Event Report: Webinar on Life Cycle of Stars

Date: November 29, 2025

Speaker: *Dr. Poojan Agrawal*, Astrophysicist, KU Leuven, Belgium
Organized by: Kalpana Chawla Space Academy (KCSA)
Date: 29/11/2025
Mode: Online Webinar

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1. Introduction

Kalpana Chawla Space Academy (KCSA) organized an insightful webinar on the **Life Cycle of Stars**, delivered by eminent astrophysicist **Dr. Poojan Agrawal** from **KU Leuven, Belgium**. The session aimed to enhance students' understanding of stellar evolution, observational astronomy, and astrophysical phenomena governing the birth and death of stars.

2. Overview of the Session

Dr. Agrawal began the session by explaining what stars are, how they form from giant molecular clouds, and the physical principles—such as gravity, nuclear fusion, and thermal pressure—that control their evolution. She highlighted the importance of studying stellar lifecycles to understand galaxy formation, chemical enrichment of the universe, and the origin of elements essential for life.

3. Key Concepts Covered

3.1 Formation of Stars

- Stars originate in **nebulae**, large clouds of gas and dust.
- Through **gravitational collapse**, the cloud condenses into a **protostar**.
- When the core temperature reaches ~10 million Kelvin, **nuclear fusion** begins, marking the birth of a main-sequence star.

3.2 Main Sequence and Stellar Evolution

- Dr. Agrawal explained that stars spend most of their life in the **main sequence**, fusing hydrogen into helium.

- The mass of the star determines its temperature, brightness, and lifespan—**massive stars live fast and die young**, while **low-mass stars evolve slowly**.

3.3 Hertzsprung–Russell (H–R) Diagram

A major highlight of the session was the discussion on the **Hertzsprung–Russell (HR) Diagram**, a fundamental tool in astrophysics used to classify and understand stars.

Dr. Agrawal explained:

- The HR Diagram plots **luminosity (brightness)** on the vertical axis and **surface temperature** on the horizontal axis (temperature decreases to the right).
- Most stars, including the Sun, lie on the **Main Sequence**, a diagonal band from hot, bright stars (upper left) to cool, dim stars (lower right).
- Above the main sequence are **Red Giants** and **Supergiants**, which are cool but highly luminous due to their enormous size.
- Below the main sequence lie **White Dwarfs**, which are hot but faint because of their small radius.

She also demonstrated how a star's movement across the HR Diagram represents its evolution:

- **Protostar → Main Sequence → Red Giant/Supergiant → White Dwarf / Neutron Star / Black Hole**
- High-mass stars move rapidly across the diagram, while low-mass stars evolve slowly.

Depending on the mass of the star:

For low-mass stars (like the Sun):

- Red Giant → Planetary Nebula → White Dwarf

For massive stars:

- Red Supergiant → Supernova → Neutron Star or Black Hole

4. Interaction Session

The webinar included an interactive Q&A, where students asked questions about:

- Maximum and minimum life of Stars
- HR diagram axes.
- Colour of star
- Artificial star

Dr. Agrawal provided clear explanations, connecting complex concepts with real astronomical data.

