (SAB) headed by Dean Student Activities and with student representatives and faculty as members, oversees all the student activities. Major activities conducted last year were

(i). DHANAK- 2018, the annual cultural fest organized from September 28th to 1st October, 2018 and had a foot fall of 901 students from all over the country. Smt.Roshni Dinakar, the famous filmmaker and costume designer was the Chief Guest of the program.

(ii) The 12th edition of Conscientia, the Annual Technology and Astronomy fest was organised from 1st to 4th March, 2019 and was inaugurated by Shri DK Das, Distinguished Scientist and Director of Space Applications Centre, Ahmedabad.

(iii) Fifth IIST Model United Nations was conducted on 6th & 7th, April 2019 with participation from 20 colleges. The agenda was "International relations in the Space Sector".
(iv) Annual sports meet was held in Magudagiri campus on February 23rd 2019.Dr. Pradeep Dutta, First Indian FIFA Conditioning Instructor and Associate Professor, LNCPE, Trivandrum was the chief guest of the event.

Other regular student events like Konchords, QC Fiction, the annual inter-collegiate general quiz competition and Food Fest were also organised by the students during the year. Regular programs were organised by the various clubs and student sections of professional societies.

The students of IIST as part of the community outreach programs offer remedial classes and training programs to the neighbouring schools and for the students living around IIST. Students also got involved in voluntary work during the flood that ravaged part of Kerala. They also developed power banks out of batteries in just a few hours and distributed it to the flood affected people. Students and faculty donated their engineering text books and a set of 2000 books was handed over to Government Engineering College, Munnar as their library was devastated by last years floods in Kerala. The institute strongly believes that inculcating an enduring social and human engagement is the hallmark of education.

Outreach

Foundation Day

IIST Celebrated its 12th Foundation day on 14th September 2018 enthusiastically with multiple activities. Prof. Anil D Sahasrabudhe, Chairman, AICTE inaugurated the Foundation Day Celebrations by delivering the 3rd Dr. APJ Abdul Kalam Lecture. Laboratories and other facilities

were made open for the students of nearby schools. An alumni meet was also arranged as part of the foundation day in which 24 alumni from various ISRO Centres interacted with the faculty and culural programs organized jointly by the cultural committee and the student music club marked the culmination of the celebrations. It is now decided to make it a regular feature.

Kalam Memorial Lecture

Dr. APJ Abdul Kalam Lecture series was instituted in IIST in 2017 in the fond memories of our first Chancellor, Dr APJ Abdul Kalam. The second lecture in this series was delivered on 5th September 2018 by Prof. Mustansir Barma, DAE – Homi Bhabha Chair Professor, TIFR, Hyderabad on 'Random Questions in Science'. Prof. Anil D Sahasrabudh, Chairman, AICTE, delivered the third lecture on "Innovation and Excellence in Technical Education: A Roadmap and Vision for the Future" on 14 September 2018 and the fourth lecture was delivered on 01st May, 2019 by Prof. V Ramgopal Rao, Director, IIT Delhi who spoke on "Connecting Academic R & D with Product Innovation: A few case studies and a way forward".

In association with VSSC and three professional societies, IIST jointly organised a Colloquium on "Systems Engineering and Institution Building" at Dr Srinivasan Auditorium on 9th February, 2019 with inauguration by Chairman ISRO, Dr K SIvan and Presidential address being delivered by Dr K Radhakrishnan former Chairman ISRO. Eminent speakers covered various aspects of system engineering and institution building and Dr B N Suresh, Chancellor IIST was felicitated.

During last one year the institute organized 9 seminars/conferences and workshops with a cumulative

participation of over 400 students and active researchers. IIST also hosted 90 students as interns These students from across the country spend six to eight weeks on a short research problem under the supervision of our faculty.

