Report on Invited Lecture "Astronomy's New Frontiers" held on 9.12.2022

Cosmology Education and Research Training Centre
(COSMOS) Mysuru

Indian Institue of Astrophysics
&
Yuvaraja's College (Autonomous)
IQAC and Science Forum

Invited Lecture

ASTRONOMY'S NEW FRONTIERS

By Prof. Ajith Parameshwaran,
International Centre for Theoretical Sciences,
Tata Institute of Fundamental Research, Bengaluru

Modern astronomy started four centuries ago with Galileo's invention of the astronomical telescope. In the past century, astronomical observations using different wavelengths of electromagnetic waves revolutionised our understanding of the Cosmos. Recently, observations using subatomic particles such as neutrinos and cosmic rays also have emerged as powerful means of probing the Cosmos. The newest frontier of astronomy is observations of gravitational waves – the elusive ripples in spacetime predicted by Albert Einstein a century ago. This lecture will take a walk through the different frontiers of astronomy, with a particular focus on gravitational wave astronomy.

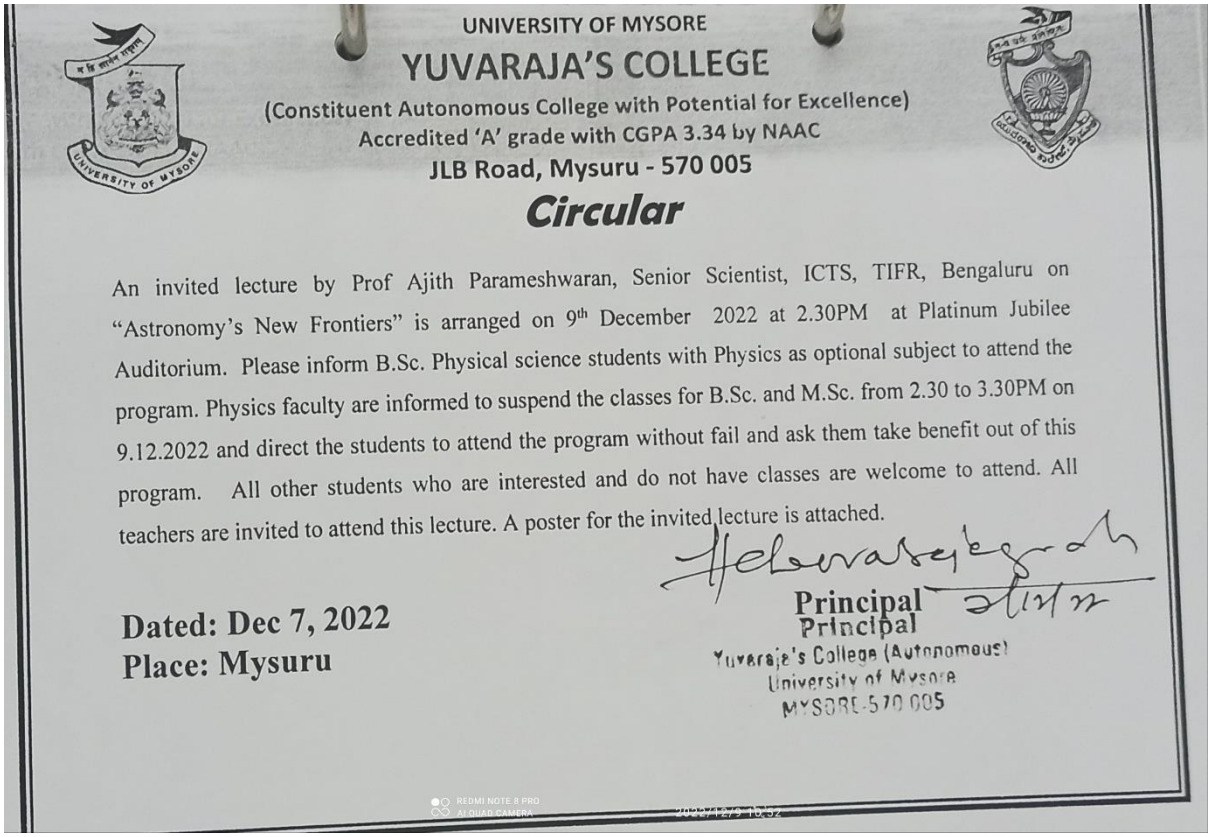
ALL ARE WELCOME

Date : 09th December 2022, 02:30 PM
Venue : Platinum Jubilee Hall, Yuvaraja's College, Mysuru.

