



**VIGYAN**  
**SAMAGAM**

***PUSHING THE FRONTIERS OF SCIENCE***



# Vigyan Samagam

## "Scientre Stage"

In order to highlight the value and impact of fundamental research to a broad cross-section of audience including students, academicians and industry, and to further strengthen India's participation in mega-science projects, Department of Atomic Energy (DAE), Department of Science and Technology (DST) and National Council of Science Museums (NCSM) are jointly organising a multi-venue mega-science exhibition, Vigyan Samagam.

The following seven mega-science collaborations will be showcased in Vigyan Samagam:

- European Organisation for Nuclear Research (CERN)
- Facility for Antiproton and Ion Research (FAIR)
- India-based Neutrino Observatory (INO)
- International Thermonuclear Experimental Reactor (ITER)
- Laser Interferometer Gravitational-Wave Observatory (LIGO)
- Square Kilometer Array (SKA)
- Thirty Meter Telescope (TMT)

A first-of-its-kind, Vigyan Samagam shall be hosted in a caravan mode at four major Indian cities as per the following schedule:

- Mumbai: 8th May to 7th July, 2019
- Bengaluru: 29th July to 28th September, 2019
- Kolkata: 4th November to 31st December, 2019
- Delhi: 21st January to 20th March, 2020

"Scientre Stage" is the inaugural, 2-day science event at each of the four cities, including the formal inauguration ceremony itself.

**Inauguration**



PUSHING THE FRONTIERS OF SCIENCE

## Welcome address

**Mr. Ranajit Kumar, Head, NCPW, DAE, Mumbai**

### About the Speaker:

- Ranajit Kumar is an Outstanding Scientist & Head of Nuclear Controls & Planning Wing in the Department of Atomic Energy (DAE). He is a leading specialist with outstanding contribution in the area of international nuclear safeguards, nuclear security and nuclear safety. He is leading DAE in the area of international civil nuclear cooperation, international cooperation on nuclear science & technology including cooperation on mega sciences projects, negotiation and implementation of international safeguards in all obligated facilities of DAE, nuclear security policy formulation and implementation etc. He is also leading the cooperation on cutting edge mega science projects with various international organizations like International Thermonuclear Experimental Reactor (ITER), The European Organization for Nuclear Research (CERN), world's third Laser Interferometer Gravitational Wave Observatory (LIGO) in India, Square Kilometre Array (SKA), Thirty Meter Telescope (TMT), India based Neutrino Observatory (INO) and Facility for Anti-proton Research (FAIR). He is leading a team responsible for technical evaluation and grant of export / import and handling license of prescribed substances, equipment and technologies as well as nuclear related dual use goods, equipment and technology as covered under SCOMET list. He is also leading the activities of the Global Centre for Nuclear Energy Partnership (GCNEP), an institute established for promoting R&D, training and human resource development with a vision to promote safe, secure and sustainable nuclear energy, in partnership with countries like USA, France, UK and international organization like IAEA.
- He serves as a member in the Council of Management of Tata Institute of Fundamental Research (TIFR), in the International Thermonuclear Experimental Reactor (ITER) Council, in the BRIT (Board of Radiation & Isotope Technology) Board, DAE and in the "Standing Advisory Group of Safeguards Implementation (SAGSI)" of the Director General (DG) of International Atomic Energy Agency (IAEA). He served as a member from India to the Nuclear Security Guidance Committee (NSGC) of IAEA during 2012 – 2017.
- Ranajit Kumar obtained his Bachelor of Engineering (Electronics & Tele-Communication Engineering) from Bengal Engineering College, Calcutta University (presently known as IEST - Indian Institute of Engineering, Science and Technology, Shibpur) in the year 1984. After completion of 1 year Orientation Course in Nuclear Engineering in Bhabha Atomic Research Centre (BARC) Training School (September, 1984 – August, 1985), he joined Reactor Control Division in BARC as R&D electronics engineer. In BARC, he has spent more than 31 years' in designing computer and microprocessor based system for application in Nuclear Safety and Nuclear Security. He was responsible for design, development, planning and implementation of nuclear security systems for different types of nuclear fuel cycle facilities including nuclear power plant, reprocessing and waste management plant, research laboratory etc.
- Shri Ranajit Kumar was awarded Technical Excellence Award of DAE in the year 2011. He was also awarded several group achievement awards of DAE.







## About Vigyan Samagam

Mr. Arun Srivastava, Secretary, AEC & Head, ICPD, DAE, Mumbai

### About the Speaker:

- Mr. Arun Srivastava, Secretary, Atomic Energy Commission and Head, Institutional Collaborations & Programs Division, is a 1983 batch Chemical Engineering graduate from Laxminarayan Institute of Technology (LIT), Nagpur. He has also completed postgraduate Diploma in Management Studies from Mumbai University in 1992 and Chartered Financial Analyst (CFA) course from Institute of Chartered Financial Analyst of India, Hyderabad in 1996.
- He is from the 27<sup>th</sup> batch of BARC training school (1983-84). He has worked in Heavy Water for the design, fabrication / construction and commissioning of Heavy Water Plant, Manuguru. In July 1999, Mr. Srivastava joined Department of Atomic Energy (DAE). He has been involved in the strategic planning and analysis related activities for the DAE. In DAE, he is presently heading the Institutional Collaborations and Programs Division of NCPW. He is responsible for all Mega Science Projects in which DAE along with DST are participating and is holding various positions in the Boards/Executive Councils of these projects.
- Since July 2010, Mr. Srivastava is holding the position of Secretary, Atomic Energy Commission, the highest policy making body for the Atomic Energy. Mr. Srivastava is currently the Chairman of the ITER Council, which is the Governing body of the ITER Project.
- Chairman, Atomic Energy Commission has conferred 'Special Contributions Award 2006' in recognition of his valuable contributions in the field of Nuclear Science & Technology and to the program of the Department of Atomic Energy under the Excellence in Science, Engineering and Technology Award Scheme of DAE. LIT, from where Mr. Srivastava has completed his graduation, has recently conferred him 'Jewel of LIT' Award, as an illustrious Alumni. He is the youngest recipient of this award, since the establishment of LIT.





## Address by Guest of Honour

Mr. K.N.Vyas, Chairperson, AEC and Secretary, DAE, Mumbai

### About the Speaker:

- Mr. K.N. Vyas is a Mechanical Engineering Graduate of MS University, Vadodara and a graduate of the 22<sup>nd</sup> Batch of BARC Training School. Joining the Department in 1979, he commenced his career with forays into nuclear reactor fuel designs. He developed programmes to carry out fuel performance analysis of nuclear fuels, which modeled fuel design aspects like irradiation swelling, fission gas generation and release, pellet-clad interaction, etc. The insights gained by these studies led to the design of the 7×7 cluster for BWR fuel having superior performance characteristics. As a fuel design engineer, he provided key inputs to fuel manufacturing units like Atomic Fuels Division and Nuclear Fuels Complex.
- Mr. has played an important role in indigenisation of special materials as well as several fabrication & test equipment used in fuel fabrication. His expertise was useful in evolving the design of Test Blanket Module and associated systems, planned to be installed at the ITER project.
- Mr. K.N. Vyas is a recipient of Indian Nuclear Society Outstanding Service Award, Homi Bhabha Science and Technology Award and the Dr. N. Kondal Rao Memorial Award. He and his team have won Group Achievement Awards in the years 2007, 2008, 2012 and 2013 in the field of design and development of critical reactor system equipment, as well as successful erection and commissioning of various reactor systems. He is a Fellow of Indian National Academy of Engineering, 2015.





## Address by Guest of Honour

**Prof. Ashutosh Sharma, Secretary, DST, New Delhi**

### About the Speaker:

- Ashutosh Sharma is the Secretary to the Government of India since January 2015, heading the Department of Science and Technology (DST), where he helped initiate several new programs.
- Ashutosh received his PhD from the State University of New York at Buffalo (SUNYAB; 1988), his MS from the Pennsylvania State University (1984) and B.Tech. from IIT Kanpur (1982). He has been a professor (1997-), an Institute Chair Professor (2007-) and the Head (2003-05) of Chemical Engineering, and the founding Coordinator of Nanosciences Center and Advanced Imaging Center at the Indian Institute of Technology at Kanpur.
- He has published over 340 peer reviewed papers, filed over 15 patents, given over 150 invited or key note conference presentations and mentored a successful nanotechnology startup.
- Ashutosh is a recipient of numerous honors and awards including the inaugural Infosys Prize in Engineering and Computer Science, TWAS Science Prize of the World Academy of Sciences, Bessel Research Award of the Humboldt Foundation, J. C. Bose Fellowship, Bhatnagar Prize, Homi J. Bhabha Award of UGC, The Syed Husain Zaheer Medal and the Meghnad Saha Medal of INSA, Distinguished Alumni Awards of IIT Kanpur and SUNY Buffalo, Firodia Award and the Life-time Achievement Award of the Indian Science Congress.
- Ashutosh is an elected Fellow of The Indian National Science Academy, The Indian Academy of Sciences, The National Academy of Sciences, India and Indian National Academy of Engineering, The World Academy of Sciences (TWAS) and the Asia-Pacific Academy of Materials. He has also served on the Councils of the first two. He has been an associate editor of ACS Applied Materials and Interfaces, Proceedings of Indian National Science Academy and ASME Journal of Micro- and Nano-Manufacturing and has been on the editorial boards of several journals: Carbon; ACS Industrial and Engineering Chemistry Research; Current Science; Nanomaterials and Energy; Chemical Engineering Science; Journal of Colloid and Interface Science; Canadian Journal of Chemical Engineering and Indian Chemical Engineer.







## Address by Guest of Honour

**Mr. Arijit Dutta Choudhury, Director General, NCSM, Kolkata**

### About the Speaker:

- Mr. Arijit Dutta Choudhury is a science museum/centre professional and has been serving presently as the Director General of the National Council of Science Museums, under the Ministry of Culture, Government of India.
- He has more than 30 years of work experience in developing and operation of Science Centres under NCSM comprising development of exhibits, complete projects on turnkey basis etc. He joined the National Council of Science Museums (NCSM) in 1987 and worked in various capacities including Director of Science City, Kolkata. During his career spanning over 31 years in science education and communication, he has contributed immensely to the development of number of science museums/centres and other museums in the country, various exhibitions and activities and non-formal science education programmes for students, teachers and general public.
- He is a member of many Science Communication organizations and science museum/centre boards.