Visitors

Six educational visits with 18 teachers and 375 students were hosted by IIST. IIST received 37 foreign visitors, from countries across the globe, exploring areas of collaboration and cooperation or as part of workshops or seminars or for technical expertise. To name a few are Prof. Sergio Pelligrino and Mr. Charles Sommers, Dr. Virendra Sarohia from JPL and Prof. Craig Underwood from University of Surrey who visited IIST on Dec. 10, 2018 to review the progress of IIST MirrorSat development, Prof. Adhikari Rana from Caltech to deliver a lecture as part of Conscientia 2019, Dr Richardo Ruiz-baier from University of Oxford, Dr Murali Damodaran, Senior Research Scientist, NUS and Dr Phee Soo Jay Louis, Dean, NTU, Singapore.

Awards & Honours

Faculty and students received many awards, honours and appreciation which is too numerous to be read. Let me illustrate with a few examples.

Veena VS, PhD scholar received K. D. Abhayankar Best Thesis Award in the 37th Astronomical Society of India meeting held in Bangalore on February 2019 and has also won Alexander von Homboldt postdoctoral fellowship to pursue post-doctoral research at the University of Cologne, Germany.

Rashi Jain student of Master of Science in Astronomy & Astrophysics received appreciation for her thesis under the

supervision of Dr Sarita Vij for New population of Ultraviolet stars in the Globular Cluster- NGC 2808.

A number of research scholars won awards for their poster and oral presentations in conferences and symposia.

Dr.Manu K V, Assistant Professor, Dept. of Aerospace Engineering won the individual Chess Championship and our Bridge team won the Fair Play Award in the ISRO-DOS inter-centre sports meet at SDSC, SHAR

Alumni

In order to further expand alumni support for the Institute's activities and vice versa, the Institute has launched a website for Alumni Affairs and is in the process of forming an alumni association. The alumni of the Institute have made their alma mater proud through their achievements and contributions in diverse fields, and our engagements with them are steadily growing. The accomplishments of the alumni include awards by ISRO, ranks in prestigious exams such as GATE, CSIR-JRF, Indian Civil Services Examination 2018, foreign fellowships carry out their masters or doctoral studies and awards by professional societies.

NIRF Ranking

All these persistent endeavors of the institute to achieve excellence led to IIST being ranked 30th among the engineering institutions in the country in the MHRD National Institutional Ranking Framework (NIRF) 2019. The faculty and students remain committed to scale higher peaks.

Acknowledgements

Institute would like to acknowledge and place on record the support received in abundant measure from the

Department of Space, Government of India. I personally acknowledge the continued support and encouragement we have received from our beloved Chancellor Dr B N Suresh, as well as President of the Governing Body Dr. K. Sivan, 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 exemplary behavior and their innumerable contributions towards enriching the campus life.

Before I conclude, it is my duty to once again express my gratitude to our esteemed Chief Guest Dr Ajay Mathur, our Chancellor, Dr. B. N. Suresh, President of the IIST Governing Body and Secretary, Department of Space, Dr. K. Sivan for their gracious participation in the convocation. I express my deep appreciation to Shri S Somanath, Director VSSC for his presence as Guest of honor as well as his generous support and guidance in organizing the convocation in the premises of VSSC. I am thankful to all the degree recipients, our distinguished guests and accompanying family members of students and members of the Board of Management of IIST and various committees of IIST for their presence here today. The VSSC administration has always been extremely supportive in the organization of this ceremony.

To our passing out students, I would like to convey my heartiest congratulations and best wishes to each one of the 142 BTech graduates, 30 Dual degree recipients, 71 MTech and 12 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 about and applaud your future successes and achievements.

Thank You.

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 and 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).

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, etc.

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

(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 as well as in Scientific/Research Advisory Committees of National Atmospheric Research Laboratory (NARL), Gadanki, National Rice Research Institute (NRRI), Cuttack, 2014-2017, Space Physics Laboratory(SPL), VSSC, etc. He also served as ISRO representative to the Board of Antrix Corporation.

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).

IIST/97/IP/JUL/2019

भारतीय अंतरिक्ष विज्ञान एवं प्रौद्योगिकी संस्थान

(वि. अ. आयोग अधिनियम 1956 की धारा 3 के अधीन मानित विश्वविद्यालय घोषित)
वलियमला, तिरुवनंतपुरम

Indian Institute of Space Science and Technology

(Declared as Deemed to be University under Sec.3 of UGC Act, 1956)
Valiamala, Thiruvananthapuram