

# Centre for Mega Projects in Multiwavelength Astronomy



## SCHOOL OF STUDIES IN PHYSICS & ASTROPHYSICS

PT. RAVISHANKAR SHUKLA UNIVERSITY

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The Centre for Mega Projects in Multiwavelength Astronomy is actively involved in the following activities -

**2019-20**

### 1. Research Activities

Shrutika Tiwari is working for her thesis on Thermonuclear Supernovae under the supervision of Dr. N.K. Chakradhari and co-supervision of Prof. D.K. Sahu (IIA, Bengaluru). Optical photometric and spectroscopic data were obtained from 2-m Himalayan Chandra Telescope. UV-optical photometric data of these events were also archived from Swift-UVOT. Some of the results on an interesting object ASASSN-16x were presented by Shrutika Tiwari in 38<sup>th</sup> annual Meeting of the Astronomical Society of India (ASI 2020) held at IISER, Tirupati. N.K. Chakradhari delivered invited talks on (i) A glimpse of thermonuclear Supernovae and (ii) Learning from the experiences at Pt. RS University, Raipur for spreading astronomy teaching in ASI 2020.

N.K. Chakradhari is doing collaborative work on Study of Chemically Peculiar stars with Dr. S. Joshi (ARIES, Nainital). A dedicated survey program the “Nainital-Cape survey” is continuing to detect, analyze and interpret low-amplitude pulsational variabilities in a sample of Ap and Am stars.

Pravat Dangal is working for his thesis entitled “Study of Compact Stellar Objects probing through their Radiative Mechanism” under the supervision of Dr. N.K. Chakradhari and in collaboration with Prof. Ranjeev Misra (IUCAA, Pune).

Mahendra Verma is working for his PhD thesis entitled “A study of central region of lenticular (S0) galaxies” under the supervision of Prof. S.K. Pandey and Dr. Sudhanshu Barwey, IIA Bengaluru.

Amit Tamrkar is working for his PhD thesis on “Multi-wavelength isophotal shape analysis for a sample of early-type galaxies” under the supervision of Prof. S.K. Pandey.

Spectral and timing analyses of X-ray Binaries were carried out using ASTROSAT and RXTE data by Kalyani Bagri, S.K. Pandey in collaboration with J.S. Yadav (TIFR, Mumbai) and Ranjeev Misra (IUCAA, Pune).

NK Chakradhari participated in India-TMT Science and Instruments Workshop held at ARIES Nainital during 17-19 October 2019. Shrutika Tiwari (Research Scholar), Chandra Kumar Chandravanshi and Chandrabhan Dewangan (MSc Students) also participated.

N.K. Chakradhari obtained Life Membership of Astronomical Society of India (ASI).

N.K. Chakradhari is selected for INSA visiting scientist fellowship 2020-21.

Four Students of MSc IV semester (Taramati Guruwani, Thakeshwar Sarjal, Mulchand Kurrey and Yogita Patel) visited ARIES, Nainital to carry out project work in ARIES Training School in Observational Astronomy (ATSOA 2020), during 16-26 March 2020.

Nine Students of MSc Physics IV semester (2020 Batch : Chandra Kumar Chandravanshi, Chandrabhan Dewangan, Devika Sahu, Heeramoti Manikpuri, Taramati Guruwani, Mulchand Kurre, Thakeshwar Sarjal, Yogita Patel and Pratibha Sinha) completed their Project Work.

Chandrabhan Dewangan, MSc IV sem, carried out INSPIRE Project on “Study of Photometric calibration of CCD system using Landolt Field” during 01 January – 29 February, 2020.

Taramati, MSc III sem, carried out INSPIRE Project on “Distance to Pleiades Star Cluster using Main Sequence Fit Method” during 01 July – 31 August, 2019.

Devika Sahu, MSc III sem, carried out INSPIRE Project on “Distance to Small Magellanic Cloud by PL relation” during 01 July – 31 August, 2019.

Taramati, MSc IV sem, carried out INSPIRE Project on “Measurement of Extinction Coefficient” during 08 January – 28 February, 2020.

## **2. Outreach Activities**

Lectures, Sky watching programme and telescope demonstrations were organized time to time at various places. Some of the activities are listed below:

- 22 July 2019 - Participated in a discussion on Launch of Chandrayaan-2 in a TV programme broadcasted live by Zee News MP Chhattisgarh.
- 16-17 July 2019 - Partial Lunar Eclipse - Organized Sky watching programme to see the partial Lunar eclipse on 16-17 July 2019.