Prof. H C Devarajegowda
Principal

Prof. H Somashekarappa
Administrative Officer

Prof. K B Umesha
Controller of Examination



UNIVERSITY OF MYSORE

YUVARAJA'S COLLEGE

(Constituent Autonomous College with Potential for Excellence)
Accredited 'A' grade with CGPA 3.34 by NAAC
JLB Road, Mysuru - 570 005

Circular

An invited lecture by Prof Ajith Parameshwaran, Senior Scientist, ICTS, TIFR, Bengaluru on "Astronomy's New Frontiers" is arranged on 9th December 2022 at 2.30PM at Platinum Jubilee Auditorium. Please inform B.Sc. Physical science students with Physics as optional subject to attend the program. Physics faculty are informed to suspend the classes for B.Sc. and M.Sc. from 2.30 to 3.30PM on 9.12.2022 and direct the students to attend the program without fail and ask them take benefit out of this program. All other students who are interested and do not have classes are welcome to attend. All teachers are invited to attend this lecture. A poster for the invited lecture is attached.

Dated: Dec 7, 2022
Place: Mysuru

Principal
Principal
Yuvaraja's College (Autonomous)
University of Mysore
MYSORE-570 005

Invited Lecture Report

Topic: Astronomy's New Frontiers

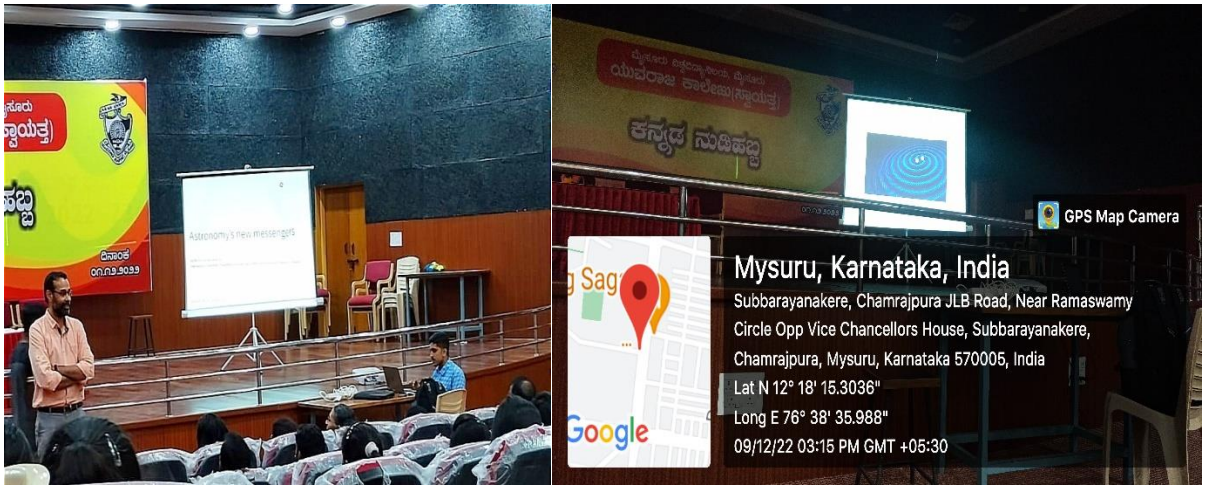
Date: 09th December 2022

The lecture on Astronomy's New Frontiers by Prof. Ajith Parameshwaran was organised at Yuvaraja's College, Platinum Jubilee Auditorium. The seminar was co-ordinated by IQAC and Science forum, Yuvaraja's College and attended by **200 participants**

The programme commenced at 2.30pm and was compered by Ms. Geethashree .R wherein she introduced the dignitaries the principal, Prof. H. C. Devarajegowda, the administrative officer, Prof. H. Somashekharappa, the chief guest, Prof. Ajith Parameshwaran, associate professor at International Centre for Theoretical Science-Tata Institute of Fundamental Research, Bengaluru. She also introduced the IQAC co-ordinator, Prof. N. S. .Devaki and Controller of Examination, Dr.K.B.Umesha. Then Mr Amoghavarsha gave a brief introduction about the chief guest, wherein he mentioned that Prof. Ajith Parameshwaran is an associate professor at International Centre for Theoretical

Science-Tata Institute of fundamental research, Bengaluru and also principal investigator in Astrophysical Relativity group.