## Address by Guest of Honour

Dr. Frédéric Bordry, Director for Accelerators and Technology, CERN, Geneva

### About the Speaker:

- Frédéric Bordry is the CERN's Director of Accelerators and Technology since January 2014. He is responsible for the operation and exploitation of the whole CERN accelerator complex, with particular emphasis on the LHC and for the development of new projects and technologies.





## Address by Guest of Honour

**Dr. Andreas Baum, Ambassador of Switzerland to India, New Delhi**

### About the Speaker:

- Born in Zurich in 1963, Andreas Baum completed his Doctor of Medicine studies at the University of Lausanne in 1989. He then obtained a Master of Arts in International relations and International economics at the School of Advanced International Studies, Johns Hopkins University, U.S.A, in 1990. Entering the Swiss Foreign Service in 1991, he has served as Secretary to the State Secretary, Federal Department of Foreign Affairs from 1996 to 2000, Minister and Deputy Head of Mission, Embassy of Switzerland to Canada from 2000 to 2004, Minister and Deputy Permanent Representative, Mission of Switzerland to the United Nations, New York from 2004 to 2008. Since then he has served as Ambassador and Head of Mission, Embassy of Switzerland to Nigeria, Chad and Niger from 2008 to 2012 and as Ambassador and Head of Mission, Embassy of Switzerland to Israel from 2012 to 2016. He is Ambassador and Head of Mission, Embassy of Switzerland to India and Bhutan since 2016.





## Address by Chief Guest

Dr. V.K.Saraswat, Member, NITI Aayog & Chancellor, JNU, New Delhi

### About the Speaker:

- Dr. V.K. Saraswat retired as Secretary, DRDO, after more than four decades of service. He is a Ph.D. from Osmania University. During his illustrious career, Dr Saraswat, has been credited with indigenous development of (i) Missiles namely PRITHVI, DHANUSH, PRAHAAR and AGNI-5; (ii) Development of two-tiered Ballistic Missiles Defence (BMD) systems (iii) Initial Operational Clearance of Light Combat Aircraft TEJAS; and Nuclear Submarine INS Arihant.
- Dr. Saraswat played a pivotal role in: (i) establishment of the command, control, communication, storage, transportation and deployment infrastructure for strategic nuclear assets, (ii) Flight Evaluation long range sub-sonic cruise missile, (iii) Long Range Radars for tracking incoming (enemy) Ballistic missiles, Command control and communication network, Command Centres with decision support system and (iv) Establishment of Cyber Security Research and Development Centre.
- Some of his well-known initiatives are development of clean coal technologies, Silicon-Photonics technology, high efficiency concentrated solar power systems, bio-energy and Hydrogen based economy, development of Indian Microprocessor, National Super Computing Systems, setting up Indian Railway Research Institute (SHRESHTHA) and development of National Super Computing Systems.
- He is a recipient of many awards and most notable among them being Padma Shri (1998), Padma Bhushan (2013). He has been conferred Honorary Doctorates by more than 25 Universities.







## Vote of Thanks

Dr. Praveer Asthana, Head, Mega Science Division, DST, New Delhi

### About the Speaker:

- Dr. Praveer Asthana, an Adviser/Scientist-G in DST, is currently the Head of INSPIRE and Mega Science Divisions of DST. He did his Ph.D. in Theoretical Particle Physics from the University of Alberta, Canada and he joined DST in April 1989. Some of the major responsibilities handled by him in DST are – adoption of Science and Technology Policy 2003 by the Government, Nano Mission, establishment of SERB, KVPY, INSPIRE, the Women Scientists Scheme, scientific, administrative and budgetary affairs of 25 DST autonomous institutions and mega science projects like collaborations with CERN, Fermilab, KEK, Elettra, FAIR, DESY, TMT, INO and so on.







## Keynote Address

Prof. K.VijayRaghavan, Principal Scientific Adviser, Government of India, New Delhi

### About the Speaker:

- Professor K. VijayRaghavan is the Principal Scientific Adviser to the Government of India, succeeding Dr. R. Chidambaram on April 3, 2018 and the Chairperson of Prime Minister's Science, Technology & Innovation Advisory Council (PM-STIAC). He was Secretary, Department of Biotechnology (DBT), Government of India from January 28, 2013 to February 2, 2018.
- The Principal Scientific Adviser works with all arms of the Government, with our States, our citizens, national and international agencies. The goal is that the benefits of science, technology and innovation solutions reach the most needy, for the sustainable development of India and for the well being of our planet.
- VijayRaghavan is also a Distinguished Professor at the National Centre of Biological Sciences (NCBS), Tata Institute of Fundamental Research Bangalore (TIFR) and was the NCBS Director till 2013. He studied Chemical Engineering at the Indian Institute of Technology, Kanpur, holds a Ph.D. in Molecular Biology from the Tata Institute of Fundamental Research was a Senior Research Fellow at the California Institute of Technology. His research is on nerves and muscles and how complex behaviour emerges during animal development.
- VijayRaghavan is a Fellow of the Indian Science Academies, the Royal Society, the Academy of Medical Sciences (UK) and a Foreign Associate of the US National Academy of Sciences. He was awarded the Padma Shri by the Government of India in 2013.



# European Organisation for Nuclear Research (CERN)



# European Organisation for Nuclear Research (CERN)

Dr. Emmanuel Tsesmelis, Head, AM and NM State Relations, CERN, Geneva  
CERN-India Collaboration Perspectives



## Abstract:

- Founded in 1954, CERN represents one of the first attempts of European co-operation amongst its Member States and has now become one of the most successful examples of international co-operation and the world's largest laboratory for particle physics research. Each year, CERN hosts more than 14 000 scientists and engineers from around the world who are involved in CERN's experiments, engineering and technology projects or theoretical physics activities. The presentation will introduce the core science studied, the innovation in technology, and the advanced scientific and technical education and training that CERN offers within a truly international collaborative environment. The presentation will highlight the many contributions of India to CERN and the perspectives to strengthening the co-operation in the future.

## About the Speaker:

- Emmanuel Tsesmelis is an experimental particle physicist with a career spanning scientific research, academic teaching, science communication, international relations and management at CERN and at several universities. His scientific research includes the search for the charged Higgs boson at the UA2 experiment at CERN and the study of neutrino properties at CERN's neutrino facilities. In 1998 he joined the CMS Collaboration at CERN's Large Hadron Collider (LHC), one of the two experiments that discovered the Higgs boson in 2012, and for the period 2005-2008 he was Head of the LHC Experimental Areas. He has served over many years on CERN scientific committees and was a member of the CERN Directorate Office during the period 2009-2013. Since 2004 he has been providing strategic advice to CERN Directors-General on international relations and for the period 2013-2015 he was Deputy Head of International Relations. Today, he is a Principal Physicist and Head of Associate Member and Non-Member State Relations in CERN's Directorate for International Relations.





# European Organisation for Nuclear Research (CERN)

Dr. Frédérick Bordry, Director for Accelerators and Technology, CERN, Geneva  
CERN Accelerators and future projects



## Abstract:

- Since the start-up of the LHC accelerator, there has been two successful physics runs with an impressive amount of data delivered to the LHC experiments at 7 and 8 TeV centre of mass energy for the Run 1 (2010-2012) and at 13 TeV for the Run 2 (2015-2018). A full exploitation of the LHC including an upgrade of the accelerator and detectors (High Luminosity LHC) is defined for the next two decades. An intensive program of R&D was launched to achieve the High Luminosity challenges: superconducting high field magnets, superconducting RF compact cavities, collimators, superconducting lines, radiation hard power converters. CERN is also initiating exploratory studies for future long-term project post-LHC : CLIC and FCC. The presentation will recall the main LHC technical developments. Then the R&D program, the role of industry and the plans for the full exploitation of the LHC will be discussed and finally the CLIC and FCC studies will be presented.

## About the Speaker:

- Frédérick Bordry is the CERN's Director of Accelerators and Technology since January 2014. He is responsible for the operation and exploitation of the whole CERN accelerator complex, with particular emphasis on the LHC and for the development of new projects and technologies.







# European Organisation for Nuclear Research (CERN)

## Mr. Purushottam Shrivastava, AD, Proton Accelerator Group, RRCAT, Indore Indian Contributions in CERN



### Abstract:

- India is a proud partner of the Large Hadron Collider (LHC) from its nascent stage, in all aspects of science, engineering and technology for the construction and commissioning of LHC machine and two of its detectors ALICE and CMS. India played an important role in GRID Technology through which huge volumes of data are accessed and analysed, which involves sharing and monitoring of computing/storage resources worldwide via high-speed internet (multi-Gbps) under World-wide LHC Computing GRID (WLCG). A large number of high technology components like superconducting corrector magnets, QHPS supplies, and protection units for LHC; 100kV solid state modulator and couplers for Linac 4 (LHC upgrade) were developed and supplied by India. India was accorded Observer State in 2002 and Associate Member in 2016. India has also important role in the construction and operation of two huge detectors viz., ALICE and CMS. The overall participation has critical role in the discovery of the Higgs boson at the LHC in 2012, leading to the Nobel prize in physics in 2013. The present talk includes contributions from the speaker(LHC accelerators), Dr. B. S. Jagdeesh, BARC (GRID), Dr. B. C. Choudhary, University of Delhi (CMS), Dr. S. Chattopadhyay, VECC (ALICE).

### About the Speaker:

- Shri Purushottam Shrivastava, Outstanding Scientist, Associate Director, Proton Accelerator Group, Raja Ramanna Centre for Advanced Technology, Department of Atomic Energy, Indore, serves as the member secretary (Sc) for the Joint India CERN collaboration committee and Project Coordinator, International Collaboration in CERN Accelerators. He spearheaded R & D, tests and supply of crucial high technology components for CERN LHC, Linac 4 and CLIC. He was conferred Group Achievement Award as Team Leader for his contribution of 100 kV solid state modulator for Linac 4. He has served as expert in various national and international committees including ISRO, India; ESS, Sweden. He had served in the Scientific Advisory Board of International Particle Accelerator Conference, IPAC'14 Germany, IPAC'15, USA, and IPAC'18 Canada ; Organisation Committee member IPAC'19 Australia, IPAC'20 France. He had played important role in getting 1MW CW klystrons, 1MW CW circulators and high power RF hardware for Indian proton accelerator programs at RRCAT, Indore and BARC, Mumbai, from CERN. He has over 161 publications.





