Astromy Club

VIVEKANANDA COLLEGE.

THAKURPUKUR, KOLKATA-63

Astronomical Club Convener

Mission and Vision of Our Astronomy Club

Vivekananda College, Thakurpukur

Mission

The mission of the Astronomy Club of Vivekananda College, Thakurpukur, established in 2017, is to inspire curiosity, foster scientific exploration, and cultivate a deep appreciation for the universe and its wonders among students. The club was founded by Principal Dr. Tapan Podder and Dr. Arvind Pan, with the support of the Physics and Mathematics departments and the entire college community. By creating a platform for education, engagement, and hands-on experiences in astronomy, the club seeks to promote critical thinking, collaboration, and innovation. The club emphasizes the integration of scientific knowledge with a sense of wonder, humility, and purpose, aiming to prepare students to be informed global citizens and contributors to humanity's cosmic journey.

Vision

The vision of the Astronomy Club is to establish itself as a beacon of astronomical learning and exploration for the students of our college and all the interested students from other colleges. It envisions creating an environment where students can:

Explore the Universe: Through observations, discussions, and research, the club aspires to unravel the mysteries of the cosmos, from distant galaxies to the intricate details of our solar system.

Promote Scientific Literacy: The club strives to bridge the gap between academic knowledge and real-world understanding by simplifying complex astronomical concepts and encouraging a culture of scientific inquiry.

Foster Interdisciplinary Learning: Astronomy is inherently multidisciplinary, combining physics, mathematics, history, and even philosophy. The club envisions fostering a holistic

approach to education, demonstrating how various disciplines converge to answer universal questions.

Engage with Modern Technology: Embracing tools like telescopes, software for celestial tracking, and data analytics, the club seeks to offer students hands-on opportunities to engage with cutting-edge astronomical technologies.

Inspire Future Astronomers and Scientists: By providing a nurturing environment for students to pursue their interests in astronomy, the club aims to guide aspiring scientists toward meaningful careers in space sciences and related fields.

Promote Community Outreach: The club aspires to be a catalyst for change within the local community by organizing star-gazing nights, workshops, and awareness campaigns, inspiring others to look up and explore the universe.

Core Objectives of the Astronomy Club:

Educational Outreach: Conduct regular workshops, seminars, and guest lectures by astronomers and scientists. Collaborate with educational institutions and science organizations to expand resources and opportunities for members.

Observational Activities: Organize night sky observations and field trips to observatories.

Guide members in using telescopes, binoculars, and other astronomical equipment to observe celestial events like meteor showers, eclipses, and planetary conjunctions.

Skill Development: Provide training in astrophotography, data analysis, and sky-charting software. Encourage members to participate in national and international science fairs and astronomy competitions.

Research and **Innovation**: Facilitate student-led research projects in astronomy and astrophysics. Build collaborative platforms for students to explore innovative ideas, such as designing models of astronomical phenomena or experimenting with simulation software.

Cultural Integration: Explore the historical and cultural significance of astronomy in Indian and global traditions.

Sustainability and **Space Ethics**: Raise awareness about the environmental impact of space exploration and advocate for sustainable practices in space sciences.

Conveners and Members of the Astronomy Club.

Convener:

1. Dr. Kaushik Ghosh.

2. Prof. Subhayan Biswas.

Members:

1. Dr. Arvind Pan
2. Dr. Asutosh Mukherjee
3. Dr. Arunava Jha.
4. Dr. Nirmalya Pahari.
5. Dr. Jayeeta Saha.
6. Dr. Aniket Bhanja.
7. Dr. Kasturi Sanyal
8. Prof. Somnath Paul.
9. Prof. Sourajit Sarkar.
10. Prof. Jhuma Mazumder.

Guiding Principles

Curiosity: Cultivate a sense of wonder and inquisitiveness about the universe, encouraging members to seek knowledge beyond their textbooks.

Collaboration: Foster teamwork and mutual respect among club members, facilitating peer-to-peer learning and mentorship.

Inclusivity: Ensure the club is open to all students, irrespective of their academic backgrounds, creating a welcoming space for everyone passionate about astronomy.

Innovation: Encourage creative problem-solving and novel approaches to exploring astronomical concepts and challenges.

Community Engagement: Share knowledge and resources with the larger community, inspiring others to engage with astronomy.