रविवि में छात्रों ने देर रात शुरू किया चंद्र ग्रहण को देखना,  
16 की रात 1.31 बजे हुआ शुरू, 17 जुलाई की सुबह 4.30 तक रहा

## ग्रहण काल का अनोखा नजारा, पल-पल बदलता रहा चांद



सम्पूर्ण (फुलमून) की विलक्षण के दौर पर हम अक्सर चांद की बात करते हैं। रात करीब एक बजे रात 3.1 मिनट के बाद मुकुर्गिमा की रात के लुप्तमूरत चांद में अचानक हलचल की यहदूस होने लगी। खगोलविद घटना का यह अनोखा नजारा नमन आंखों से भी दिखा। चौका वा अस्थिर बदलता था, जिसे देखने के लिए पॉइज

### रायपुर। नईदुनिया प्रतिनिधि

चांद की लुप्तमूरत की विलक्षण के दौर पर हम अक्सर चांद की बात करते हैं। रात करीब एक बजे रात 3.1 मिनट के बाद मुकुर्गिमा की रात के लुप्तमूरत चांद में अचानक हलचल की यहदूस होने लगी। खगोलविद घटना का यह अनोखा नजारा नमन आंखों से भी दिखा। चौका वा अस्थिर बदलता था, जिसे देखने के लिए पॉइज

कुर्गुर्ग की रात एक बजे रात 3.1 मिनट पर शुरू हुआ और 17 जुलाई बुधवार की सुबह 4 बजे रात 3.0 तक रहा।

विशेषज्ञों की माने तो इस चंद्र ग्रहण के बाद सीमा 2021 में चंद्र ग्रहण लगेगा। यह अस्थिर चंद्र ग्रहण मध्य रात्रि से सुबह तीन बजे तक आया, जब चंद्रमा का ज्यादातर हिस्सा ढक गया। रात चंद्रमा



प. रविशंकर गुरुनगर विद्यापीठ के छात्र चंद्र ग्रहण को देखते हुए।

का केवल एक हिस्सा धरती की छाया से गुजरता।

बुधवार की सुबह 3:01 पर चंद्रमा का 6.5 प्रतिशत व्यास धरती की छाया के तहत रहा। अंतराष्ट्रीय गतिविधियों से दिनचर्या रखने वाले लोगों ने इस मौके को नहीं गंवाया क्योंकि 2021 तक फिर ऐसा मध्य रात्रि से दिखने वाला कोई चंद्र ग्रहण नहीं लगेगा।

मौके पर रविवि के विशेषज्ञ और

प्राध्यापक डॉ. एन के चक्रवर्ती ने बताया कि दक्षिण अमेरिका, यूरोप, अफ्रीका, एशिया और ऑस्ट्रेलिया के विभिन्न हिस्सों में भी लोगों ने चंद्रग्रहण का यह नजारा देखा। यह खगोलीय घटना देश के हर हिस्से से दिखाई दी।

### विज्ञान की नजर में चंद्र ग्रहण

जब पृथ्वी, सूर्य की परिक्रमा के दौरान चंद्रमा और सूर्य के बीच में आ जाती

है, लेकिन वे तीनों एक सीमा त्वापन में नहीं होते।

पेसी स्थिति में चांद की छोटी सी सतह पर पृथ्वी के बीच के हिस्से की छाया पड़ती है, जिसे अंब्र (सम्राज) कहते हैं। चांद के बाकी हिस्से में पृथ्वी के बाहरी हिस्से की छाया पड़ती है, जिसे पेंम्ब्रा कहते हैं। इस दौरान चांद के एक बड़े हिस्से में हमें पृथ्वी की छाया नजर आने लगती है।

Source : Nai Duniya 17 July 2019, Raipur

- 6 September 2019 - Invited as an expert for a discussion on “Vikram Lander, Prgyan Rover and Chandrayaan-2” in a TV programme broadcasted live by IBC 24 hour TV channel. <https://youtu.be/FLS0QfVu5fo>



- 07 September 2019 Invited as an expert for a discussion on “Soft landing of Vikram Lander of Chandrayaan-2” in a TV programme broadcasted live by Zee News MP Chhattisgarh channel on 07 September 2019 (morning program).
- 07 September 2019 - Invited as an expert for a discussion on “Chandrayaan-2” in a TV programme broadcasted live by Zee News MP Chhattisgarh channel (evening prog).