# European Organisation for Nuclear Research (CERN)

Dr. B.S.Jagadeesh, Distinguished Scientist, BARC, Mumbai

Panel Discussion: Leveraging collaboration for Indian science and industry



## About the Panel Moderator:

B.S. Jagadeesh, graduated in Electronics Engineering in First class with Distinction and has graduated in the orientation course in nuclear engineering from the 26<sup>th</sup> batch of the prestigious BARC Training School. Currently he is working as Distinguished Scientist, Associate Director E&I (C) Group & Computer Division, BARC. He has made outstanding contributions in the design, development and deployment of Anupam Series Parallel Supercomputers. His outstanding contributions in the areas of system and application software development for parallel processing are note worthy. He is the Chairman of the Infrastructure Group of the 'National Supercomputing Mission', Government of India. He is the team leader from Indian Side for collaborative projects with CERN and has carried out many projects in World Wide Large Hadron Collider Grid (WLCG) in collaboration with IT-Division, CERN. Currently he is leading the project for "upgradation and operation of regional WLCG" that ensures smooth flow of data from LHC to 14 Institutes of higher learning in India. He has published more than 40 papers and has taught advanced credit courses in Computer Engineering in HBNI. He is recipient of VASVIK (2017), DAE's Homi Bhabha Science and Technology Award (2017) and DAE's Scientific & Technical Excellence Award (2007).





# European Organisation for Nuclear Research (CERN)

Prof. Brajesh Choudhary, Spokesperson, India-CMS collaboration

Panel Discussion: Leveraging collaboration for Indian science and industry



## About the Panel Member:

- Dr. Brajesh Chandra Choudhary is a Professor of Physics in the Department of Physics & Astrophysics, University of Delhi and the Spokesperson of the India-CMS collaboration at CERN. He is also a member of the Management Board and Finance Board of the CMS collaboration. He has served on the expert committee for Project reviews for D.O.E (USA) as well as the European Union. He has been a visiting faculty at Durham University, UK from 2014 to 2016.
- Prof. Choudhary's interest lies in understanding the fundamental nature of matter through the study of particle physics. He has been associated with several experiments over last three decades. These include the E706 and the Tevatron at Fermilab, LHC (CMS) at CERN as well as with the MACRO experiment at LNGS, Italy, Long-baseline Neutrino Physics with MINOS, NOvA and LBNE/DUNE at Fermilab, USA.
- Prof. Choudhary did his B.Sc (Physics Honors) and M.Sc (Physics) with Gold medals from Science College, Patna. After finishing his Ph.D from the University of Delhi he did a postdoctoral fellowship at UC Riverside, USA. He has worked as a research faculty at California Institute of Technology, Pasadena and as a Scientist at Fermilab before returning to India as a Professor of Physics at University of Delhi. He has made significant contributions to the understanding of Direct Photon Physics at E706 and CMS. He also played a seminal role in the discovery of the "top quark" with the D0 detector. Among his other major contributions are the discovery of multi-boson physics at D0 as well as an understanding of the quark substructure at CMS. He was part of the team that discovered the "Higgs Boson" in 2012. He has also led a multi-institutional India-Fermilab Neutrino Collaboration at Fermilab since 2012 and is one of the recognized experts on long-baseline neutrino physics and neutrino detectors.







European Organisation for Nuclear Research (CERN)

Prof. Sudhir Raniwala, University of Rajasthan, Jaipur

Panel Discussion: Leveraging collaboration for Indian science and industry



## About the Panel Member:

- Born in 1960, Sudhir Raniwala graduated from St.Xavier, Jaipur and obtained his further education up to Ph.D in the University of Rajasthan, where he is currently a Professor. A merit holder throughout, he also received the Best Thesis Presentation Award from the Indian Physics Association in Nuclear Physics Symposium. His interest is the study of heavy-ion collisions which is met through experiments at European Organisation for Nuclear Research (CERN, Geneva). With a penchant for pedagogy and academic ethics, he has contributed to both through newspapers/journals and many popular talks (including one in TEDx forum). Prof. Raniwala has been a visiting scientist of Indian National Science Academy (INSA), Scientific Associate at CERN, and a Senior Associate at the International Centre for Theoretical Physics (ICTP, Italy). His recent/current responsibilities in the ALICE experiment are as member of Editorial Board, Thesis Committee for best thesis award and the Physics Board. For a brief period he was the Dean/Director of the LNM Institute of Information Technology at Jaipur.







# European Organisation for Nuclear Research (CERN)

## Mr. Anders Unnervik, Head, Procurement and Industrial Service, CERN Doing Business with CERN



### Abstract:

- As an Intergovernmental Organization, CERN is not a legal entity under national law but governed by public international law. CERN is thus entitled to establish its own internal rules necessary for its proper functioning, such as the rules under which it purchases equipment and services. In my presentation, I will explain those rules and procedures. I will also give a brief overview of the various types of supplies and services required by CERN. Finally, I will also show that various reports indicate that firms derive great value above the actual payments for supplying equipment to CERN. Such values are related to, e.g. increased international exposure, improved technological learning, finding new markets and customers and not least, value from CERN as a marketing reference.

### About the Speaker:

- Anders Unnervik obtained an MSc in Industrial and Management Engineering in Linköping (Sweden), before joining CERN in 1988 as a member of the Procurement Service. Having headed several procurement projects, he was appointed Head of CERN's contract section in 1992 and became responsible for all LHC related procurement activities from the very beginning of the LHC project. In 2008, he was promoted Head of CERN's Procurement and Industrial Services Group.



# Facility for Antiproton and Ion Research (FAIR)



# Project: Facility for Antiproton and Ion Research (FAIR)

## Prof. Paolo Giubellino, Scientific Managing Director, GSI & FAIR

### FAIR, the Universe in the Laboratory



#### Abstract:

- FAIR is one of the flagship facilities for basic science in the coming decades and will become operational around 2025. FAIR will open unprecedented research opportunities in hadron and nuclear and atomic physics, nuclear astrophysics as well as materials research, plasma physics and radiation biophysics. FAIR is under construction as an international facility at the campus of the GSI Research Center in Darmstadt, Germany. Some of the experimental detectors and instrumentation are already available and are used since summer 2018 in a dedicated research program. The progress of FAIR realization and the prospects of science at FAIR will be presented.

#### About the Speaker:

- Paolo Giubellino is an experimental Physicist working on High-Energy Nuclear Collisions. After six years leading the CERN ALICE experiment, he is since 2017 Scientific Managing Director of the GSI Helmholtz Center and of the FAIR international Laboratory, Germany and full Professor at TU Darmstadt. Author of over 300 scientific papers, he received several recognitions, among which two Doctor honoris causa, the title of Commendatore for scientific merits, the Medal of the Mexican Physical Society, the Fermi Prize, highest recognition of the Italian Physical Society and the Meitner Prize, highest recognition for Nuclear Physics of the European Physical Society.





## Project: Facility for Antiproton and Ion Research (FAIR)

Dr. Rakesh K. Bhandari, Inter University Accelerator Centre, New Delhi

FAIR: the next generation accelerator, a technology marvel



### Abstract:

- The Facility for Antiproton and Ion Research (FAIR) is a unique accelerator complex under construction at GSI, Darmstadt, Germany. It will offer the scientists opportunities to carry out physics experiments so far not possible with the existing accelerator facilities. Primary and secondary beams spanning practically all elements of the periodic table would be accelerated with  $\sim 100$  to 1000 times the presently available intensity. The facility will provide beams with a wide range of energies. High energy antiproton beams will also be available. Several experiments with different types of beams would be possible to carry out in parallel. The main accelerator is a 1.1 km circumference, superconducting synchrotron for heavy ions. The facility will have storage rings, a collector/cooler ring, super fragment separator, high intensity proton linac, high energy beam transport system etc. The existing heavy ion accelerators of GSI will be upgraded to meet the intensity challenge for FAIR. Several advanced countries, including India, are partners in the construction of FAIR. In this talk, the challenges involved in the design and construction of the accelerator systems, particularly in view of the unprecedented versatility of the available beams, will be presented.

### About the Speaker:

- Dr. Bhandari is an eminent accelerator physicist/technologist and former Director of the Variable Energy Cyclotron Centre (VECC) of DAE. He has been instrumental in the construction of two large cyclotrons, namely, K=130 room temperature cyclotron and K=520 superconducting cyclotron for basic nuclear physics and allied research at this Centre. He played a key role in setting up of a 30 MeV, 500 microamperes medical cyclotron facility at Kolkata. He has been serving on several national and international committees related to accelerator projects including FAIR at GSI Darmstadt. He is presently associated with the Inter University Accelerator Centre (IUAC), New Delhi as Honorary Visiting Scientist.







# Project: Facility for Antiproton and Ion Research (FAIR)

## Dr. Subhasis Chattopadhyay, Programme Director, FAIR Project

### Indian industries at FAIR



#### Abstract:

- India is a founder member of the Facility For Antiproton and Ion Research (FAIR), the largest basic science project coming up at Darmstadt, Germany. This technological marvel will have 4 parallel operations using fast switching superconducting magnets. The machine requires ultra-stable power converters apart from cryogenic systems, vacuum system, RF systems among others. Indian industry apart from contributing in India's share in the in-kind item can participate in building FAIR accelerator equipment, detectors and electronics in general. The details of scope will be presented.

#### About the Speaker:

- Dr. Subhasis Chattopadhyay after completion of MSc(Physics) from University of Calcutta and M.Tech (Materials Science and Engineering) from IIT-Kharagpur joined BARC training school and currently holding the position of Scientific Officer at Variable Energy Cyclotron Centre, Kolkata. He is holding an adjunct Professor position at Bose Institute, Kolkata. Dr. Chattopadhyay has worked on instrumentation, phenomenology and physics analysis in the field of high energy heavy ion collisions at CERN and Brookhaven National Laboratory, USA and currently coordinating India's participation in the FAIR project, Germany. He has made significant contribution in detection and study of photons and dileptons in such collisions. He has supervised 14 PhD students so far and a recipient of Homi-Bhabha Science and Technology Award from the Department of Atomic Energy.