Planned Initiatives

- A week-long event featuring stargazing nights, debates, poster presentations, and a planetarium show to celebrate the wonders of the cosmos.
- Public gatherings to observe significant astronomical events like eclipses, planetary alignments, or comets, with live commentary and explanations.
- Special sessions to prepare interested students for national and international astronomy and astrophysics competitions.
- Partner with nearby schools to organize educational programs, making astronomy accessible to younger students and cultivating a love for science at an early age.

Why Join the Astronomy Club?

- ✓ Hands-On Learning: Gain practical experience with telescopes and modern astronomical software.
- ✓ Networking Opportunities: Meet like-minded peers, faculty, and professionals passionate about space sciences.
- ✓ Exposure to Cutting-Edge Research: Stay updated on recent developments in astronomy and astrophysics.
- ✓ Skill Development: Enhance critical thinking, teamwork, and presentation skills through active participation in club events.
- ✓ Cosmic Perspective: Develop a profound sense of purpose and interconnectedness by exploring the universe and our place within it.

The Astronomy Club of Vivekananda College, Thakurpukur, seeks to be a cornerstone of scientific exploration and community engagement. The club envisions a future where students are empowered to dream beyond the stars and contribute meaningfully to the progress of humanity. By igniting curiosity, fostering knowledge, and building connections, the club hopes to leave an enduring impact on its members and the broader community, encouraging everyone to reach for the cosmos and beyond.

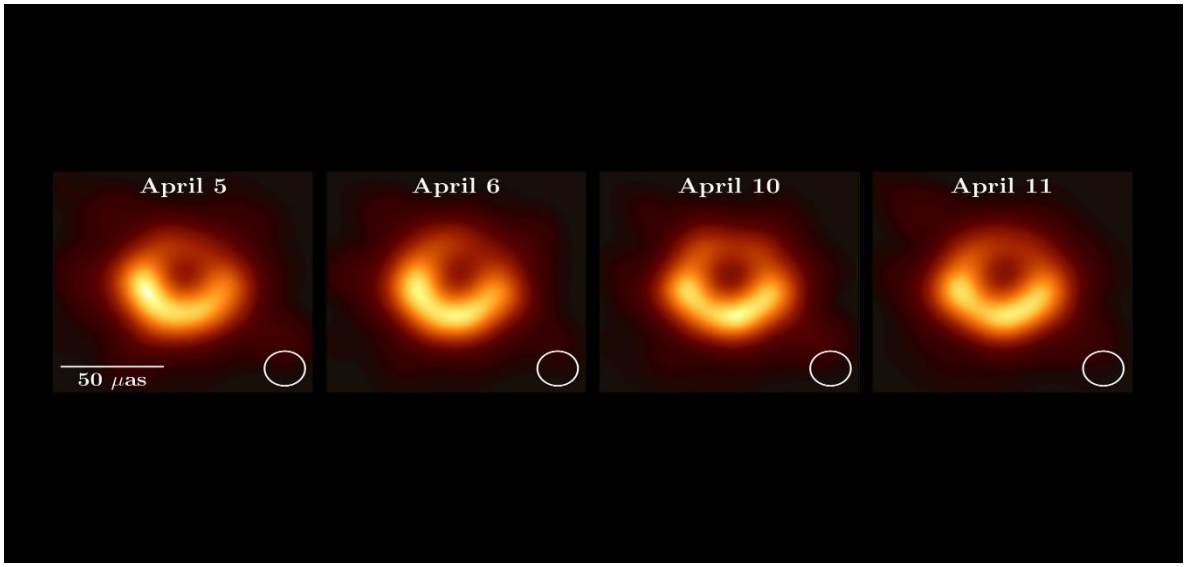
2018-2019

Activities of the Astronomy Club, Vivekananda College, Thakurpukur (2018-2019)