The honourable chief guest has earned his PhD at Max Planck Institute for Gravitational Physics and he is also recognised as a scholar at Albert Einstein Institute and California institute of Technology. Prof. Ajith Parameshwaran has great interest in astrophysics and hence turned out as an astrophysical researcher and he is also a member of esteemed international collaboration LIGO/VIRGO. He has been awarded TWAS-CAS Young Scientist Award-2020 for his work regarding Frontier Science. He has given 93,100 citations till date. His area of research include Gravitational wave and astrophysics. He has contributed to the first discovery of gravitational wave by LIGO. Prof. Ajith Parameshwaran was then called upon to deliver his lecture on **'Astronomy's New Frontiers'**.



Prof. Ajith Parameshwaran giving his lecture.

A view of Audience

His talk began with an introduction that modern astronomy began 400 years ago with the discovery of the optical telescope. In the last century, astronomy has expanded to multiple wavelengths. Recently, observations using subatomic particles such as neutrinos and cosmic rays also have emerged as powerful means of probing the cosmos.

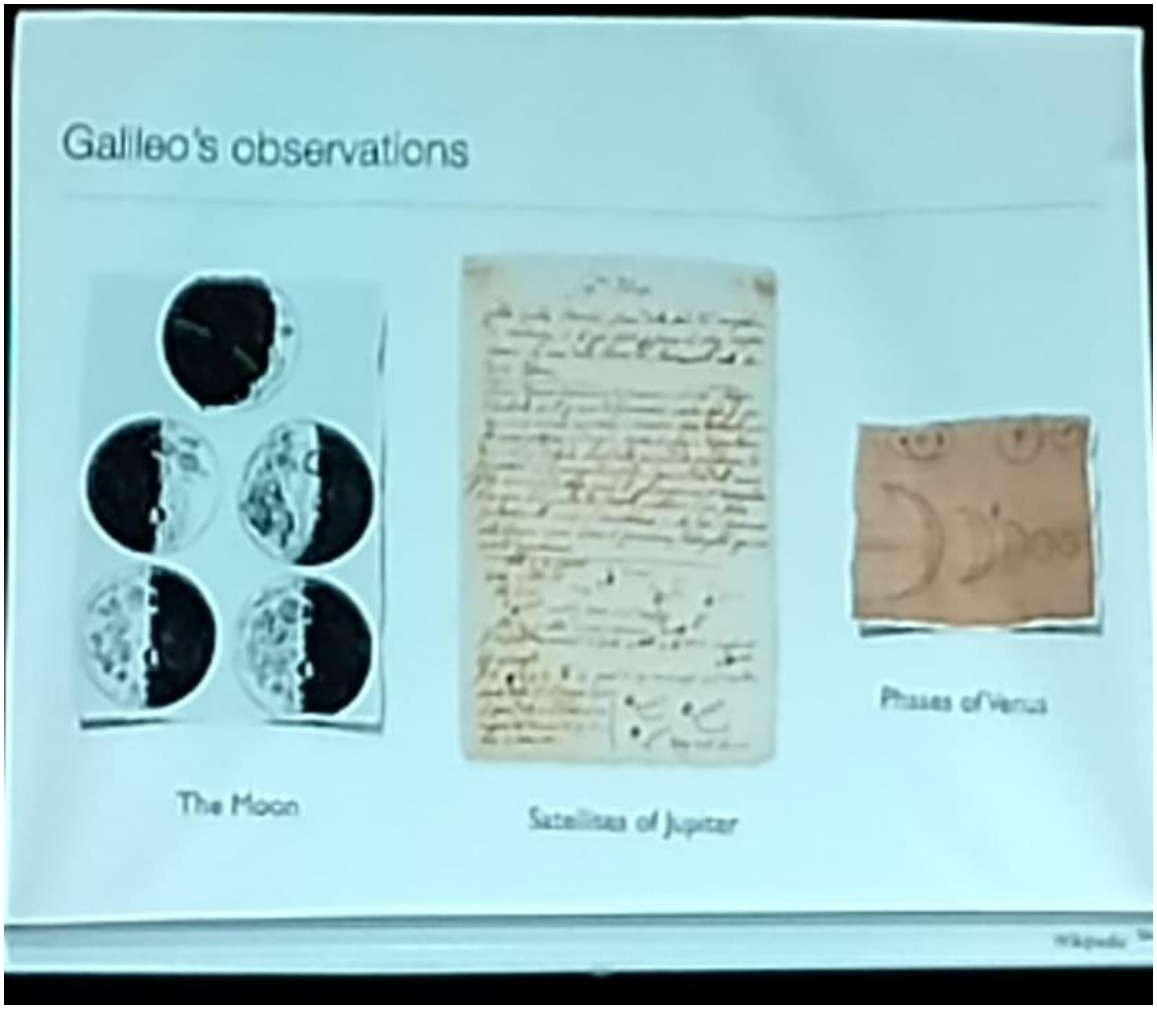
The new observation of astronomy is about the gravitational waves. Then he took up the concept of invention of astronomical telescope by Galileo Galilei.

