



**Bharathidasan University**  
Re-accredited with 'A' Grade by NAAC

**ExploreTheSpace**

Opportunities in Space Sciences & Technology  
A Programme of The Global Trade Driver

**A Report  
on  
RAMAN - ARMSTRONG LECTURE  
SERIES ON SPACE- 2018  
“Future of Space Exploration”**

**Keynote Address : Dr. Jaydeep Mukherjee, Director, NASA FSGC, USA**

**Bharathidasan University Main Campus, Tiruchirappalli  
19<sup>th</sup> December, 2018**



ExploreTheSpace, a non-profit initiative spreading awareness on Space Sciences and technology among school and college students, joined hands with Bharathidasan University to launch the **Raman- Armstrong Lecture Series on Space** on 19th December 2018 at Bharathidasan University, Trichirappalli. The keynote address was delivered by **Dr. Jaydeep Mukherjee, Director, NASA FSGC, USA** on **FUTURE OF SPACE EXPLORATION**.

Dr. M. Ravichandran, Director, BSM, welcomed the gathering. D.V.Venkatagiri, CEO, ExploreTheSpace gave a brief note on the importance of Space Education and the MOU with Bharathidasan University.



Dr. M. Ravichandran   Dr. K. Jeganathan   Dr. Bhimaraya Metri   D.V. Venkatagiri   N. Balaji

Dr.K.Jeganathan, Professor and Head, Department of Physics, BDU highlighted on the various aspects of Space Sciences and research. Dr. Bhimaraya Metri, Director, IIM Tiruchi, in his presidential address emphasized on the impact of changing technologies on the job market and the growing Indo-US business opportunities in the space sector.

The objective of Explore The Space launching **The Raman-Armstrong Lecture series on Space**, is to celebrate and promote Indo-US cooperation in space science, technology and exploration. Dr. G. Gopinath, Registrar, BDU delivering the inaugural address spoke on the remarkable progress made by Indian Space programme-ISRO- ever since the launch of the first satellite - Aryabhata. Mr. N. Balaji, Honorary Chair, Explore The Space, Southern Region highlighted on the spin-off benefits - Communication Satellites, Water purification systems, Solar Panels etc - and proposed the vote of thanks.

The Seminar had over 150 enthusiastic participants – mostly College Students and a few school students and faculty from different departments. The event had a very good interactive session with Students asking questions on using cosmic rays as fuel for Satellites, Space Debris, Time machine etc.

The Seminar was co-sponsored by Potti Sriramulu College of Engineering & Technology, Vijayawada, Oxford English School, Chidambaram, Akara Research & Technologies Pvt. Ltd, Chennai, Apex Solutions Ltd, Guntur & SS Industrial Systems, Hyderabad.



## Excerpts of the speech delivered by Dr. Jaydeep Mukherjee

We explore space to understand earth's environment, for the long-time survival of the human race, to inspire the general public, to develop new technologies for economic gains. Since the world will be experiencing shortage of water, fuel and food in the near future, we have to think about settling on other planets and the moon and hence the need for space exploration.

We started at a very simple level, which is the low-orbit around the earth (250 km to 1500 km). To understand the impact of weightlessness on humans, we need to use an environment of weightlessness which is provided by the orbiting International Space Station. 30 plus countries have participated in the research program on the ISS (International Space Station)

Astronauts on the space station experience blurry vision, nausea and dizziness. These are all result of the effects of weightlessness. To ensure the health of Astronauts



**Dr. G. Gopinath**  
Registrar  
Bharathidasan University

who would be traveling to Mars and other planets we have to combat these side effects of weightlessness. The next step would be to have a settlement on the Moon, since it is so close to earth. To make this settlement effective and cheap, we should use the resources available on the Moon.

One of these resources is the use of the lunar soil (Regolith) to make cement and the use of the concept of 3-D printing to construct habitats on the Moon. It is very expensive to carry everything from the Earth to construct habitats on the Moon and would make more sense to use the resources on the Moon.

Once we have developed the technology to build settlements on the Moon, we can focus on the Earth's neighbour, Mars. Mars is a better place for human settlement, since Mars has a thin atmosphere and seasons like the Earth.

Like the Moon, we need to use the resources on Mars namely, the gases in the Martian atmosphere to generate fuel to return to Earth. Scientists think that there might be water in the form of permafrost, just below the surface of Mars. There is evidence of ice on the North and South Poles of Mars. The time taken to travel to the Mars –nearly 6 to 8 months –is now a very big challenge and it takes 6 months when Mars is closest to the Earth which is in once in one and a half years. Else, it takes much longer.



**Dr. Jaydeep Mukherjee**  
Director  
NASA FSGC, USA



## Raman-Armstrong Lecture series on Space



## Indo-US Space Co-operation



- Indo-US Cooperation in the Space arena dates back to the very beginning of the Indian space programme.
- The very first surrounding rocket, a Nike- Apache launched from Thumba on November 21, 1963 was a US made rocket that carried instruments to conduct ionospheric experiments over the earth's magnetic equator that passes over Thumba.
- Chandrayaan-I, India's unmanned lunar mission, has been the pivot of Indo-US cooperation in space exploration.
- The Deep space navigation and tracking services support was provided by NASA for India's Mars Mission.
- A large number of men and women of Indian origin work for NASA in USA.
- **RAMAN - ARMSTRONG LECTURE ON SPACE** is a vibrant addition to celebrate and promote Indo-US Co-operation.

# GLIMPSES OF THE EVENT



**“MOU between Bharathidasan University and The Global Trade Driver - August 2018”, to Promote Indo-US Educational, Business and Cultural Exchanges with specific reference to Central Tamil Nadu (Tiruchi and surroundings).**



**(L to R): D.V.Venkatagiri, CEO, The Global Trade Driver, Dr. P. Mani Sankar, Vice Chancellor, BharathiDasan University, Dr. Gopinath Ganapathy, Registrar and Dr. M.Balamurugan, Director, BUTP**

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