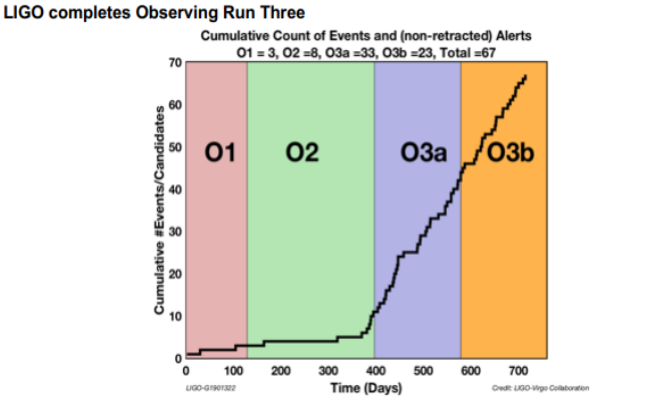
During the academic year 2018-2019, the Astronomy Club of Vivekananda College, Thakurpukur, organized several activities aimed at fostering interest in astronomy among students. These included:

Classroom Lectures: Engaging sessions focused on popular astronomical events, providing insights into celestial phenomena and their significance. The topic of the lectures was depending on some special astronomical phenomena-

First Image of a Black Hole (April 10): The first image of a black hole was released on April 10, 2019 by the Event Horizon Telescope (EHT) Collaboration. The image shows a bright ring formed by light bending around a black hole in the galaxy M87. The black hole is 6.5 billion times more massive than the Sun. The EHT is a world-spanning network of telescopes that captured the image by syncing up measurements taken simultaneously around the world. The image was captured at



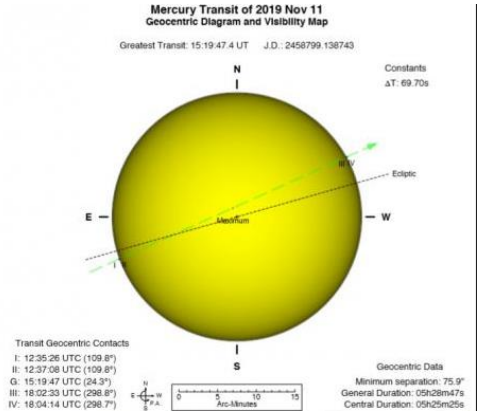
a wavelength of 1.3 mm. The image was a major milestone in the study of black holes. It confirmed the existence of black holes and allowed scientists to directly observe them. The EHT Collaboration is working to improve the resolution of the image by adding new telescopes and taking shorter-wavelength observations.



Total number of LIGO gravitational wave event detections (image courtesy LIGO-Virgo Collaboration)

In April 2019, the third observing run (O3) of LIGO began with a notional one year length. Although the COVID-19 pandemic caused the run to end approximately a month earlier than planned, the observing run showed a significant enhancement in detection capabilities with the inclusion of the European Virgo detector. In total, O3 measured over 50 new gravitational wave detection events, a factor of five increase over observing runs one and two combined.

***2019 November 11 Transit of Mercury*:** As seen from Earth, only transits of the inner planets Mercury and Venus are possible. Planetary transits are far rarer than eclipses of the Sun by the Moon. On average, there are 13 transits of Mercury each century. Nowadays, all transits of Mercury fall within several days of May 8 and November 10. During November transits, Mercury is near perihelion and exhibits a disk only 10 arc-seconds in diameter. By comparison, the planet is near aphelion during May transits and appears 12 arc-seconds across. However be aware that the planet Mercury is too small to be seen with the naked eye in front of the Sun. It's therefore essential to magnify the image using a telescope or any appropriate device to detect the black ball pinned in the foreground of the photosphere of our star**.**



JWST in the Northrop Grumman clean room in October, 2019

In August of 2019, the science payload and spacecraft components of the James Webb Space Telescope (JWST) completed integration, marking the first time the entire observatory was a single unit. In November of the same year, the sunshield underwent a test deployment. Further environmental testing is slated for spring of 2020, and the mission is currently on track for a launch in spring, 2021.

2019-2020

Activities of the Astronomy Club, Vivekananda College, Thakurpukur (2019-2020).

Like previous year, the astronomical club decided to arrange class room seminar about some popular astronomical phenomena and trying to arrange model presentation on astrophysical events by the students.

Class room Seminar: Launch of the Solar Orbiter (February 10, 2020)

The European Space Agency (ESA) and NASA launched the Solar Orbiter to study the Sun. It aimed to capture the first-ever images of the Sun's poles and provide insights into solar wind and space weather. Solar Orbiter won't try to match those superlatives; on the closest-approach phases of its highly elliptical orbit, the probe will still be about 26 million miles (42 million km) from the sun. But the ESA-NASA spacecraft will do some special things of its own.