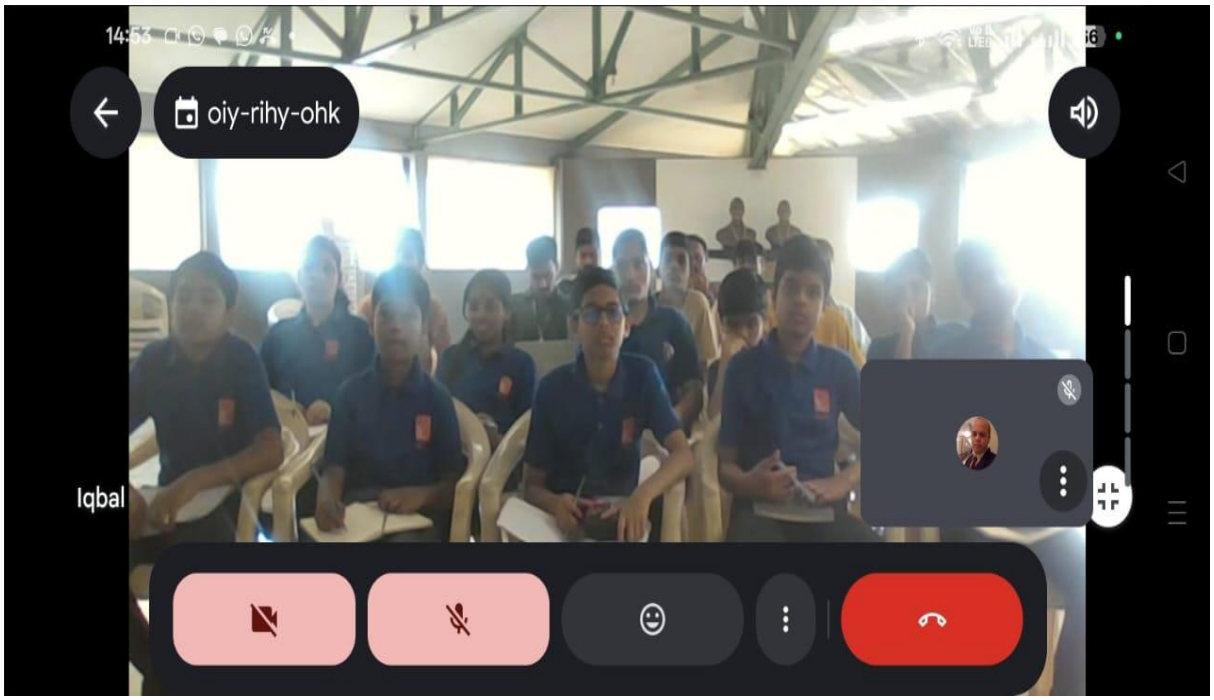
5. Learning Outcomes

Participants gained:

- A comprehensive understanding of stellar birth, evolution, and death.
- Clarity on the role of mass in determining stellar fate.
- Knowledge of the HR Diagram as a tool for studying stars.
- Insights into the cosmic recycling of matter through supernovae.
- Inspiration to explore astrophysics, observational astronomy, and cosmology further.