# Project: Facility for Antiproton and Ion Research (FAIR)

Prof. Sibaji Raha, Bose Institute, Kolkata

Panel Discussion: Leveraging collaboration for Indian science and industry



## About the Panel Moderator:

- Sibaji Raha is a Physicist, specialising in High Energy Particle and Nuclear Physics, Astrophysics, Astroparticle Physics, Cosmology as well as a multitude of areas related to the Global Change scenario. He was born in Calcutta (now Kolkata) in 1954 and had his early education in the city, culminating in a Bachelor of Science degree in Physics from Presidency College. He had his postgraduate training in Physics in the USA, obtaining a Doctorate from the University of Texas at Austin. After several years of research and teaching in Germany and France, he returned to India to join the faculty of Saha Institute of Nuclear Physics in Kolkata in 1985, whence he moved to Bose Institute in 1991 where he has been since. He served as the Director of Bose Institute during 2006 – 2016 as also the Officiating Director of S. N. Bose National Centre for Basic Sciences, Kolkata during 2014 - 2016. Over the years, he has also held numerous concurrent visiting professorships at a number of leading universities and research laboratories all over the world, including USA, France, Germany, Japan, Italy, Brazil and other countries. After retirement from active service as Senior Professor in 2018, he continues to be associated with Bose Institute as a researcher.
- He created the National Centre for Astroparticle Physics and Space Science at the Darjeeling campus of Bose Institute, which has attained an enviable international status and reputation within a very short time. He is currently the Chairman of the Joint Scientific Council of the international Facility for Antiproton and Ion Research (FAIR) and the German Helmholtz Institute for Heavy Ion Research (GSI) in Darmstadt, Germany.
- He has authored over 300 scientific papers in leading international journals, authored/edited 8 books and also written extensively in non-technical publications on various issues. His exposure to science education, teaching and research in many countries across the globe has instilled in him an abiding interest in the history of science and society.





## Project: Facility for Antiproton and Ion Research (FAIR)

Mr. Y.S. Mayya, Raja Ramanna Fellow, Department of Atomic Energy

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

- Y.S. Mayya obtained his B.Tech. in Electronics & Communication Engineering in 1979 Mysore University. He is a product of 1980 batch of the BARC Training School. As Scientific Officer in Reactor Control & Control Instrumentation divisions of BARC from 1980 to 2007 he was responsible for the design and development of Automation and Control systems for Nuclear facilities, Accelerators, Telescopes, Antennas and Radars for national and international projects.
- During 2007- 2012, Mr. Mayya was Director Technical and subsequently Chairman & Managing Director of Electronics Corporation of India Ltd, Hyderabad. While at ECIL, he was responsible for directing the operations of company in the area of strategic electronics in nuclear, defense, aerospace and security sectors and steered its steady growth.
- Back in BARC in 2012, he held various managerial positions, including Director of Electronics & Instrumentation Group of BARC and Project Director of Global Centre for Nuclear Energy Partnership (GCNEP). He superannuated from BARC as Distinguished Scientist in October 2016.
- During his career, Mr. Mayya was involved in many international mega Science projects such as LHC at CERN Geneva, FAIR at Germany, ITER in France and Fermi lab in USA. Mr. Mayya is currently holding 'Raja Ramanna Fellowship' of Department of Atomic Energy and mentoring R&D activities at BARC and ECIL.
- Mr. Mayya has published around 30 papers in national / international conferences and authored many reports. He is the recipient of DAE Technical Excellence award.







## Project: Facility for Antiproton and Ion Research (FAIR)

Prof. Peter Senger, Head of CBM Department, GSI Darmstadt

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

- Prof. Senger obtained the PhD degree from Technical University of Darmstadt in 1983. He took leading role in developing a magnetic spectrometer at GSI, Darmstadt to measure kaon and anti-kaon production in heavy-ion collisions to study the equation of state of nuclear matter at high densities. He was further involved in the measurement of in-medium properties of strange particles in dense nuclear matter. Both these research programs were aimed at the understanding of the properties of matter present in the core of a neutron star. For the last 15 years he has been working on the realization of the Compressed Baryonic Matter (CBM) experiment at the proposed Facility for Antiproton and Ion Research (FAIR) at Darmstadt, Germany.





# India-based Neutrino Observatory (INO)



# Project: India-based Neutrino Observatory (INO)

## Prof. Amol Dighe, Dean, Graduate Studies, TIFR, Mumbai

### Neutrinos: a new window to the universe



#### Abstract:

- Neutrinos are elementary particles, but quite elusive. They are the second most abundant particles in the universe, and trillions of them pass through us every second without us even realizing it. At the same time, they help the sun shine, make stars explode, and allow us to see places from where light cannot reach us. The exploration of neutrino mass patterns would give us clues about mechanisms of mass generations, which are beyond the Standard Model of particle physics. On the other hand, observations of neutrinos from the sky can inform us about important astrophysical phenomena, sometimes even before the light reaches us!

#### About the Speaker:

- Dr. Amol Dighe is a professor at the Tata Institute of Fundamental Research (TIFR), working in the area of high energy physics and astro-particle physics. His aims to understand the nature of fundamental interactions by studying properties of elementary particles. He obtained his B.Tech. from IIT Bombay, and Ph.D. from University of Chicago. He is a Fellow of Indian Academy of Sciences and Indian National Science Academy. He is the recipient of Swarnajayanti Fellowship (DST), Shanti Swarup Bhatnagar Award (CSIR), and the Distinguished Alumnus Award of IIT Bombay. He has written numerous popular science articles in newspapers and magazines.





# Project: India-based Neutrino Observatory (INO)

Prof. V.M. Datar, Project Director, INO, TIFR, Mumbai

## Why INO (India-based Neutrino Observatory)?



### Abstract:

- The genesis of the India based Neutrino Observatory project is described briefly. The flagship experiment is based on a 51,000 ton magnetised iron calorimeter (ICAL) which aims to determine the mass ordering of the 3 tiny neutrino masses through a measurement of atmospheric muon neutrinos and muon anti-neutrinos. An 85 ton 4m×4m×11 layer mini-ICAL detector with 10 glass RPCs has been built and is presently taking data at the rented premises of INO at Madurai. The possibility of a shallow depth ICAL with an efficient cosmic veto detector is being examined and shows promise.

### About the Speaker:

- Dr. Vivek Datar is a senior professor at the TIFR, Mumbai since May 2015. He obtained his PhD from the University of Mumbai in 1983 and did post-doctoral work at IPN, Orsay, France and SUNY (Stony Brook), USA. Before moving to TIFR he was at the Nuclear Physics Division, BARC [1975-2015]. He was a senior professor of the Homi Bhabha National Institute (HBNI) and Dean-Academic (Physical & Mathematical Sciences), BARC. He was also the Head NPD and an Adjunct Professor at the School of Natural Sciences, TIFR. His areas of interest include low energy nuclear physics, tests of conservation laws and symmetries and neutrino physics. Presently he is the Project Director of the India based Neutrino Observatory (INO) project, which aims to build a large underground laboratory at Pottipuram, Tamil Nadu.





# Project: India-based Neutrino Observatory (INO)

Dr. B.Satyanarayana, Scientific Officer (H), INO, TIFR, Mumbai

## Spin-offs and societal benefits of INO project



### Abstract:

- The India-based Neutrino Observatory (INO) Project is a multi-institutional effort aimed at building a world-class underground laboratory at Bodi West Hills near Madurai in Tamil Nadu. The project includes construction of an Iron Calorimeter (ICAL) detector for studying many key open questions of the tiny and elusive particles called neutrinos. ICAL will consist of 50000 tons of magnetized iron plates arranged in stacks with gaps in between where around 29000 Resistive Plate Chambers (RPCs) would be inserted as active detectors. A total of about 3.6 million ultra high speed electronic signals need to be instrumented. In this talk I will briefly describe the indigenous research and development of detectors and instrumentation needed for this experiment. Spin-offs and societal benefits of the project along with career opportunities for the young and motivated students as well as industrial synergies in this prestigious project will be highlighted.

### About the Speaker:

- Dr. Satyanarayana did his B. Tech in Electronics and Communication Engineering from J.N.T. University, Hyderabad and Ph.D. in Physics from IIT Bombay. His areas of interest include 'Detectors and Instrumentation for high energy and nuclear physics experiments'.
- Dr. Satyanarayana is a Fellow of Institution of Electronics and Telecommunication Engineers (IETE) as well as Institute of Engineers (IE). He is a member of the Governing Council of Instrument Society of India as well as a Member of Indian Physics Association. He is a Senior Member of IEEE. He is a member of the Executive Committee, Secretary and Chair of Signal Processing Society of the IEEE Bombay Section. Until recently he also served as the Chair, Technical and Professional Activities of the Section as well as an Executive Committee member, and Vice Chair (Technical Activities) of the IEEE India Council. He won IEEE Bombay Section's Outstanding Volunteer Award for 2014 and IEEE Head Quarter's MGA Achievement Award for 2016.
- Dr. Satyanarayana has published over 220 research papers and proceedings in national and international journals and conferences, besides scores of invited talks. He guided and co-guided a large number of undergraduate, master and doctoral students. He served on many of doctoral and expert committees as well as on college/universities' academic councils, boards of studies and advisory boards. He is on editorial and refereeing teams of several prestigious science and engineering journals.







## Project: India-based Neutrino Observatory (INO)

Mr. S.P. Prabhakar, Scientific Officer (H), BARC, Mumbai

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Moderator:

- Mr. Prabhakar did B. Tech in Mechanical Engineering from Harcourt Butler Technological University, Kanpur and Post Graduate Diploma in Industrial Engineering from VJTI, Mumbai. He joined 34<sup>th</sup> Batch of BARC training school in 1990. He has executed many projects which are based on technological developments of R& D activities in BARC. Naming few are Installation of a 10 Ton per hour multi commodity food irradiator in Lasal Gaon of Nashik district, Maharashtra. Developing an underwater core inspection system for BWR reactor Tarapur, Manufacturing a reactor fuel inspection system for NFC, Hyderabad, Developing tools for reconstitution of partially ruptured fuel bundles of boiling water reactors etc. Presently Mr. Prabhakar is associated with all mechanical works of ICAL magnet of INO project and with his team members he has installed an 86 ton ICAL magnet at IICHEP Madurai. He has many papers in reputed national journals. His speciality is that he has strong belief in contributions of each and every team member of a project for timely delivery of components.





## Project: India-based Neutrino Observatory (INO)

Ms. Anita Behere, Head, Electronics Division, BARC, Mumbai

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

- Anita Behere is OS and Head, Electronics Division at Bhabha Atomic Research Centre. Her area of work is design and development of high performance Data Acquisition Systems for high energy physics and other research experiments. She obtained B.E. in Electronics and Telecommunications from S.G.S.I.T.S. Indore MadhyaPradesh in 1983 and subsequently completed the Orientation Course in Engineering and Sciences of BARC.
- She is recipient of Scientific & Technical Excellence Award (2007) of DAE. She has played lead role for imaging camera of MACE (Major Atmospheric Cerenkov Experiments) telescope, the high energy gamma ray telescope being setup by DAE in Hanle, Ladakh, India. The 1088 PMT based imaging camera is a full custom design to meet the constraints of size, weight, power and performance. Her other noteworthy contributions are for the design and development of high speed DAQ systems for accelerator based high energy physics and other research experiments & trigger system for INO.