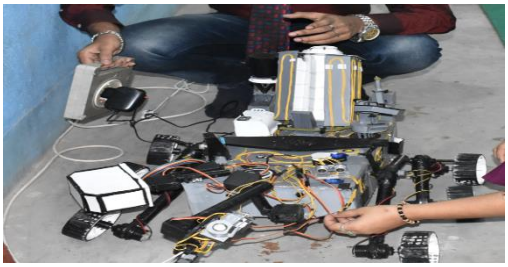
The Earth has a New Mini-Moon (for now) — 2020 CD3: The asteroid 2020 CD3 entered orbit around Earth before being found by astronomers examining results from the Catalina Sky Survey. Astronomers know of more than a million asteroids, but this is just the second such body, after 2006 RH120, known to orbit the Earth. That earlier object was also spotted by the Catalina Sky Survey. [T]his object is temporarily bound to the Earth. No evidence of perturbations due to solar radiation pressure is seen, and no link to a known artificial object has been found," The Minor Planet Center reports.

Comet NEOWISE:

NEOWISE, formally known as C/2020 F3 NEOWISE, was discovered on March 27, 2020 by NASA's Near-Earth Object Wide-field Infrared Survey Explorer (NEOWISE). The comet reached and survived its closest approach to the Sun (perihelion) on July 3 and has since become brighter with every passing day as it moves closer to the Earth. Under dark skies, it could be seen with the naked eye and remained visible to the naked eye throughout July 2020

Model Presentation by astronomy club students: Students of our college presented some models in the 1st week of September 2019. There good efforts should be mentioned by giving short descriptions of the models.

Solar System Model: A detailed 3D model of the solar system, with accurate planetary sizes, distances, and orbital paths was presented by a group of students. They have considered using scaled distances for a more realistic representation.



Mars Rover Model: A replica of a Mars rover was made and weaponized with scientific instruments and a solar panel or RTG (Radioisotope Thermoelectric Generator), all are controlled by Arduino board. The students explainined how rovers explore the Martian surface and their contributions to science.

Model of Telescope.

Demonstration of gravitational effect explained in Einstein's General Theory of Relativity.

. 1 Model of a Telescope.

2020-2021

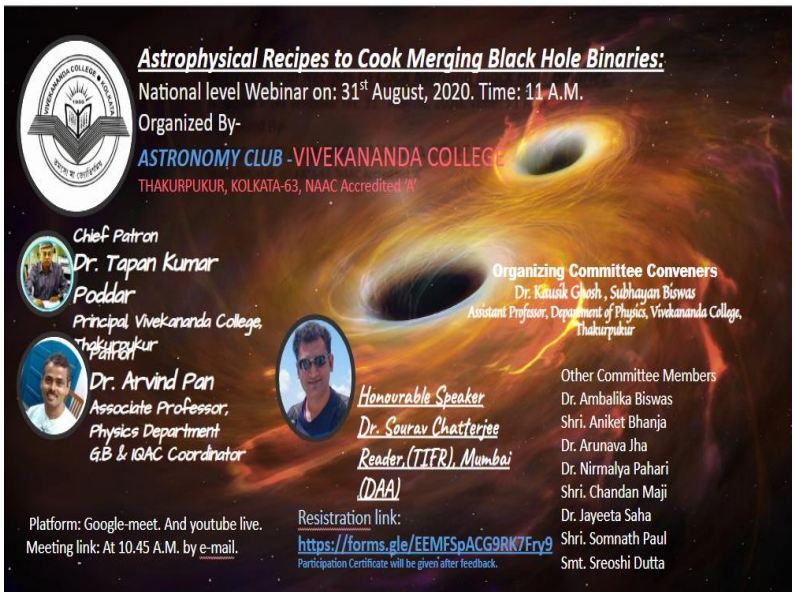
Activities of the Astronomy Club, Vivekananda College, Thakurpukur (2020-2021).

Covid 19 ruined all the plans made by the astronomical club. So we have decided to arrange webinar about some popular astronomical phenomena.