- 07 September 2019 Invited as an expert for Question and Answer session on “Chandrayaan-2” at Govt. Education College, Raipur on 07 September 2019.
- 08 September 2019 Invited as an expert for a discussion on “Space missions of ISRO and Chandrayaan-2” in a TV programme broadcasted live by Doordarshan Chhattisgarh channel on 08 September 2019. <https://youtu.be/vHrVtQG0T8o>



- 25 September 2019 - Given an invited talk on “India in Space” at Regional Science Centre, Raipur.



- 26 September 2019 - Given an invited talk on “Mathematics and Astronomy” at SoS Mathematics, Pt RSU, Raipur.
- 12 October 2019 - Organized sky watching programme at SoS in Physics & Astrophysics, Pt. R.S. University Raipur



- 17 October 2019 - Organized sky watching programme at 46<sup>th</sup> Jawahar Lal Nehru Children’s Science Congress, SCERT, Raipur.
- 21-22 October 2019 - Given an invited talk on Supernovae in International seminar at Physics Department, St. Josephs’ College, North Point, Darjeeling
- 08 November 2019 - MSc Students of Kalinga University visited. A lecture was given by N.K. Chakradhari on Research in Astronomy and Astrophysics. Telescope, Planetarium and Lab demonstration were done.



- 16 November 2019 - Given an invited talk on “Dr. Meghnad Saha and His Research” in a National Seminar on “Dr. Meghnad Saha’s life and work” held at SCERT Raipur.

- 20-22 November 2019 - N.K. Chakradhari participated in a National workshop on AstroSat Data Analysis at Goa University in association with IUCAA, Pune.
- 21 November 2019 - Students of Govt. P.G. College Kurud, Dhamatari, C.G. visited. Telescope and Lab demonstration was done.



- 26 December 2019 - Partial Solar Eclipse - Sky watching programme was organized to see the partial Solar Eclipse on 26 December 2019. It was an annular event in south India which was viewed through live streaming.
- 21 June 2020 Partial Solar Eclipse - viewed through solar filter, and live interview given in media/television. It was annular in north India.



## **1. Research Activities**

Shrutika Tiwari is working for her thesis on Thermonuclear Supernovae under the supervision of Dr. N.K. Chakradhari and co-supervision of Prof. D.K. Sahu (IIA, Bengaluru).

Pravat Dangal is working for his thesis entitled “Study of Compact Stellar Objects probing through their Radiative Mechanism” under the supervision of Dr. N.K. Chakradhari and in collaboration with Prof. Ranjeev Misra (IUCAA, Pune).

N.K. Chakradhari is doing collaborative work on Study of Chemically Peculiar stars with S. Joshi (ARIES, Nainital).

Mahendra Verma is working for his PhD thesis entitled “A study of central region of lenticular (S0) galaxies” under the supervision of Prof. S.K. Pandey and Dr. Sudhanshu Barwey, IIA Bengaluru.

Amit Tamrkar is working for his PhD thesis on “Multi-wavelength isophotal shape analysis for a sample of early-type galaxies” under the supervision of Prof. S.K. Pandey.

Nine Students of MSc Physics IV semester (2021 Batch: 1. Aditya Tiwari 2. Daneshwar Bhandari 3. Gaurishankar 4. Khushbu Tewary 5. Kiran Sinha 6. Saloni Singh 7. Reshma Sahu 8. Sharda Verma 9. Shashikant) completed their Project Work.

Venika Sahu (MSc Integrated program, 9<sup>th</sup> Sem, Centre for Basics Sciences) completed her MSc thesis on “Spectral Study of Thermonuclear Supernovae”.

Five Students of MSc IV semester (1. Aditya Tiwari 2. Daneshwar Bhandari 3. Reshma Sahu 4. Saloni Singh 5. Kiran Sinha) were selected for ARIES Training School in Observational Astronomy (ATSOA 2021), 17-24 May 2021, ARIES Nainital.

**Nitya Pandey (MSc 2018 Batch) has been selected for PhD program at the Department of Astronomy (DAS), Universidad de Chile, Santiago, Chile.**

## **2. Outreach activities**

Lectures, Sky watching programme and telescope demonstrations were organized time to time at various places. Some of the activities are listed below-

- Given an invited lecture entitled “Understanding the life of a Star” in a National Webinar organized by the Department of Physics, Arya Vidyapeeth College, Guwahati on 22-07-2020.
- Given an invited lecture entitled “Looking into a star’s journey” in a National Webinar on “Dark energy and Dark Matter: Mysteries of the Universe” organized by Seth Phool Chand Agrawal College Nawapara, Rajim on 23-07-2020.