<u>Galileo's observations:</u>

Galileo sparked the birth of modern astronomy with his observations of the moon, phases of the Venus, moon around Jupiter, sunspots

and the news that seemingly countless individual stars make up the Milky Way galaxy.

At the time, most scientists believed that the moon was a smooth sphere, but Galileo discovered that the Moon has mountains, pits and other features just like the Earth.



Pictorial representation of Moon, Phases of Venus, Satellites of Jupiter

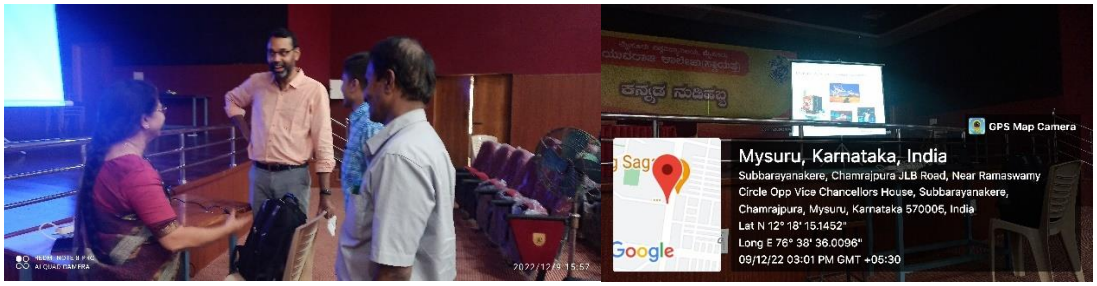
Galileo also figured out that these stars were actually moons in the orbit of Jupiter. Galileo's observations challenged the prevalent wonders of the times. Then scientists realised that to observe faint objects they need bigger telescopes. That was when Herschel discovered the existence of Infrared light by passing sunlight through a glass prism in an experiment. As sunlight passed through the prism, it was dispersed into a rainbow of colours called spectrum and then measured the temperature of each colour. A spectrum contains all the visible colours that make up sunlight. He noticed that the temperature increased from blue to red. He then placed a thermometer just beyond the red part of the spectrum in a region where there was no visible light and found that the temperature was even higher.

Then he realised that there must be some other light beyond red which we cannot see and called it as Infrared radiation. Gravitational waves were predicted by Einstein's theory of general relativity and were first detected in 2015 by ***LIGO-VIRGO*** collaboration. They are extremely tiny disturbances similar to ripples in the water that travel at the speed of light through the fabric of space time. Gravitational waves recently supplemented electromagnetic waves as the primary tool, that astronomers use to observe the universe when gravitational waves pass through Earth they produce a time-dependent change in the geometry of the space. These changes can be detected with the help of laser interferometers.

Gravitational waves observations have established a new branch of astronomy.

LIGO stands for "Laser Interferometer Gravitational-Wave Observatory". It is the world's largest gravitational wave observatory and a marvel of precision engineering. An ongoing project to build a LIGO detector is taking place in Maharashtra, Japan etc. In this way Prof. Ajith Parameshwaran's talk came to an end. Approximately this lecture was attended by 200 participants including students from Yuvaraja's college, MMK and SDM College for women, JSS College for women and also from Maharani's science college for women in Mysuru.This lecture was then followed by question and answer session in which the audience actively participated. Then at last the vote of thanks was given by Ms.Madhushree .K.S.

Some more images related to the lecture:



View of the Guest speaker Dr Ajith Parameshwarn talking with Dr Swarnamala Sirsi and Dr.HSomashekarappa

View of the Guest speaker Dr Ajith Parameshwarn talking with Dr SwanrnamalaSirsi, Dr.Somashekarappa and Dr Amoghavarsha, Scientist at COSMOS

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