## Project: India-based Neutrino Observatory (INO)

Mr. Nitin Amte, General Manager (R&D), Essar Steel India Limited, Hazira  
Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

- Mr. Nitin Amte did his Bachelor of Engineering in Metallurgical Engineering from NIT, Raipur and Masters from Indian Institute of Technology, Mumbai. He possesses over 24 years of rich experience in the fields of Research and Product Development, Quality Assurance and Quality Control, and Process Improvement in Steelmaking, Hot Rolling, Cold Rolling and Heavy plate rolling.
- His areas of expertise include alloy design and process optimization in hot rolling of flat steel for various application segments like Energy and Power, Automotive, Yellow Goods, Shipbuilding, Defense and General Engineering and Constructions. He executed various co-development projects with several Government Establishments and Customers.
- Mr. Amte published technical papers in National and International Seminars and Conferences.



# International Thermonuclear Experimental Reactor (ITER)





# Project: International Thermonuclear Experimental Reactor (ITER)

Dr. Shashank Chaturvedi, Director, IPR, Gandhinagar

India's Plasma Science & Technology Program and Spin-offs



## Abstract:

- Institute for Plasma Research (IPR), at Gandhinagar has been actively engaged in developing programs related to plasma science and technology since 1986. These include various fields of theoretical science, materials and technologies related to superconducting magnets, cryogenics and RF and neutral beam systems. Experiments on indigenously built ADITYA Tokamak and its upgrade have shed light on several important aspects of plasmas behaviour in tokamaks. SST-1 has helped address several areas of material and technology developments. India's participation in ITER through ITER-India is further helping the Indian academia and industry to understand and develop several areas relevant to fusion technology. In addition, keeping societal benefits into consideration several spin offs have been/are being developed in the Facilitation Centre for Industrial Plasma Technologies (FCIPT). The proposed talk will highlight outcome from the above programs to showcase India's progress in the ultimate quest for fusion energy while continuing to reap societal benefits.

## About the Speaker:

- Shashank Chaturvedi got his B.Tech. in Chemical Engineering from IIT Delhi and Ph.D. in Chemical Engineering from Princeton University, USA. His PhD work involved the computational study of a novel Nuclear Fusion reactor concept, and was part of the Plasma Science & Technology Programme supported by the Princeton Plasma Physics Lab. He is a Fellow of the Indian National Academy of Engineering and Senior Professor in the Homi Bhabha National Institute (HBNI). He is a recipient of the Homi Bhabha Science & Technology award of the Dept. of Atomic Energy. His research interests include modelling of pulsed-power & plasma systems, including Magneto-hydrodynamics, radiation-hydrodynamics, high-speed impact & shock waves, pulsed electromagnetics, High Performance Computing (HPC), Theoretical and experimental determination of materials properties under extreme conditions (equation of state, radiation opacity), and automated processing of signals, voice, image & video data.





# Project: International Thermonuclear Experimental Reactor (ITER)

Mr. Laban Coblentz, Head, Communications, ITER, France

The ITER Project: “the way” to new energy



## Abstract:

- Rapid progress is ongoing in design, manufacturing, construction and R&D activities for the ITER project. The facility is now taking shape in Provence in Southern France, where construction of major buildings is advancing rapidly. Supported by achievements in fusion R&D, manufacturing of major components, such as superconducting magnet systems, vacuum vessel and cryostat, is in full swing. India is playing a critical role as one of seven ITER Members. This presentation offers an overview of the importance of ITER and industrial scale fusion to the future of human society, as a safe, clean, and nearly unlimited source of energy.

## About the Speaker:

- Mr. Coblentz’s career has spanned technology, communication, education, and sustainable development. At the US Nuclear Regulatory Commission, he applied probabilistic risk models to enhance safety at nuclear facilities. In the US Congress, he led Senator Joe Lieberman’s effort to create *The E-Government Act of 2002*. At the International Atomic Energy Agency, he collaborated with Director General Mohamed ElBaradei on nuclear diplomacy in Iraq, Iran, and other political hotspots. In New York, he established new university-based and community-based models integrating entrepreneurship and advanced manufacturing. Currently, he leads communication at the 35-country ITER Project, focused on making industrial-scale fusion a reality.





PUSHING THE FRONTIERS OF SCIENCE

# Project: International Thermonuclear Experimental Reactor (ITER)

Mr. Ujjwal Baruah, Project Director, ITER-India

India's participation in ITER – Technology challenges and Industry response



## Abstract:

- Indian commitment to ITER is in the form of in-kind 9 deliverable packages consisting of cryostat, in-vessel neutron shielding blocks, the cryo-distribution and cryo-lines, cooling water systems, diagnostic neutral beam, ICRH and ECRH RF systems, diagnostics and power supplies. Considering that ITER is a machine operated in nuclear environment, several aspects of materials, manufacturing and quality needs as per French nuclear standards need to be considered during the manufacturing of these components. Extensive interactions of ITER-India with Indian industries has resulted in developing several prototypes successfully as per standards and most of the components are now under manufacture. Role of Indian industry as equal partners in the development of the desired technologies in a short time has been a highlight of the learning process. This experience will go a long way in developing fusion technologies from the Indian perspective in future. A brief overview of the packages, their technological requirements and experiences with the Indian industry will form the highlights of the presentation.

## About the Speaker:

- Mr. Baruah is Project Director of the Indian Domestic Agency (ITER-India, Institute for Plasma Research, Gandhinagar) for Indian contributions to ITER. Institute for Plasma Research, Gandhinagar. He holds a Masters in Electrical Engineering from IIT, Madras. His research interests are in high power Neutral Beam Systems, Power Converters and High and extra-High Voltage Systems used in Fusion Research. Indigenous development of complex engineering systems and transfer of technology to local industry is his mainstay.







PUSHING THE FRONTIERS OF SCIENCE

## Project: International Thermonuclear Experimental Reactor (ITER)

Mr. Arun Chakraborty, Project Manager, Diagnostic Neutral Beam, ITER-India  
Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Moderator:

- Arun Chakraborty joined IPR in March 1991 as a Scientific Officer, after completing his masters in Physics from the University of Kolkata and M.Tech in Nuclear engineering from IIT Kanpur in Dec. 1990. He has been involved in the development of Neutral Beam (NB) injection systems that require special technologies for mechanical, electrical, vacuum and control systems. He lead the technology development program in several areas of NB and has established an implementable model for developing technologies with the industries. The first Indian Cryo-condensation pump, Megawatt class UHV compatible Heat Exchangers, Development of 1st large size ion source etc. are notable outcome of this model. In the ITER project, he is leading the Indian contribution from the technical and administrative front as a Project Manager in the Indian domestic agency. To date he has 3 patents and more than 100 publications in peer reviewed international journals.







PUSHING THE FRONTIERS OF SCIENCE

## Project: International Thermonuclear Experimental Reactor (ITER)

Dr. K. Balasubramanian, Director, NFTDC, Hyderabad

Panel Discussion: Leveraging collaboration for Indian science and industry



### Abstract:

- Fusion reactor systems are characterized by extreme service conditions of P, T and high electro-magnetic fields, high energy densities and thermal fluxes. In order to render such a system, advanced materials, engineering design and manufacturing processes play a quintessential role. In this lecture, advances in materials and innovations in manufacturing processes are elucidated with case studies on Beam Line Components and Divertor element Developments.

### About the Panel Member:

- Dr Balasubramanian, graduated from Indian Institute of Technology, Kanpur, India with B. Tech in Metallurgical Engineering (1982) and PhD from McMaster University, Canada. Dr Bala set up unique, self-financing and multidisciplinary Technology Centre called NFTDC, (Nonferrous Materials Technology Development Centre) at Hyderabad, India. Serving as its Director over two decades, he created centres of excellence, namely, CoE for advanced materials & processes, CoE for Engineering Design and Manufacturing, CoE for Electric Vehicle Technologies, CoE for Biomedical Devices and CoE for Materials and Energy Devices. He has won many awards, published over 100 papers in international journals, holds 7 patents and guided many PhDs.





## Project: International Thermonuclear Experimental Reactor (ITER)

Prof. Rajiv Dusane, P. K. Kelkar Chair Professor in Nanotechnology, IIT Bombay

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

- Prof. Rajiv Dusane did his M.Sc. Physics in 1984 from Nagpur University, followed by Ph. D. (Physics) in 1989 in Pune University. His interests are: Synthesis and characterization of amorphous and nano-crystalline thin films of elemental semiconductors and alloys, silicon nano-devices, for applications such as thin film solar cells, thin film transistors for flat panel displays, MEMS devices and nuclear detections. He also works in Plasma processing and surface nano-engineering for various applications.

<http://www.met.iitb.ac.in/~rod>

<http://www.iitb.ac.in/mems/en/prof-rajiv-o-dusane>





PUSHING THE FRONTIERS OF SCIENCE

## Project: International Thermonuclear Experimental Reactor (ITER)

Mr. Rajkumar Panjwani, President, Cryo Scientific Division, INOX India (P) Ltd.

Panel Discussion: Leveraging collaboration for Indian science and industry



### Abstract:

- ITER, a Mega Scientific Experiment to obtain Thermal energy by Fusion Process is complex and therefore poses challenges in producing equipment to conduct the experiment. Be it design of process, basic design, segregating the packages or execution of individual packages, every phase has been exciting and equally demanding. INOX as Industry partner of the ITER Project has lived through the execution of one of the packages in the field of Cryogenics. Even though complex in nature the mitigation of challenges is made possible by the following:
  - Understanding ITER Project and its systems
  - Interpretation of the requirements and specifications of ITER Project
  - Design, Engineering and sourcing of the equipment for a first time experiment with commonly available materials.
  - Meticulous planning
- Industry has been able to achieve it by Hand Holding from ITER India and ITER Organization.