- Given an invited talk on “Observational studies of Thermonuclear supernovae using HCT” in a two days conference on “20 years of Himalayan Chandra Telescope” organized by IIA, Bengaluru during 29-30 September 2020.
- Given an invited talk on “Time, Seasons, and Astrophysics”, organized by Chhattisgarh Vigyan Sabha on 12-12-2020.
- Given an invited talk on “The night sky: what we have to observe” at Two Day workshop organized by Chhattisgarh Vigyan Sabha, Raipur for the preparation of Jupiter Saturn Conjunction event 19-20 December 2020.
- Jupiter Saturn Conjunction Sky watching Programme was held on 21-12-2020.



- Given an invited talk on “Constellation, Time and Season in Astrophysics” at Dhamangaon College, Amravati, Maharashtra on 23-12-2020.
- Given a talk “The Experimental Component of Astronomy Teaching at Pt. R.S. University Raipur” in Astronomical Society of India Conference held during 18- 23 February 2021.



- Given a talk on “Motion of the Sun” in Training workshop on Zero Shadow Day, Organized by Chhattisgarh Vigyan Sabha on 15 May 2021.

**2021-22**

## **1. Research Activities**

Bharti Arora has given pre-PhD seminar and submitted her thesis entitled “Massive O-type and WR stars” under the supervision of Dr. J. C. Pandey, ARIES Nainital and co-supervision of Dr. N.K. Chakradhari

Shrutika Tiwari is working for her thesis on Thermonuclear Supernovae under the supervision of Dr. N.K. Chakradhari and co-supervision of Prof. D.K. Sahu (IIA, Bengaluru).

Pravat Dangal is working for his thesis entitled “Study of Compact Stellar Objects probing through their Radiative Mechanism” under the supervision of Dr. N.K. Chakradhari and in collaboration with Prof. Ranjeev Misra (IUCAA, Pune).

N.K. Chakradhari is doing collaborative work on Study of Chemically Peculiar stars with S. Joshi (ARIES, Nainital).

N.K. Chakradhari has been awarded with INSA Teacher Summer Fellowship 2022 and INSA Visiting Scientist Fellowship (2022 – 23).

Mahendra Verma is working for his PhD thesis entitled “A study of central region of lenticular (S0) galaxies” under the supervision of Prof. S.K. Pandey and Dr. Sudhanshu Barwey, IIA Bengaluru.

Amit Tamrkar is working for his PhD thesis on “Multi-wavelength isophotal shape analysis for a sample of early-type galaxies” under the supervision of Prof. S.K. Pandey.

Six Students of MSc Physics IV semester (2022 Batch: 1. Akash Dewangan 2. Bhevendra Mannadey 3. Bhumika Nirmal 4. Divyanshu Janghel 5. Mamta yadav 6. Rashmi Sahu) carried out their Project Work.

Three Students of MSc II semester (1. Niraj Kumar Sahu, 2. Shubham Padhi, 3. Jay Shankar Prasad Sahu) carried out their INSPIRE Project.

Two Students of MSc IV semester (Akash Dewangan and Divyanshu Janghel) visited ARIES, Nainital to carry out project work in ARIES Training School in Observational Astronomy (ATSOA 2022), 16 - 27 May, 2022.



**Mulchand Kurre (MSc 2018-20 batch) joined IIA Bengaluru as a telescope operator to work on 2-m Himalayan Chandra Telescope.**



## **2. Outreach activities**

Lectures, Sky watching programme and telescope demonstrations were organized time to time at various places. Some of the activities are listed below-

- Given an invited talk on “Astrophysics – The Wonders of Galaxies” at Vinayakrao Patil Mahavidyalaya, Vaijapur, Aurangabad on 14 September 2021.
- Sky watching program was held at Savitri Bai Phule Educational Academy Saddu, Raipur on 26 December 2021.
- Given an invited lecture on “Sun, Season and Sky” at Kalinga University on 11 December 2021.
- Sky watching program was held at Korba on 11 December 2021.
- Given an invited lecture on “Opportunities and Challenges in Physics” at Govt College Rajim on 21 January 2022.
- Given an invited lecture on “India in Space Science” at Govt. Gundadhur College Kondagaon on 05 February 2022.