Webinar: "Astrophysical Recipes to Cook Merging Black Hole Binaries"

Event Details:

Title: *Astrophysical Recipes to Cook Merging Black Hole Binaries*
Date: August 31, 2020
Time: 11:00 AM to 4:00 PM
Organizer: Astronomy Club of Vivekananda College, Thakurpukur.
Speaker: Dr. Sourav Chatterjee



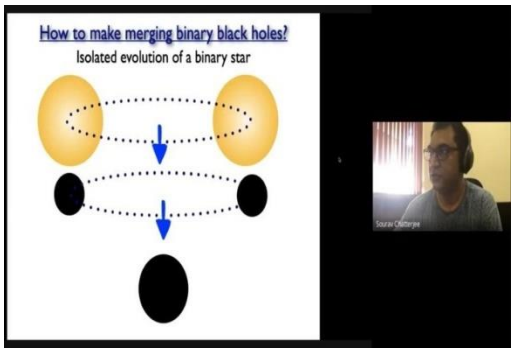
The Astronomy Club of Vivekananda College, Thakurpukur organized a national-level webinar titled "Astrophysical Recipes to Cook Merging Black Hole Binaries" on August 31, 2020. The event featured Dr. Sourav Chatterjee, Reader, TIFR, Mumbai, DAA, a prominent astrophysicist known for his extensive research in black hole physics and stellar dynamics. The webinar aimed to provide participants with a

deeper understanding of the complex processes involved in the formation and merging of black hole binaries.

Webinar Overview

The webinar commenced at 11:00 AM with a welcome address by the Joint Convener of the Astronomy Club. Participants included students, faculty members, and astronomy enthusiasts from across the country. The introductory session highlighted the significance of studying black hole binaries and the impact of such research on our understanding of the universe. Then the Principal and IQAC coordinator were explained the purpose of the club.

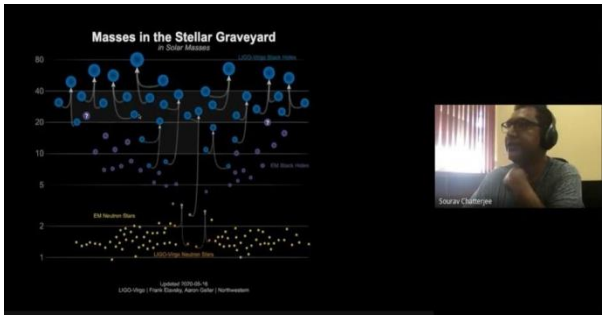
Dr. Sourav Chatterjee's presentation was divided into several segments, each covering critical aspects of the topic:



Session 1: Formation of Black Hole Binaries

Dr. Chatterjee began with an overview of black holes, their properties, and the conditions required for their formation. He discussed the various pathways through which black hole binaries can form, including stellar evolution, dynamical interactions in dense star clusters, and the role of supernova explosions.

Session 2: Dynamics and Evolution



The second session focused on the dynamical evolution of black hole binaries. Dr. Chatterjee explained how gravitational interactions and energy dissipation mechanisms drive the binaries towards eventual merger. He elaborated on the role of gravitational wave radiation and its observational implications.

Session 3: Detection and Observational Techniques.

In the third session, Dr. Chatterjee highlighted the cutting-edge observational techniques used to detect merging black hole binaries. He covered the contributions of ground-based detectors like LIGO and Virgo, and the future prospects with space-based observatories like LISA. Real-world examples of detected mergers were presented, showcasing the advancements in this field.

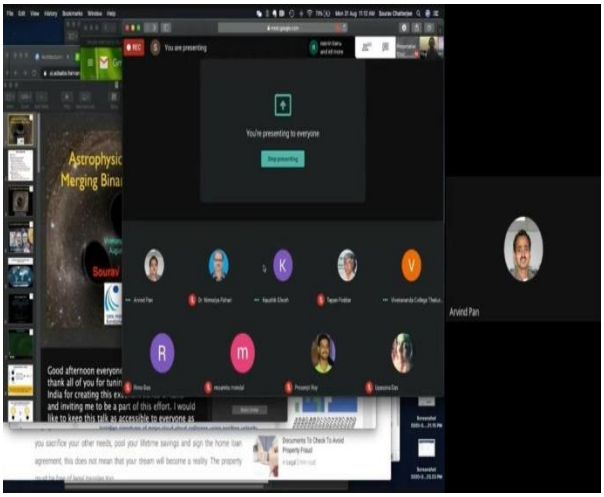
Session 4: Theoretical Models and Simulations

The final session delved into the theoretical models and numerical simulations that astrophysicists use to predict and study black hole mergers. Dr. Chatterjee discussed various computational approaches and the challenges involved in simulating these cataclysmic events. He also shared insights from his own research, offering a glimpse into the complexities of modeling such phenomena.