6. Conclusion

The webinar by **Dr. Poojan Agrawal** provided students with a structured and engaging journey through the life cycle of stars and the use of the HR Diagram. The session successfully deepened students' interest in astrophysics and aligned with KCSA's mission to promote high-quality space education.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Rendezvous with Dr. Pushpendu Rakshit
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10 others
Aditya Patil (adi_photomaniac)
Webinar on Lifecycle of Stars
ARYAN 3:13 PM
what is the age of sun
VIAAN SANTOSH BARWADE 3:23 PM
what if a group of astroides crash into the sun
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Mam , beyond hydrogen fission, what makes a star stable throughout its lifetime ? And how do scientists predict that a dying star will either become a neutron star or black hole ?
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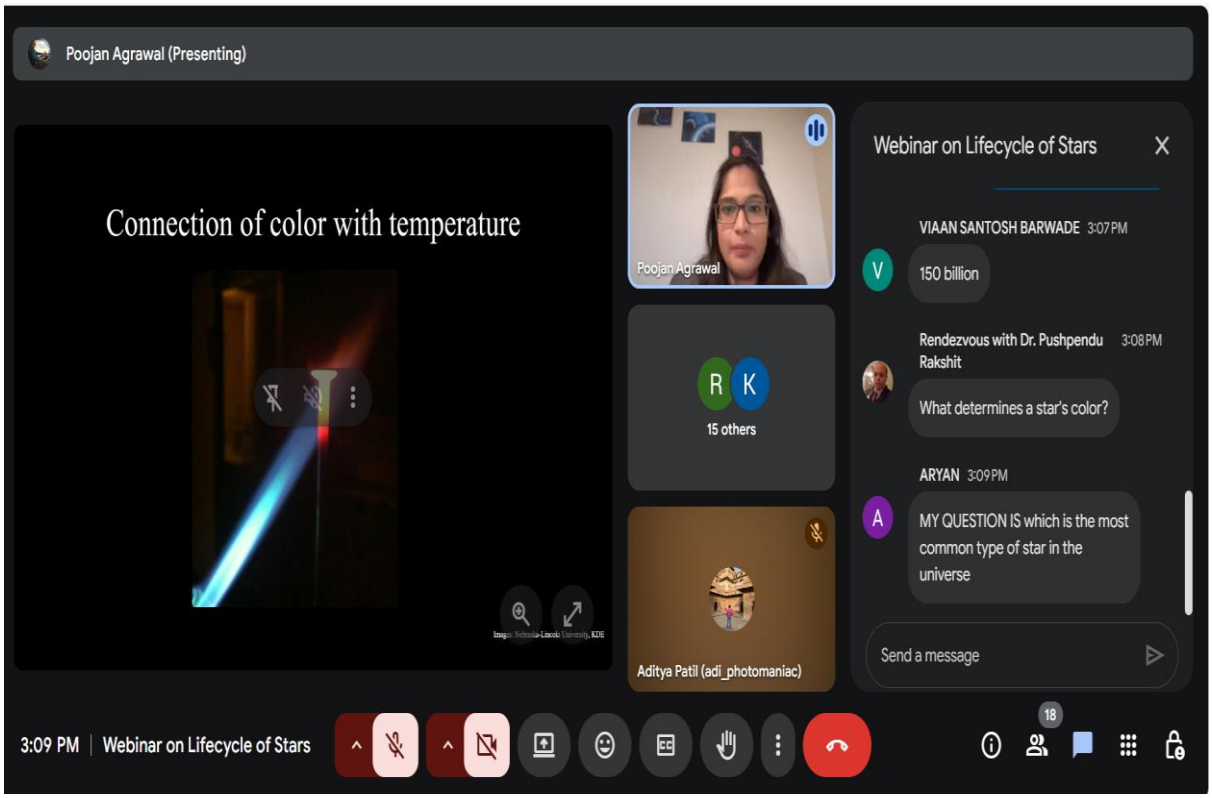
Poojan Agrawal (Presenting)
Connection of color with temperature
Poojan Agrawal
15 others
Aditya Patil (adi_photomaniac)
Webinar on Lifecycle of Stars
VIAAN SANTOSH BARWADE 3:07 PM
150 billion
Rendezvous with Dr. Pushpendu Rakshit 3:08 PM
What determines a star's color?
ARYAN 3:09 PM
MY QUESTION IS which is the most common type of star in the universe
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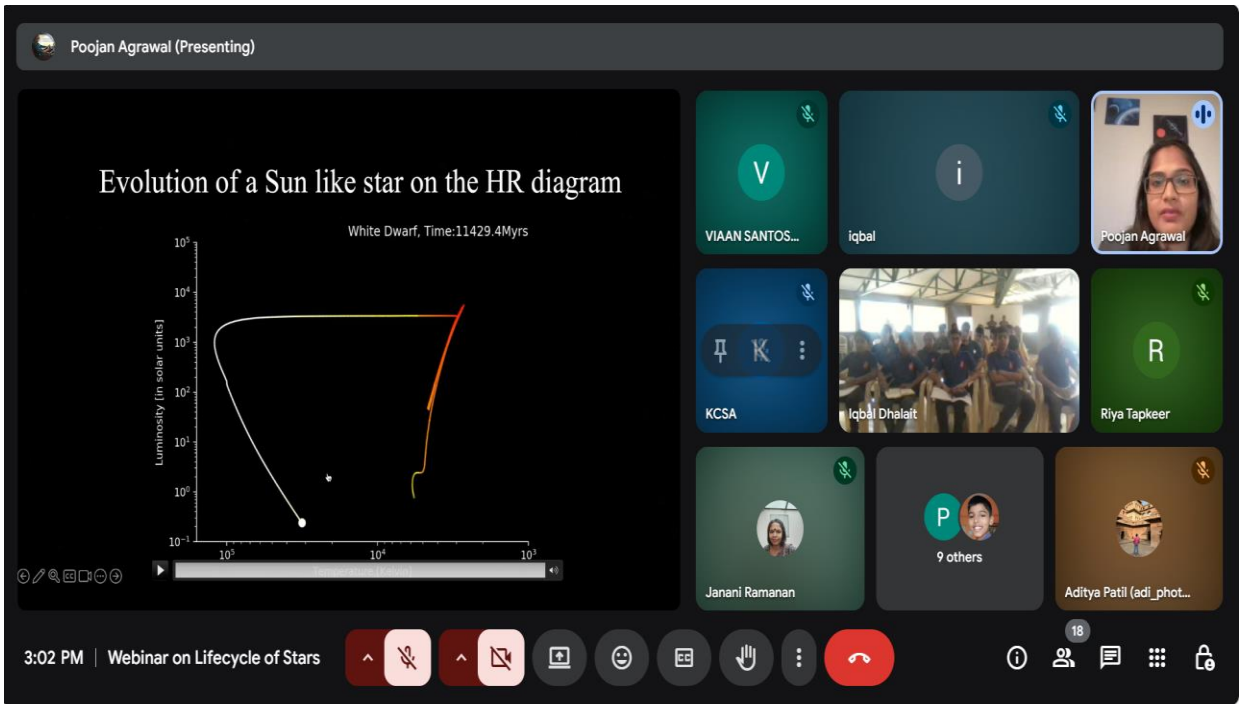
Poojan Agrawal (Presenting)
Evolution of a Sun like star on the HR diagram
White Dwarf, Time:11429.4Myrs
Luminosity [in solar units]
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Poojan Agrawal
KCSA
Iqbal Dhalait
Riya Tapkeer
Janani Ramanan
9 others
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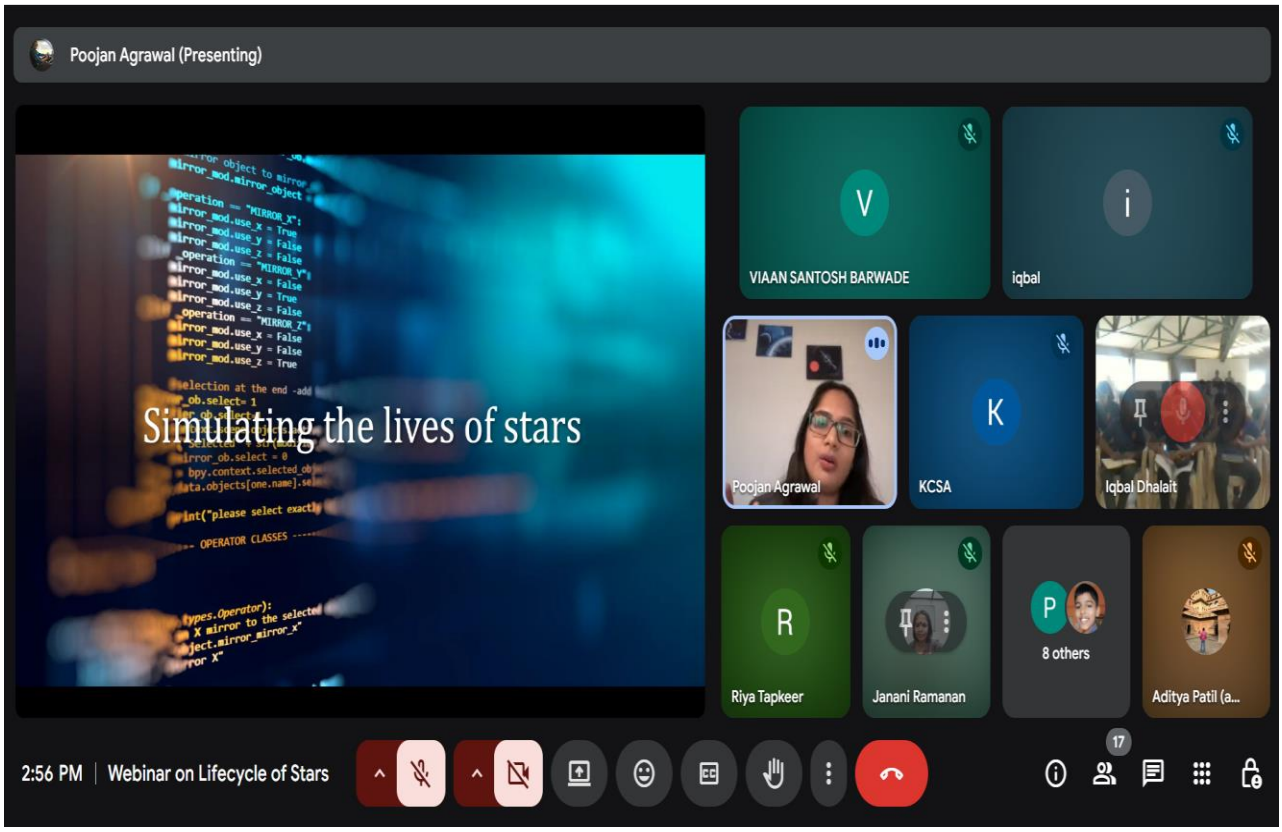