- Given an invited lecture on “Space Science and Technology for a sustainable future” at Govt. College Dharsiva on 26 February 2022.
- Given an invited lecture on “The story of stars” at Govt college Kurud on 28 February 2022.
- Sky watching program was organized at SoS in Physics & Astrophysics on 16 April 2022.
- Given an invited lecture entitled “Explosion in the cosmos: Supernovae” at Physics Department, Kalinga University on 02 May 2022.

## **2022-23**

### **1. Research Activities**

Bharti Arora was awarded PhD degree on her thesis entitled “Massive O-type and WR stars” under the supervision of Dr. J. C. Pandey, ARIES Nainital and co-supervision of Dr. N.K. Chakradhari

Ankur Ghosh has given pre-PhD seminar and submitted his PhD thesis entitled “Study of GRBs - on aspects of multi-wavelength emission, environment and host galaxies” under the supervision of Dr. Amitesh Omar (ARIES Nainital) and Dr. N.K. Chakradhari.

Mahendra Verma submitted his PhD thesis entitled “A study of central region of lenticular (S0) galaxies” under the supervision of Prof. S.K. Pandey and Dr. Sudhanshu Barwey (IIA Bengaluru).

Amit Tamrkar submitted his PhD thesis on “Multi-wavelength isophotal shape analysis for a sample of early-type galaxies” under the supervision of Prof. S.K. Pandey.

Shrutika Tiwari is working for her thesis on Thermonuclear Supernovae under the supervision of Dr. N.K. Chakradhari and Prof. D.K. Sahu (IIA, Bengaluru). She has started writing her thesis.

Pravat Dangal is working for his thesis entitled “Study of Compact Stellar Objects probing through their Radiative Mechanism” under the supervision of Dr. N.K. Chakradhari and in collaboration with Prof. Ranjeev Misra (IUCAA, Pune). He has started writing his thesis.

Kripa Ram Sahu has joined PhD program and completed his PhD course-work. He will be working on “Photometric and spectroscopic studies of thermonuclear supernovae” under the supervision of Dr. N.K. Chakradhari and Prof. D.K. Sahu (IIA, Bengaluru). KRS and NKC visited IIA during 14-22 April and 1- 14 June 2023 for the work.

N.K. Chakradhari visited IIA, Bangalore during 16 June-13 Aug, 2022 as a part of INSA Summer Research Teacher Fellowship and IUCAA, Pune during 19 December 2022 to 31 January 2023 as a part of INSA Visiting Scientist Fellowship and collaborative work.



N.K. Chakradhari is doing collaborative work on Study of Chemically Peculiar stars with S. Joshi (ARIES, Nainital).

Four students of MSc IV semester: 1. Jay Prakash Sahu 2. Niraj Kumar sahu 3. Unnati Pandey 4. Yojashwi Dewangan visited ARIES, Nainital to carry out project work in ARIES Training School in Observational Astronomy (ATSOA-2023), 7 - 28 April, 2023.



Four Students of MSc III semester (1. Gunjan sinha 2. Jay Shankar Prasad Sahu 3. Niraj Kumar Sahu 4. Shubham Padhi) carried out their INSPIRE Project.

Mayank Kumar MSc IV sem got selected to participate in the Aditya-L1 Support Cell Third Workshop at IIT (BHU), Varanasi, 25 - 27 Feb 2023, and the Fourth Workshop at ARIES, Nainital, June 28 -July 7, 2023.





Seven Students of MSc Physics IV semester (2023 Batch : 1. Ayush sharma 2. Gunjan Sinha 3. Jay Prakash Sahu 4. Mayank Kumar 5. Niraj Kumar sahu 6. Unnati Pandey 7. Yojashwi Dewangan) carried out their Project Work.

N K Chakradhari and Kripa Ram Sahu visited IIA, Bengaluru during 01 - 15 June, 2023 for collaborative work.

**Yogita Patel (MSc 2018-20 batch) joined IIA Bengaluru as a telescope operator to work on 2-m Himalayan Chandra Telescope.**

**Divyanshu Janghel (MSc 2022 Batch) got selected for PhD program at ARIES Nainital.**

## 2. Workshop

International workshop on “Science & Technology in Astronomy Research (STAR)” was organized during 15-18 October 2022 in association with IUCAA Pune. There were 21 lectures of scientists and researchers. The participants got detailed information about the Universe, the development of astronomy, Giant Telescopes, Space Observatories, Supernova Explosion, the motion of celestial bodies, X-ray binaries, Black Holes, Gravitational waves, Dark Energy, Space Weather, Solar Physics, Extra-Solar Planets, Galaxies, Cosmology, and Python. They were also informed about their career and opportunities in astronomy. A group of students demonstrated the use of python in Astronomy by taking examples such as PL relation and distance measurements, use of HR diagram in main-sequence fit method, Hubble’s expansion law and age of the Universe, Kepler’s law and Planetary motion etc. Some students displayed their knowledge and art through Rangoli and painting competitions. Students who outperformed were rewarded. Skywatching program was organized in the evening. Besides the workshop participants, many nearby families, including kids, joined sky watching enthusiastically. It was a matter of curiosity for some of the participants to see the planet Saturn and Jupiter, for the first time, the response was overwhelming. There were 80 offline participants and 135 online participants.