Q&A Session

The webinar concluded with an engaging Q&A session, where participants had the opportunity to ask Dr. Chatterjee questions. Topics ranged from the intricacies of gravitational waves to the potential for new discoveries in the field. Dr. Chatterjee's responses were insightful and further enriched the participants' understanding of the subject.

The webinar was a resounding success, providing a comprehensive exploration of the fascinating processes behind merging black hole binaries. Dr. Sourav Chatterjee's expertise and engaging presentation style captivated the audience, fostering a deeper appreciation for astrophysical research. The Astronomy Club of Vivekananda College looks forward to organizing more such informative events in the future.



2021-2022

Activities of the Astronomy Club, Vivekananda College, Thakurpukur (2021-2022).

Though Covid 19 Lockdown suppressed our club activities by gathering and exploring some new, the internet connection connected us and motivated us to arrange a webinar.

Webinar on Space Science

Date: 11th January 2022
Time: 11:00 AM to 5:00 PM

Organized by: Astronomy Club of Vivekananda College, Thakurpukur

The Astronomy Club of Vivekananda College, Thakurpukur, successfully organized a webinar on Space Science on 11th January 2022. The event took place from 11:00 AM to 5:00 PM and featured distinguished speakers who are experts in their respective fields. The webinar included a series of insightful talks on various topics related to space science, followed by an interactive Q&A session.

The webinar commenced at 11:00 AM with a warm welcome and introductory remarks by the organizing committee. They provided an overview of the event and introduced the speakers.

Talk 1: "Are We Alone in the Universe?" by Dr. Ankan Das

Time: 11:15 AM - 12:15 PM

Dr. Ankan Das opened the session with a thought-provoking talk on the possibility of extraterrestrial life. He discussed the current research and theories about life beyond Earth, exploring the various scientific endeavors aimed at finding signs of life in the universe.

Talk 2: "Earthquake Prediction: A Scientific Controversy" by Dr. Sudipta Sasmal

Time: 12:15 PM - 1:15 PM

Dr. Sudipta Sasmal addressed the controversial topic of earthquake prediction. He explained the scientific challenges and debates surrounding the predictability of earthquakes, highlighting recent advancements and the limitations faced by researchers in this field.

Lunch Break

Time: 1:15 PM - 2:00 PM

Participants took a break for lunch, during which they had the opportunity to network and discuss the morning sessions.

Talk 3: "Mars Mission" by Dr. Ritabrata Sarkar

Time: 2:00 PM - 3:00 PM

Dr. Ritabrata Sarkar delivered an engaging talk on the ongoing and future missions to Mars. He provided insights into the objectives, challenges, and scientific significance of Mars exploration, emphasizing the potential for human colonization of the Red Planet.

Talk 4: "Black Holes: End Product of Massive Stars" by Dr. Dipak Debnath

Time: 3:00 PM - 4:00 PM

Dr. Dipak Debnath concluded the series of talks with an in-depth discussion on black holes. He explained the formation of black holes as the end product of massive stars, their properties, and the latest discoveries in black hole research.

Q&A Session

Time: 4:00 PM - 4:45 PM

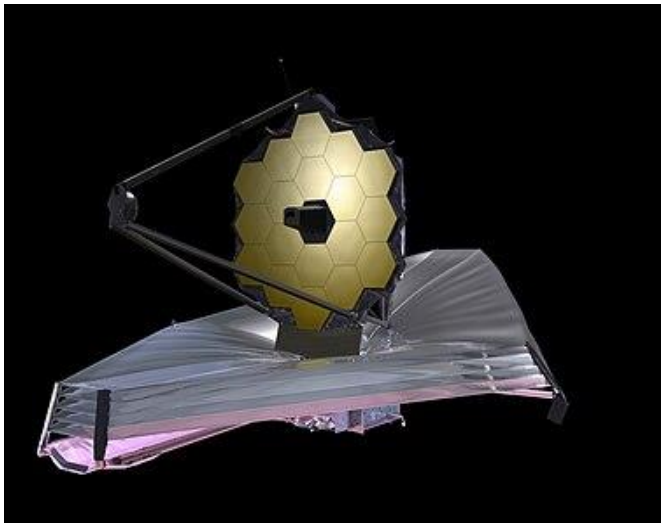
Following the talks, an interactive Q&A session was held, allowing participants to engage directly with the speakers. This session provided a platform for attendees to ask questions, share their thoughts, and gain further insights into the topics discussed.