### About the Panel Member:

- Mr. Rajkumar Panjwani has a total experience of around 43 years (34 years in India and 9 years in Gulf) of Handling Project Management & Control, out of which 34 years as member of senior management team implementing various projects in the field of Design, Engineering, Process Industry, Oil & Gas Refinery and Petrochemical Complex. He has expertise in start-up of new projects and putting them on the track for execution, even bringing troubled projects on the right track. In addition he has working Experience in India with Larsen & Toubro, Tata Group Companies and HCL Group. He has also been associated with reputed Multinational companies like Fluor, Technip, CBI, Air Liquide, Hyundai, ITER.



# Laser Interferometer Gravitational-Wave Observatory (LIGO)





# Project: Laser Interferometer Gravitational-Wave Observatory (LIGO)

Dr. David Reitze, Executive Director, LIGO Laboratory

The Gravitational Wave Astronomical Revolution: India's Emerging Role



## Abstract:

- The past four years have witnessed a revolution in astronomy, enabled by the first detections of gravitational waves from colliding black holes and neutron stars through the direct observation of their gravitational wave emissions by the LIGO and Virgo observatories. These discoveries have profound implications for our understanding of the Universe. Gravitational waves provide unique information about nature's most energetic astrophysical events, revealing insights into the nature of gravity, matter, space, and time that are unobtainable by any other means. In this talk, I will briefly discuss how we detect gravitational waves, how gravitational-wave observatories will revolutionize astronomy in the coming years and decades, and how India is poised to play a key role in the future gravitational wave astronomy.

## About the Speaker:

- David Reitze holds joint positions as the Executive Director of the LIGO Laboratory at the California Institute of Technology and as a Professor of Physics at the University of Florida. His research focuses on the development of gravitational-wave detectors. He received a B.A. in Physics with Honors from Northwestern Univ. and a Ph. D. in Physics from the University of Texas at Austin. He is a Fellow of the American Association for the Advancement of Science, the American Physical Society, and the Optical Society. and was jointly awarded the 2017 US National Academy of Sciences Award for Scientific Discovery for his leadership role in LIGO. He is a member of the international LIGO Scientific Collaboration that received numerous awards for the first direct detection of gravitational waves in 2015, including the Special Breakthrough Prize in Fundamental Physics, the Gruber Prize for Cosmology, the Princess Asturias Award for Scientific and Technical Achievement, and the American Astronomical Society Bruno Rossi Prize. He served as the Spokesperson of the LIGO Scientific Collaboration from 2007 until 2011.





# Project: Laser Interferometer Gravitational-Wave Observatory (LIGO)

## Dr. Sendhil Raja, Head, Laser & Optical Instrumentation Section, RRCAT

### LIGO-India Project - Optical Instrumentation at its limits!



#### Abstract:

- The Laser Interferometer Gravitational Wave Observatory or LIGO as it is popularly known, is a 4 km arm length laser interferometer designed and developed for detecting the minuscule contraction and expansion of space due to a passing gravitational waves. The LIGO interferometers are arguably the most complex instrument that humankind had ever built to understand the universe. The talk will provide a brief overview of the LIGO-India project which is for setting up one of these interferometers in India, the complexities and challenges in setting up of a 4 km arm length laser interferometer and the technology that goes into achieving the required sensitivity to be able to detect and measure Gravitational Waves.

#### About the Speaker:

- Sendhil Raja S. did his B.Sc. in Physics from P.S.G. Collage of Arts & Science, Coimbatore. He did his M.Sc. in Physics from the India Institute of Technology Madras, Chennai, after which he joined the Raja Ramanna Centre for Advanced Technology to pursue a career in optical instrumentation. He received his PhD in Physics (Optical Instrumentation) from India Institute of Technology Madras, Chennai, in 2009. He is a recipient of the Young Technologist Award of the Department of Atomic Energy for the year 2006. He currently heads the Laser & Optical Instrumentation Section of the Advanced Lasers & Optics Division at Raja Ramanna Centre for Advanced Technology, Indore.





# Project: Laser Interferometer Gravitational-Wave Observatory (LIGO)

Prof. Subroto Mukherjee, Head LIGO Division, IPR, Gandhinagar  
LIGO India - opportunities for the industry



## Abstract:

- LIGO-India observatory, developed by the four R&D institutes (DCSEM, IPR, IUCAA, RRCAT) has the following major work elements; civil facilities, vacuum systems, contamination control, instrumentation & controls, laser & optics, data storage and making scientific data available for research. A major task would be to ensure quality control. The presentation would give a glimpse of the opportunities that the industry can have during the development phase of the project.

## About the Speaker:

- Prof Subroto Mukherjee is an experimental plasma physicist and has developed plasma based technologies for societal benefit. Prof Mukherjee is currently leading the LIGO-India activities related with vacuum and controls & data systems activities at IPR. He has published 140 journal papers, has 15 patents and guided 16 PhD students. He is an Alexander von Humboldt fellow, Fellow of Gujarat Science Academy (FGSA) and Fellow of Indian National Academy of Engineering (FNAE).







## Project: Laser Interferometer Gravitational-Wave Observatory (LIGO)

Prof. Sukanta Bose, IUCAA, Pune

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Moderator:

- Sukanta Bose is a Professor at the Inter-University Centre for Astronomy and Astrophysics and Science Lead of the LIGO-India Project. He is a member of the LIGO Scientific Collaboration (LSC) Council and the LSC sub-committee of the Indian Initiative in Gravitational wave Observations (IndIGO). Since 2013, Bose has worked on training several IndIGO scientists in gravitational wave research, particularly, using LIGO data, and on guiding their contributions in LSC science.







## Project: Laser Interferometer Gravitational-Wave Observatory (LIGO)

Dr. Anish Bekal, Forbes Marshal Pvt Ltd, Pune

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

- Dr. Anish Bekal after his Bachelors from MIT Manipal, started his career as Reliability Engineer for RF systems in Remote sensing satellites at Indian Space Research Organisation. He completed his PhD from Indian Institute of Technology Madras in 2013 in the area of Stabilization of Mode locked Fiber lasers and then went on to work as a Researcher in GE Technology center in Bangalore. He worked on several technologies such as Raman spectroscopy and Quantum Cascade lasers for sensing trace gas concentration at high temperature and harsh environments in collaboration with Combustion lab at Stanford University. Currently he is working at Forbes Marshal Pvt Ltd where he has been instrumental in establishing a laboratory focused on developing Sensing technologies for Emission measurement and industrial process control. He has 12 research papers in reputed journals and Conferences and filed 4 US and 3 Indian patents.





## Project: Laser Interferometer Gravitational-Wave Observatory (LIGO)

Prof. Archana Pai, IIT Bombay

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

- Archana Pai is an Associate Professor at the Department of Physics, IIT Bombay since July 2017. After securing PhD from IUCAA on Gravitational Wave detection using multi-detector network, she held several prestigious post-doctoral fellow positions such as Henri Poincare Fellow at Observatory of Nice, INFN Fellow at La Sapienza and Post Doctoral position at Albert Einstein Institute where she worked did research on gravitational wave signal detection methodologies for ground based as well as future space based LISA detector. Her research interests span from gravitational wave transient search in LIGO-Virgo data to multi-messenger astronomy. Her group in IIT Bombay is an active member of LIGO Scientific Collaboration and contributed to the testing GR using the first Binary Black Hole event and at present leads the Intermediate Black Hole Binary burst search in the LIGO collaboration. She is a recipient of Special Breakthrough Prize in Fundamental Physics as well as Gruber prize in Cosmology along with the LIGO-Virgo Scientific Collaboration for the year 2016.





## Project: Laser Interferometer Gravitational-Wave Observatory (LIGO)

Prof. Somak Raychaudhury, Director, IUCAA, Pune

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

- Somak Raychaudhury is the Director of the Inter-University Centre for Astronomy and Astrophysics (IUCAA), Pune, and is the Chair of the TMT-India Project Management Board and the LIGO-India Science Management Board. He graduated from Presidency College, University of Calcutta, and University of Oxford, UK. After his PhD from the University of Cambridge, UK, he worked at the Harvard-Smithsonian Center for Astrophysics, USA, where he was part of the team that built the Chandra X-Ray Observatory for NASA. After faculty positions at IUCAA, Pune and at the University of Birmingham, UK, he was Dean of Sciences at Presidency University, Kolkata, before his current position. His research involves a wide range of topics in observational Cosmology and Astrophysics.



# Square Kilometre Array (SKA)





## Project: Square Kilometre Array (SKA)

Prof. Robert Braun, Science Director, SKA Organisation

The Square Kilometre Array: an Astronomer's Dream Science Machine



### Abstract:

- The Square Kilometre Array (SKA) is an ambitious project to build a radio telescope that will revolutionise our understanding of the Universe and the laws of fundamental physics. It will be the world's largest scientific instrument, built in two Phases. SKA1 will make highly competitive contributions to addressing fundamental questions in physics and astrophysics, while SKA2 will define a new benchmark in these fields. In this presentation I will summarise the current status of the project as well as demonstrating some of its amazing scientific potential.

### About the Speaker:

- Prof. Braun currently fills the role of Science Director of the SKA Organisation. He has published more than 250 scientific papers attracting some 7000 citations in a career spanning 35 years. He has previously led the scientific staff of the ASTRON Institute in the Netherlands and CSIRO Astronomy and Space Science in Australia.





## Project: Square Kilometre Array (SKA)

Prof. Yashwant Gupta, Centre Director, NCRA, TIFR, Pune

Technology challenges on the road to designing and building the SKA



### Abstract:

- The Square Kilometre Array (SKA) is an ambitious project that will push many existing technologies to the limit, as well as drive new technology developments, in a wide range of areas covering antennas, low noise electronics, high volume optical fibre networks, sophisticated real-time signal processing, big data challenges in computing and storage, as well as complex system management algorithms and software. This presentation will highlight the main challenges that have come up during the design phase of the SKA, and those that are expected to come up as the construction of SKA gets going, and will also indicate possible solutions to these challenges.

### About the Speaker:

- Prof. Yashwant Gupta presently heads the National Centre for Radio Astrophysics as the Centre Director. He obtained his M.S. and Ph.D. in Radio Astronomy from the University of California, San Diego in 1990, after completing his Bachelor's degree in Electrical Engineering from IIT Kanpur in 1985. In addition to research in the astrophysics of pulsars, Prof Gupta also has significant interest and involvement in instrumentation and signal processing applications in radio astronomy. He has led the recent major upgrade of the GMRT, and is also involved in the technical developments at the SKA, in addition to being the Science Director from India on the SKA Board.