## 3. Outreach activities

Lectures, Sky watching programme and telescope demonstrations were organized time to time at various places. Some of the activities are listed below-

- Given a Lecture “The legacy of Physics & Astrophysics, PRSU Raipur” in the International workshop on “Science & Technology in Astronomy Research (STAR

2022)”, SoS in Physics and Astrophysics, Pt. Ravishankar Shukla University, Raipur, 15-18 October 2022. Sky watching was organized in the evening.

- Sky watching program was organized at SoS in Physics & Astrophysics on the occasion of Partial Lunar Eclipse on 08 November 2022



- Given an invited lecture entitled “Understanding the Sky” in the one day workshop “Training in Astronomy Research and Education (TARE-2022)”, Department of Physics, Govt. College Dharsawa, Raipur, 28 November 2022. Sky watching was organized in the evening.



- 02-03 Feb 2023 Sky watching programme was organized at NIT annual fest, Raipur.
- Given an invited lecture entitled “Global Science for Global Wellbeing - The Science of Stars”, at Seth Phool Chand Smiriti College, Nawapara-Rajim on 17 Feb 2023. Sky watching was organized in the evening.





- Given an invited lecture entitled “The world of Stars”, at Govt. D.B. Girls P.G. College, Raipur on 23 Feb 2023.



- Given an invited lecture entitled “The amazing sky”, at Govt. Rajiv Lochan P.G. College, Rajim on 27 Feb 2023. Sky watching was organized in the evening.



- Given an invited lecture on “Career Guidance in Physics & Astrophysics” at Satyanarayan Shiksha Vikash Samiti, Kansari Samaj Nawapara Rajim, on the occasion of felicitation of meritorious students, 28 May 2023.





**2023 – 24**

## **1. Research Activities**

Spectral and timing studies of X-ray Binaries were conducted by Pravat Dangal (Thesis submitted) with N.K. Chakradhari in collaboration with Ranjeev Mishra (IUCAA, Pune).

UV-optical photometric and spectroscopic study of supernovae is being carried out by Shritika Tiwari (Thesis to be submitted), Kripa Ram Sahu (Thesis work ongoing) and Mulchand Kurre (Thesis work ongoing) with N.K. Chakradhari in collaboration with G.C. Anupama and D.K. Sahu (IIA, Bengaluru).

Studies of early-type/lenticular galaxies were carried out by Mahendra Kumar Verma (PhD awarded), and Amit Kumar Tamrakar (PhD awarded), with S.K. Pandey and Laxmikant Chaware in collaboration with S. Barwey (IIA Bengaluru) and Kanak Saha (IUCAA, Pune).

Study of GRBs – on aspects of multi-wavelength emission, environment and host galaxies was carried out by Ankur Ghosh (PhD awarded) with Amitesh Omar, Kuntal Misra (ARIES, Nainital) and N.K. Chakradhari (co-supervisor).

A research project titled “Probing the Compact Stellar Objects: The X-ray Binaries” was submitted to the Teachers Associateship for Research Excellence (TARE) program of Science and Engineering Research Board (SERB) / Anusandhan National Research Foundation (ANRF), Department of Science and Technology, Government of India, New Delhi. The proposal was successfully selected. As part of this project, N. K. Chakradhari visited IUCAA, Pune, from 05 to 17 Feb 2024 for this collaborative work with IUCAA, Pune.

## **Other Research Initiatives**

1. Harish Kumar Sahu (MSc III sem) participated in the Aditya-L1 Support Cell Fifth Workshop at Dept. of Physics, IIT Kanpur during September 29 - October 1, 2023.





2. Harish Kumar Sahu, and Hitesh Kumar Gurjar (MSc 3<sup>rd</sup> sem) participated in Space weather and Solar Physics workshop at Udaipur Solar Observatory during 4-8 December 2023.