2022-2023

Activities of the Astronomy Club, Vivekananda College, Thakurpukur (2022-2023).

The year 2022 – 2023 was an event full one. There were many interesting astronomical events occurred and some of the events were discussed to the students and members through class room seminars.

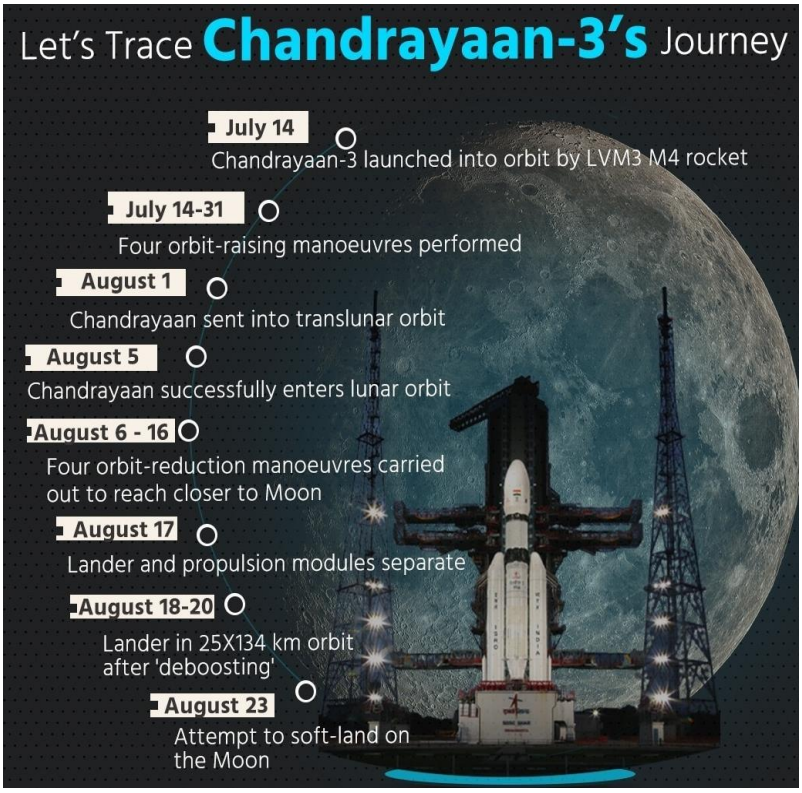
James Webb Space Telescope (JWST) Launch and Observations: The JWST began its operational phase, capturing stunning high-resolution images of the universe, including galaxies, nebulae, and exoplanets. Its findings included revealing the earliest stars and galaxies and detailed atmospheric analyses of exoplanets. The mass of the James Webb Space Telescope (JWST) is about half that of the Hubble Space Telescope. Webb has a 6.5 m (21 ft)-diameter gold coated beryllium primary mirror made up of 18 separate hexagonal mirrors. The mirror has a polished area of 26.3 m2 (283 sq ft), of which 0.9 m2 (9.7 sq ft) is obscured by the secondary support struts,[16] giving a total collecting area of 25.4 m2 (273 sq ft). This is over six times larger than the collecting area of Hubble's 2.4 m (7.9 ft) diameter mirror, which has a collecting area of 4.0 m2 (43 sq ft). The mirror has a gold coating to provide infrared reflectivity and this is covered by a thin layer of glass for durability.



Meteor Showers and Eclipses: The year featured notable meteor showers like the Perseids and Geminids, along with visible lunar eclipses.

Comet C/2022 E3 (ZTF): This green comet made a spectacular appearance early in the year, visible to the naked eye after nearly 50,000 years.