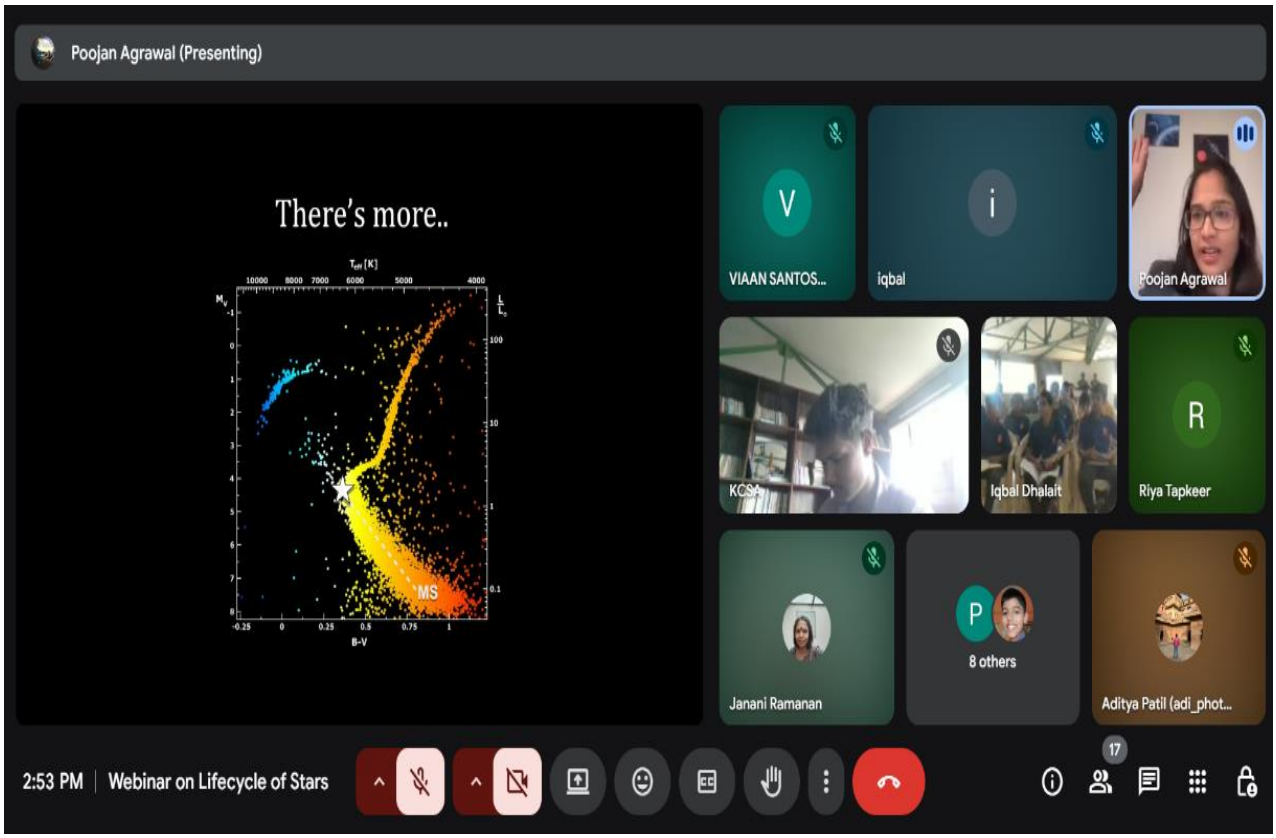
Poojan Agrawal (Presenting)
There's more..
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Janani Ramanan
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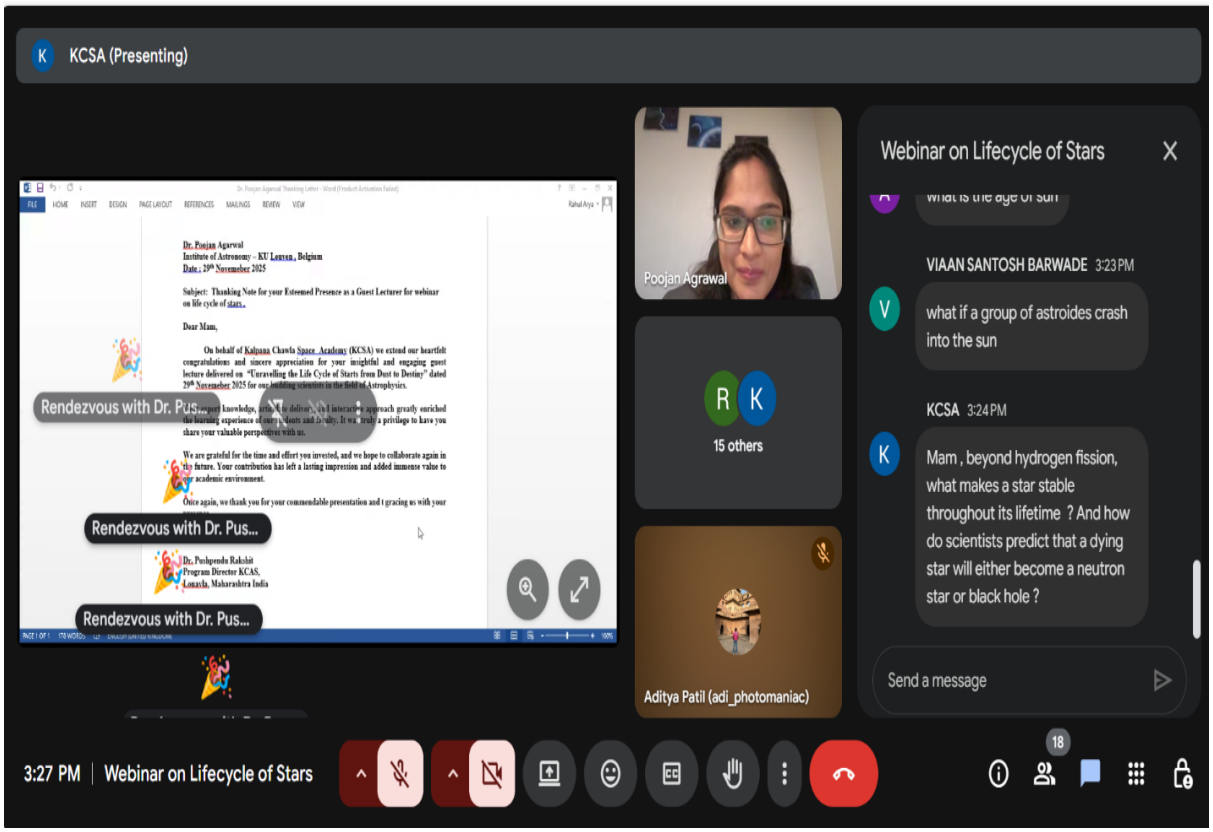
KCSA (Presenting)
Dr. Poojan Agarwal
Institute of Astronomy - KU Leuven , Belgium
Date : 29th November 2025
Subject: Thanking Note for your Esteemed Presence as a Guest Lecturer for webinar on life cycle of stars .
Dear Mam,