3. Devendra Bhasakhure (MSc 3<sup>rd</sup> sem) participated in Aditya L1 workshop at the University of Allahabad during 4-6 December 2023.



4. Mulchand Kurre, Kripa Ram Sahu and Shrutika Tiwari, each one presented a Poster at the 42<sup>nd</sup> annual Meeting of the Astronomical Society of India (ASI 2024), hosted jointly by IISc, ISRO and JNP, Bengaluru, during 31 Jan to 04 Feb 2024.
5. Vesh Kansari (MSc 4<sup>th</sup> Sem) and Niraj Sahu (MSc 2023 batch) participated in the Aditya-L1 workshop at JECRC University, Jaipur during 6-8 Feb 2024.



6. Shrutika Presented a paper titled “Supernova 2010ju: The star died to give you life” at the 19<sup>th</sup> Chhattisgarh Young Scientist Congress, 26 - 27 Feb 2024, NIT Raipur.
7. Devendra Bhusakhare, Priyanka Paikara, Shaily Dewangan, and Vesh Kansari four students from MSc 4<sup>th</sup> Sem were selected for the ARIES Training School in Observational Astronomy (ATSOA 2024) at ARIES, Nainital during 22 April – 3 May, 2024.





8. Devendra Bhusakhare, Gajendra Bharati, Harish Kumar Sahu, Hitesh Kumar, Priyanka Paikara, Shaily Dewangan, Vakeshwar Anand, and Vesh Kansari, Eight students from MSc 4<sup>th</sup> Sem completed their MSc Project.
9. **Yogita Patel (2020 batch) has been selected for PhD program at the Department of Astronomy (DAS), Universidad de Chile, Santiago, Chile.**

## 2. Outreach activities

1. Arrangements were made for the students to see the live launch of Chandrayaan-3 from ISRO on 14 July 2023.



2. Invited for a discussion on launch of Chandrayaan-3 in IBC24 News Channel on 14 July 2023. <https://www.youtube.com/watch?v=D7N7wdpNU4c>
3. Students from Govt Higher Secondary School Shantinagar Raipur visited the Lab on 10 August 2023 (through NSS University Exposure Programme). During this visit, the students interacted with faculty members, participated in astronomical

discussions, and experienced demonstrations on telescopes and laboratory equipments. The event appeared in Dainik Bhaskar News.



4. Arrangements were made for the students/staff to see the live soft landing of Chandrayaan 3 from ISRO on 23 August 2023. Interviews given in many News channels such as Zee News, IBC24, Bansal News, TV 24, CG Swaraj etc.

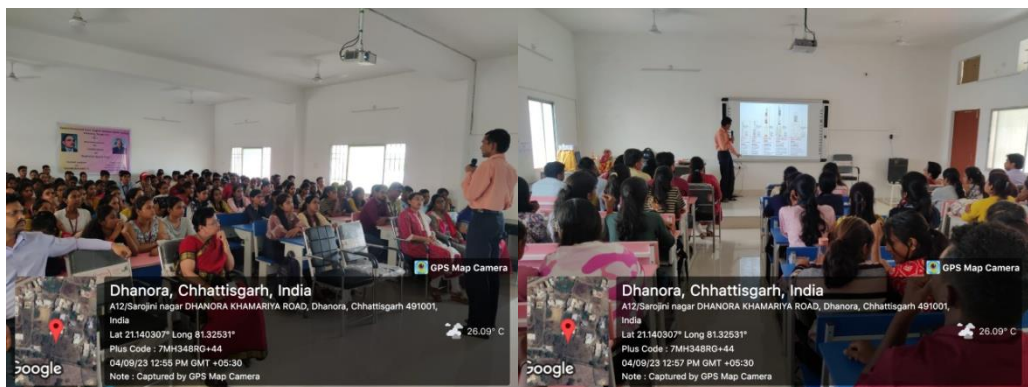


5. Arrangements were made for the students/staff to see the live Launch of Aditya L1 from ISRO on 02 September 2023. Interviews given in News channels. e.g. IND 24 <https://www.youtube.com/watch?v=Q09hm5fZR1g>



6. Given an invited lecture on “Chandrayaan 3” at Swami Atmanand Government English Medium Model College, Dhanora, Durg, on 04 Sep 2023.