Chandrayaan-3 Success: Chandrayaan-3 Successfully Lands on Moon; India Scripts History, Joins Elite Club of Achievers. India successfully launched the heavy lift 3,897.89 kg rocket-LVM3 Chandrayaan-3 spacecraft into orbit for its 42-day journey to the moon. The LVM3 broke free from the second launch pad at the Satish Dhawan Space Centre (SDSC) and began ascending towards the skies, rising the happiness on every proud Indian. The satellite had a nearly 42 days journey to reach the moon. "The objective of Chandrayaan-3 mission is to demonstrate a soft landing on the lunar surface, and roving on the lunar terrain, conduct in-situ scientific experiments, and develop and demonstrate new technologies required for interplanetary missions. During the 42 days period, the LVM3 rocket will carry its 3895-kg payload using three different rocket power stages with a maximum thrust of 10.242 km/sec (speed over 36000 km/hr) being provided by the indigenous cryogenic C-25 engine fired on the rocket in the final phase. Chandrayaan is also known as the LVM3-M4 mission because it is the fourth operational mission of LVM3. Chandrayaan-3 is built on a budget of just under Rs 615 crore or $75 million. Chandrayaan-3 has 3.84 lakh km distances to cover on its own. The Lander carried by the spacecraft is expected to make a soft landing on the moon on August 23 or August 24."



2023-2024

Activities of the Astronomy Club, Vivekananda College, Thakurpukur (2023-2024).

The astronomical club decided to arrange class room seminar about some popular astronomical phenomena and trying to arrange model presentation on astrophysical events by the students based on Arduino projects.

Classroom Seminar: Comet C/2022 E3 (ZTF): informally called the “Green Comet”, recently made its closest approach to the Sun, after having traveled tens of thousands of years from the far fringes of the solar system. It’s forecast to be brightest around January 31, 2023 and February 1, 2023 at just slightly brighter than 6th magnitude when the comet is at its closest point to Earth. But don’t worry. As you are gazing at this cosmic fuzzball, there’s no threat of it crashing into Earth, as it will be 26 million miles away from us at its closest approach. Around 6th magnitude is the faintest an object can be seen without optical aid in a very clear, very dark sky. A comet that dim won’t look like popular photos of comets. It will be more like a faint, fuzzy glow or smear of light. Under a city or suburban sky, you’ll need binoculars or a small telescope to actually see this comet.

Annular Solar Eclipse: The **Annular Solar Eclipse** on **October 14, 2023**, was a remarkable astronomical event. During this type of eclipse, the Moon moves directly in front of the Sun but does not completely cover it. Instead, the edges of the Sun remain visible, creating a bright "ring of fire" effect. This occurs because the Moon is at or near its farthest point from Earth (apogee), making its apparent size slightly smaller than the Sun. This eclipse was part of **Saros cycle 134**, a series of eclipses that recur approximately every 18 years. It preceded the **Total Solar Eclipse** scheduled for **April 8, 2024**, which will offer a completely different visual experience.

Astronomical Model presentation: (23rd July 2023)

Figure 1 Rover tracking line

Figure 2 Surface mapping

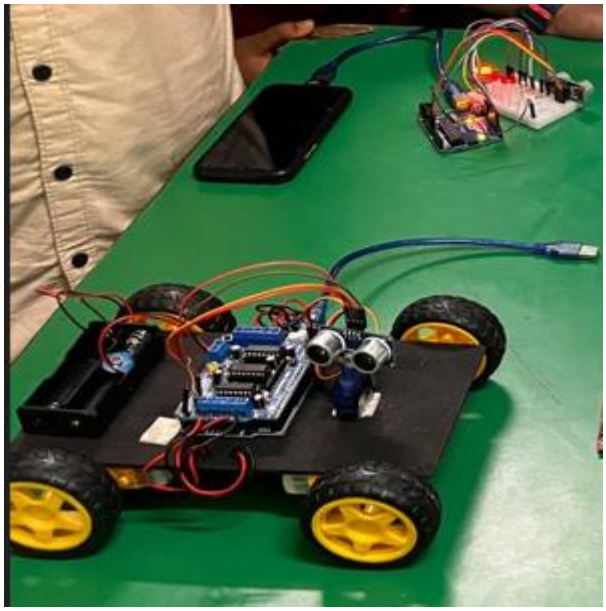


Figure 4 Moon rover with obstacle detector

Figure 3 moon rover with altitude sensor