## Project: Square Kilometre Array (SKA)

Prof. Yogesh Wadadekar, NCRA, TIFR, Pune

Indian industry engagement in the SKA: current status and future

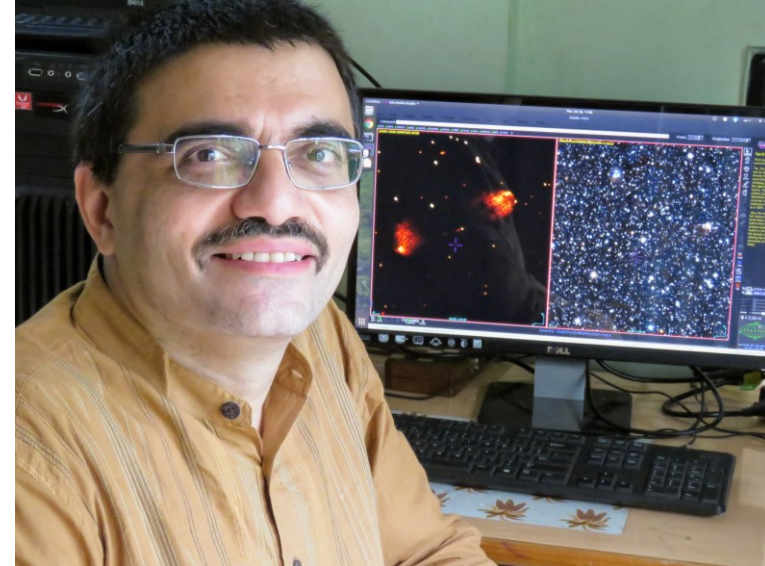


### Abstract:

- Industry participation has been integral to the Indian participation in the SKA project since the early days. This participation has been both collaborative and contractual in nature. I will describe the various ways in which SKA India has successfully partnered with industry over the last decade to develop state of the art solutions to challenging engineering problems. There are many learnings here for forging a public-private partnership that leverages the strength of both partners in the Indian context. I will also indicate the way forward for industry to engage even more deeply during SKA construction and operations.

### About the Speaker:

- Prof. Yogesh Wadadekar works at the National Centre for Radio Astrophysics, Tata Institute of Fundamental Research in Pune. Yogesh is an astronomer who does research on various problems related to the evolution of galaxies using many telescopes in space and on the ground. Yogesh obtained his BTech at IIT Bombay in 1994 and then a MSc and PhD in Physics from the University of Pune while working at IUCAA. He then did postdoctoral stints at Paris, Baltimore and Princeton before returning home to India. Outside of his work, he has many interests – nature and wildlife (especially birds and snakes), public outreach in astronomy, Indian history, computer programming, and economics.







## Project: Square Kilometre Array (SKA)

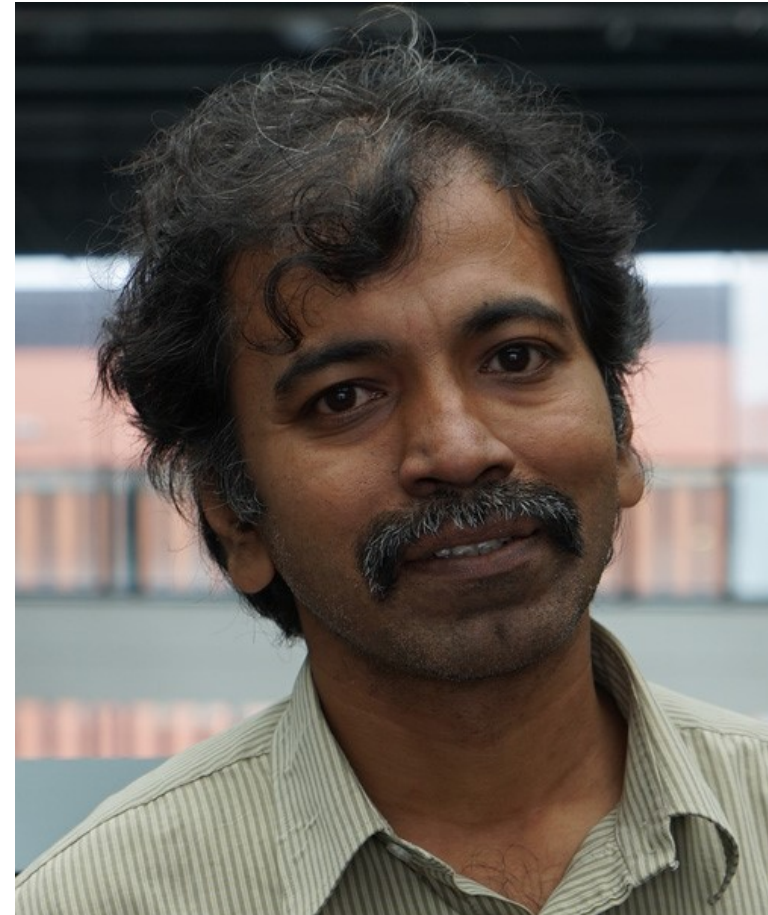
Dr. Prabu Thiagaraj, Raman Research Institute, Bengaluru

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Moderator:

- Prabu Thiagaraj graduated in Computer Engineering from the Bharathiar University, India. Subsequently he joined The American College, Madurai, and developed a four-axis X-Ray Goniometer with Prof Richard P Riesz. Then he joined the Radio Astronomy Lab at the Raman Research Institute, Bangalore, played critical roles developing a pulsar search preprocessor, digital beamforming, FPGA based digital receivers for Ooty, GMRT and MWA radio telescopes. Received his MS and PhD through radio-astronomy instrumentation from the Indian Institute of Science, India. He worked for JBCA, University of Manchester, UK, between 2014 to 2017, and developed FPGA based acceleration prototypes along with the SKA TDT team for Pulsar search with the SKA. Presently, he is at the Raman Research Institute, and his current interests are digital signal processing with FPGA and HPC.







## Project: Square Kilometre Array (SKA)

Mr. Vikas Kumthekar, Tata Consultancy Services Limited, Pune

Panel Discussion: Leveraging collaboration for Indian science and industry



### Abstract:

- Tata Consultancy Services Limited (TCS) is a flagship Tata group company, focused on providing the information technology and business consulting services globally. TCS is one of the industry partners of NCRA in the SKA program and has been involved through early stages of SKA preconstruction work. TCS involvement includes control system development, project management, research and innovation. In my presentation, I will talk about TCS's involvement in the larger SKA program.

### About the Panel Member:

- Vikas Kumthekar is senior associate from Engineering and Industrial Services division of Tata Consultancy Services. He leads the real time system development programs. He has diverse 15+ years of professional experience in working with real-time systems, process control and industrial automation systems in various domains including the radio astronomy. A graduate engineer in Electronics, has his key strengths in the solution design and architecture for complex systems involving integration of automation, control and business systems. Apart from his present role of relationship manager, he is deeply involved in the development of software system for SKA pathfinder- Giant Metrewave Radio Telescope.





## Project: Square Kilometre Array (SKA)

Ms. Snehal Valame, Persistent Systems, Pune

Panel Discussion: Leveraging collaboration for Indian science and industry



### Abstract:

- Industry partners play a key role in Team SKA as part of the engineering consortia, collaborating with research institutions around the world to design the SKA's core elements. Persistent Systems, a global IT company headquartered in Pune, India is an industrial partner with NCRA - a member of the SKA's Telescope Manager consortium. This presentation talks about Persistent's long term association as a technology partner on various Astronomy domain projects like Virtual Observatory, India, Astrosat, GMRT and SKA. The presentation also highlights Persistent's offerings and experience in building software that drives the business of our customers; enterprises and software product companies with software at the core of their digital transformation.

### About the Panel Member:

- Snehal presently leads the astronomy domain projects at Persistent Systems. After her bachelor's degree in Computer Engineering and Master's in Software Engineering, Snehal Valame started her career with Persistent Systems. Snehal has been working on various projects across the entire life-cycle of an observatory ranging from telescope execution software - data management - science operations systems - support systems. She spent a short period of her career as a project scientist at Côte d'Azur Observatory in France.

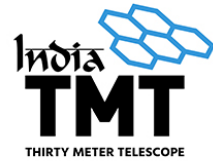


# Thirty Meter Telescope (TMT)



## Project: Thirty Meter Telescope (TMT)

Dr. Ravinder S. Bhatia, Associate Project Manager, TMT Project  
Thirty Meter Telescope



### Abstract:

- The Thirty Meter Telescope (TMT) represents the next generation of ground-based astronomical observatories. Driven by frontier science themes, TMT will offer 10 times the light-gathering power of the largest existing ground-based optical/near-infrared facilities, and will produce images 10 times more detailed than the Hubble Space Telescope. With this tremendous increase in power, TMT will deliver as yet unforeseen, groundbreaking discoveries about the Universe. TMT will herald a new generation of telescopes and will serve its partner communities as a flagship research facility. TMT is an international partnership involving India, the USA, Canada, Japan, and China. In this talk I will provide an overview of the scientific goals and technical architecture of the observatory. I will also provide a status report on the construction activities.

### About the Speaker:

- Dr. Ravinder S. Bhatia is Associate Project Manager for the Thirty Meter Telescope. He has worked on international collaborations in technology development for over twenty years in astronomy, Earth observation and oceanography. Previously, he was Project Systems Engineer for the \$1.2 billion Atacama Large Millimeter/submillimeter Array (ALMA) in Chile. He was Senior Thermal/Cryogenics Engineer for the European Space Agency, where he worked on the Planck Space Telescope, the MIRI camera for the James Webb Space Telescope, and also served as Technical Officer for technology research and development contracts across Europe. He was Visiting Research Fellow at the UK National Oceanography Centre. As Senior Postdoctoral Scholar at Caltech's Division of Physics, Mathematics and Astronomy, his research focused on developing instruments to measure the Cosmic Microwave Background. Ravinder Bhatia gained his Bachelor's degree in Aeronautics from Imperial College (1991), his Ph.D. in Experimental Astrophysics and Aerospace Engineering from Queen Mary College (1998), and his Master's degree in International Relations from Cambridge University (2005).