On behalf of Kalpana Chawla Space Academy (KCSA) we extend our heartfelt congratulations and sincere appreciation for your insightful and engaging guest lecture delivered on "Unravelling the Life Cycle of Starts from Dust to Destiny" dated 29th November 2025 for our budding scientists in the field of Astrophysics.
We are grateful for the time and effort you invested, and we hope to collaborate again in the future. Your contribution has left a lasting impression and added immense value to our academic environment.
Once again, we thank you for your commendable presentation and t gracing us with your
Dr. Pushpendu Rakshit
Program Director KCAS,
Lonavla, Maharashtra India
Rendezvous with Dr. Pus...
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Poojan Agrawal
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15 others
Aditya Patil (adi_photomaniac)
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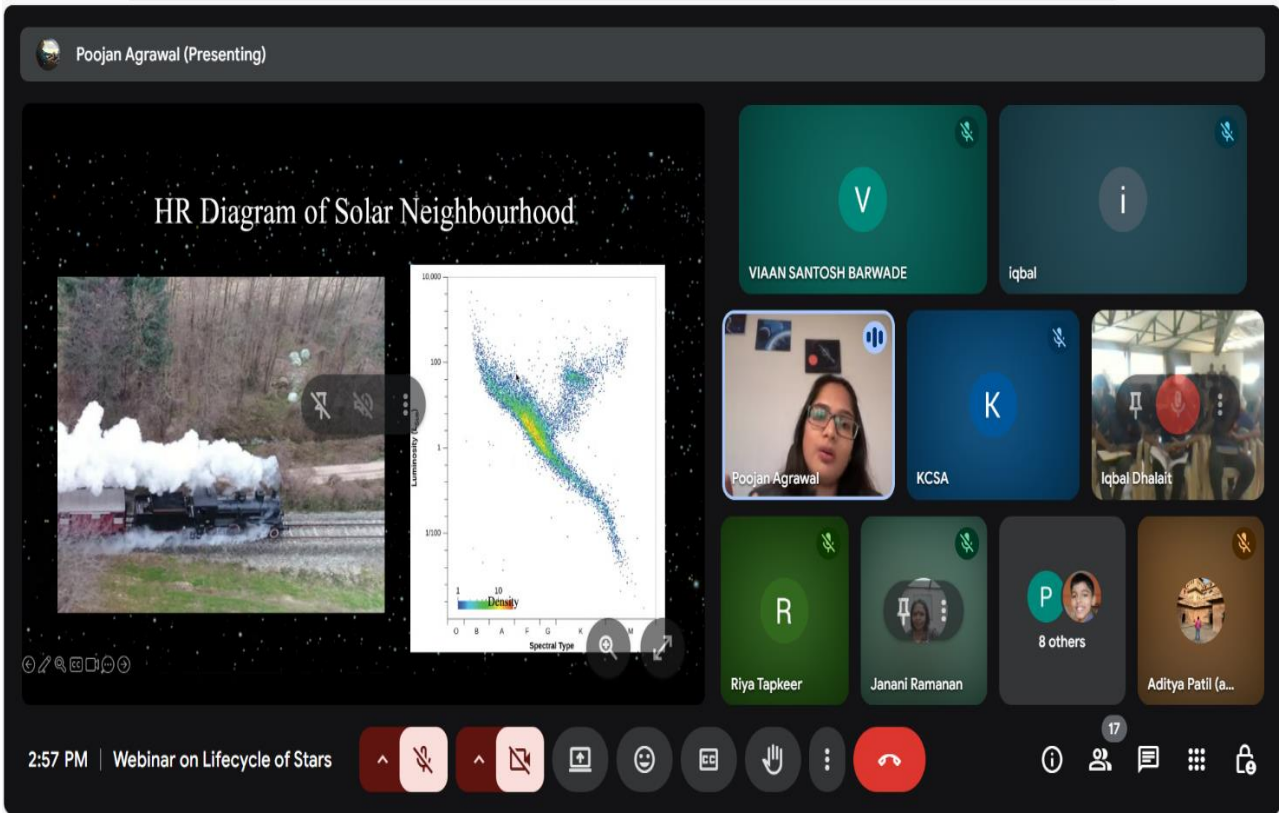
Poojan Agrawal (Presenting)
HR Diagram of Solar Neighbourhood
Luminosity
Density
Spectral Type
VIAAN SANTOSH BARWADE
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