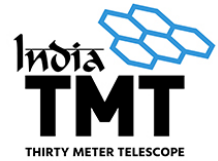




## Project: Thirty Meter Telescope (TMT)

Prof. A.N. Ramaprakash, IUCAA, Pune

Challenging technology horizons for expanding discovery space



### Abstract:

- The drive to establish complex observatory facilities stems from our quest to probe ever farther, fainter and finer into the cosmos which we inhabit. Building such facilities for astronomy pushes the envelopes of several technology fields. Not surprisingly, such mega-endeavors have to be jointly undertaken by scientists, technologists, industries, science managers and even lawyers. Teams are often distributed across the globe thus raising barriers of time zones, language and working cultures. Revolutions in communication, travel and transport are bringing down these barriers. This talk will take a glimpse at how science and technology challenge each other in the building of the Thirty Metre Telescope International Observatory.

### About the Speaker:

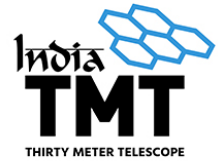
- A.N. Ramaprakash is a Professor at the Inter-University Centre for Astronomy & Astrophysics (IUCAA), Pune, India and is the Associate Programme Director of India - Thirty Meter Telescope (TMT) project. Trained as an Electronics Engineer, he obtained his PhD in Physics from IUCAA, Pune. He was a visiting research fellow at California Institute of Technology (Caltech), US. As a postdoctoral research fellow at Institute of Astronomy, Cambridge, UK, his research focused on astronomical instrumentation. Ramaprakash joined IUCAA as Scientist in 2000, and became Professor in 2010. He is the head of the instrumentation laboratory at IUCAA and has contributed significantly to the instrumentation development for national as well as international astronomical observing facilities.





## Project: Thirty Meter Telescope (TMT)

Dr. Mushtaq Ahmed, Architect, ThoughtWorks, Pune  
Building Distributed Telescope Control System for TMT



### Abstract:

- TMT(Thirty Meter Telescope) is going to be world's largest optical telescope once operational. ThoughtWorks is building distributed control system for TMT. This talk will provide an overview the middleware capabilities, the architecture, as well as team collaboration structure between ThoughtWorks, IIA and TMT-Pasadena. The telescope comprises of multiple hardware components each supporting a custom communication protocol at firmware level. Telescope observation requires coordination across these components for a higher level tasks such as mirror rotation, filter selection etc. The control-system middleware provides a homogenous higher level protocol for submitting commands that are then be mapped to heterogenous underlying hardware protocols. The middleware also provides infrastructure-level services for publishing events, raising alarms, and knowing the "current time" with high accuracy and precision. The architecture includes a service discovery mechanism that will be used by components to discover each other. The underlying technology is the Akka-toolkit which hugely simplifies creating event-based reactive-systems. The implementation language of the platform is Scala, but APIs are provided for both Scala and Java. The team is distributed across 5 geographies : Pune, Pasadena, Bengaluru and Germany. We will also talk about Agile processes and toolsets that enabled us to work effectively across different time-zones and still manage to deliver on time and stay within the budget.

### About the Speaker:

- Mushtaq is working in the IT industry for more than 17 years. He has played various roles: domain expert in life sciences, business analyst, tech-lead and architect. He has keen interest in Scala/Akka which he is evangelising for past many years. Curiously, he is a medical doctor by undergraduate training (BJ Medical College, Pune) and masters in Biomedical Engg (IIT Bombay). He is currently with ThoughtWorks, Pune and playing the role of architect on TMT project from India side.

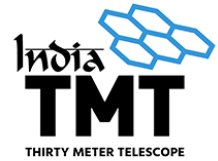




## Project: Thirty Meter Telescope (TMT)

Prof. A.N. Ramaprakash, IUCAA, Pune

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

- A.N. Ramaprakash is a Professor at the Inter-University Centre for Astronomy & Astrophysics (IUCAA), Pune, India and is the Associate Programme Director of India - Thirty Meter Telescope (TMT) project. Trained as an Electronics Engineer, he obtained his PhD in Physics from IUCAA, Pune. He was a visiting research fellow at California Institute of Technology (Caltech), US. As a postdoctoral research fellow at Institute of Astronomy, Cambridge, UK, his research focused on astronomical instrumentation. Ramaprakash joined IUCAA as Scientist in 2000, and became Professor in 2010. He is the head of the instrumentation laboratory at IUCAA and has contributed significantly to the instrumentation development for national as well as international astronomical observing facilities.



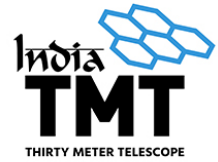




## Project: Thirty Meter Telescope (TMT)

Prof. G.C.Anupama, Dean, IIA, Bengaluru & President, ASI

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

- Prof. G.C. Anupama is a senior professor and Dean at the Indian Institute of Astrophysics (IIA), Bengaluru. She obtained her PhD from IIA in 1991. Her scientific interests are in the area of time domain astronomy, studies of novae, supernovae, gamma-ray burst sources and EM counterparts of gravitational wave sources. She is also interested in the development of astronomical facilities. She is Professor-in-charge of the Indian Astronomical Observatory (IAO), Hanle and Centre for Research and Education in Science and Technology (CREST), Hosakote. She is closely associated with the TMT project as the Group Head of India-TMT M1 Optics group. Prof. Anupama is a Fellow of the National Academy of Sciences India, Allahabad, Fellow of Indian Academy of Sciences, Bengaluru, and recipient of Govt. of Karnataka's Sir. C.V. Raman Young Scientist Award in Space Sciences for the year 2001. She has recently been elected as the President of The Astronomical Society of India (ASI), becoming the first woman President of ASI.



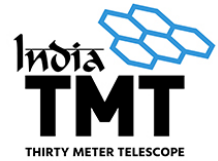




## Project: Thirty Meter Telescope (TMT)

Prof. Jayant Murthy, Director (Ag), IIA, Bengaluru

Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

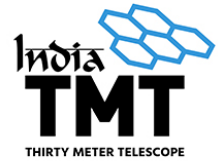
- Jayant Murthy obtained his PhD from the Johns Hopkins University in 1987 with a project to look at the distribution of gas in the neighborhood of the Sun. He spent a year at JHU working on an instrument which flew on the Space Shuttle to look at the ultraviolet sky. He then went to NASA/GSFC for two years as a NAS/NRC Research Fellow. He returned to JHU in 1990 to work on a number of ultraviolet spacecraft and finally joined IIA in 1999 where he has been ever since. Murthy has published over 100 articles in the scientific literature and has supervised over a dozen PhD students. He has actively been involved in outreach activities at all levels.





## Project: Thirty Meter Telescope (TMT)

Mr. Surendra Vaidya, Executive VP & Business Head, Godrej Aerospace  
Panel Discussion: Leveraging collaboration for Indian science and industry



### About the Panel Member:

- After graduating from IIT, Powai in Metallurgy in 1983, S.M. Vaidya chose to work in India and build his career in Welding. He was given the responsibility to set up Welding Department in Godrej Process Equipment Division (PED) in 1987 for wide Range of alloys as per international standards. In the year 1996, he was chosen to Head the special task force of Engineers and Technicians set up to contribute to India's Space & Defence programs. He is credited with developing a new Business in Aerospace – Godrej Aerospace, which has achieved important international Certification like AS9100, ISO 14001, OHSAS 18001, NADCAP and ISO27001 and has become one of the trusted suppliers of critical components and assemblies to Aerospace primes like Snecma of France, Eaton and Moog, GE of US. Has been awarded by the Aeronautical Society of India for development of Cryo Engine Technology for ISRO and also Won Indira Engineering Excellence Awards as a symbol of Excellence and a tribute to leadership in March 2009. Under his leadership, Godrej Aerospace has received several accolades including the Defense Technology Absorption Award – DRDO (2009) and TPM Excellence Award “Category A” - 2013 by JIPM, Japan. As an outreach initiative, he regularly interacts with Academia and research Institutions.



# Feedback and Conclusion



## Feedback and Conclusion

### Mr. Nuni Rambabu, Executive Director (Nuclear), ECIL, Hyderabad Perspectives from Indian Industries

#### About the Panel Member:

- Mr. Nuni Rambabu, Executive Director (Nuclear) joined ECIL on 1st July 2018. Shri Rambabu has completed his Graduation in Electronics Engineering from Bengaluru University in 1990 and joined as Graduate Engineer Trainee in NPCIL. In NPCIL, he worked at Kaiga Generating Station, TAPP -3&4, NPCIL (HQ), KAPP-3&4. He was the youngest Section Head in NPCIL and made responsible for Construction and commissioning of TAPP 3&4. Mr. Rambabu was instrumental in achieving Criticality Test of TAPP-4 in record time (less than 5 years). Mr. Rambabu conferred with NPCIL High Performance Awards for the years 2007 and 2017. He is presently heading Nuclear and Electronic Voting Machines business in ECIL.







## Feedback and Conclusion

### Mr. Mani T T, Co-founder and Managing Director, Avasarala Perspectives from Indian Industries

#### About the Panel Member:

- Born on 14<sup>th</sup> of April, 1950 in a small village near Tirupati (Andhra Pradesh). He has done his Mechanical Engineering Degree in the year 1972 and secured First rank with Gold Medal. Joined Bharat Electronics Limited in Bangalore in early 1973 and served for 13 years in various areas such as: Design, Maintenance, Machine shop, Planning and Materials control and was heading Special Purpose Machinery Manufacturing division when left Bharat Electronics Limited. Co-founded Avasarala during the year 1985 along with seven more colleagues from Bharat Electronics Limited, and at present heading the organization as Managing Director. The company is headquartered at Bangalore and having operations in multiple locations at Bangalore and Pondicherry.





## Feedback and Conclusion

### Mr. Subhrojyoti Roy, Sr. Scientist, TCS Research and Innovation Perspectives from Indian Industries

#### About the Panel Member:

- Subhrojyoti works as a senior scientist at the Embedded Systems & Robotics Research and Innovation lab at TCS and has over 20 years of experience in software research and development. He led invention of multiple novelties for flagship TCS products such as MasterCraft and Ignio. Subhrojyoti participated at ITER and the Square Kilometer Array (SKA) and successfully led creation of the design of control system for SKA on behalf of the Telescope Manager international consortium. His current research entails building next generation engineering platforms for robotics and IoT. He co-authored more than 25 publications and has 3 granted patents.





## Feedback and Conclusion

### Mr. G.Shankar, Director, Metallic Bellows (India) Pvt. Ltd. Perspectives from Indian Industries

#### About the Panel Member:

- G.Shankar is currently Director of Metallic Bellows (India) Pvt. Ltd). responsible for development in Space, Aerospace & Defense. His career span over three and half decades. During that period he has overseen Design, Marketing and Quality. He is an Engineer and has a post Graduate Diploma in Business Administration from Loyola Institute of Business Administration.