7. Given an invited lecture entitled “India on Moon” at Rungta College, Raipur on 27 September 2023.



8. Students of Maharaja Agrasen College, Raipur visited the Lab on 25 October 2023. Interaction with Faculty members, astronomical discussion, Telescope and Lab demonstration were done.
9. Sky watching was organized at NIT Raipur during 26-27 Oct 2023.
10. Given an invited lecture entitled “The sky above Dhanora: An exploration beyond the horizon” and organized Sky watching at Government Higher Secondary School, Dhanora, Durg on 25 November 2023.

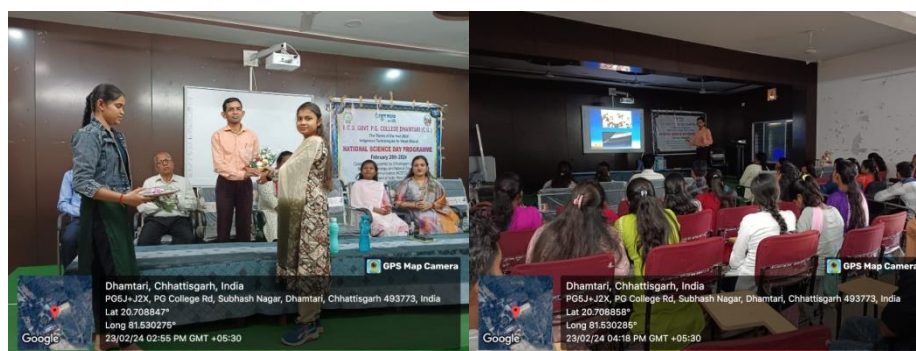


11. Students from Govt. D.B. Girls College, Govt Radha Bai Naveen Girls College, Govt Science College, and Govt Chhattisgarh College Raipur visited the lab during Jan-Feb 2024.



12. Sky watching program was organized at NSS Camp, Pt RSU Raipur on 17 Feb 2024.

13. Given an invited lecture entitled “Indigenous Technologies for Viksit Bharat: Scope in Astronomy & Space Sciences” and organized Sky watching programme at BCS Govt PG College, Dhamtari, on 23 Feb 2024.



14. Given an invited lecture entitled “Space & Astronomy” and organized Sky watching programme at Govt. P.G. Science College, Raipur, on 24 Feb 2024.

15. Sky watching program was organized at Rungta Public School, Bhilai on 15 March 2024.



16. Students from Rungta College Bhilai visited the Lab on 09 Apr 2024.



**2024-25**

## 1. Research Activities

Spectral and timing studies of X-ray binaries were conducted by Pravat Dangal (Thesis awarded) under the supervision of N.K. Chakradhari, in collaboration with Ranjeev Mishra (IUCAA, Pune). Two new PhD scholars (Chandra Kumar Chandravanshi, Daneshwar Bhandari) have joined to work in this field in collaboration with IUCAA, Pune.

UV-optical photometric and spectroscopic studies of supernovae were carried out by Ms Shritika Tiwari (Thesis awarded). Kripa Ram Sahu and Mulchand Kurre are doing their thesis work in this field under the supervision of N.K. Chakradhari, in collaboration with G.C. Anupama and D.K. Sahu (IIA, Bengaluru).

Recent results from supernova studies were presented at ASI 2025, NIT Rourkela. A research paper on X-ray binary studies has been submitted to JHEAP, and other manuscripts are in preparation for submission to peer-reviewed journals.

A research project titled “Probing the Compact Stellar Objects: The X-ray Binaries” was submitted to the Teachers Associateship for Research Excellence (TARE) program of Science and Engineering Research Board (SERB)/Anusandhan National Research Foundation (ANRF), Department of Science and Technology, Government of India, New Delhi. The proposal was successfully selected and granted funding of Rs. 18,30,000/- (Reference No: TAR/2023/000115). As part of this project, N. K. Chakradhari visited IUCAA, Pune, from 16 May to 14 August 2024 for collaborative work.

## Other Research Initiatives

1. Niraj Lahare (MSc 3<sup>rd</sup> sem), participated in the National School on fundamentals of Space Radiation at Manipal Academy of Higher Education, Manipal, Karnatka during 16-20 Sep 2024.





2. Kavita Verma and Vinay Kumar Yadav (3<sup>rd</sup> Sem) participated in High Energy Astrophysics Workshop at BHU, Varanashi during 26-27 November 2024.



3. NK Chakradhari participated in AI/ML in Astronomy and Astrophysics Workshop at IUCAA, Pune during 06 - 10 January 2025.
4. Kripa Ram Sahu (PhD Scholar) presented a poster at the 43<sup>rd</sup> Annual meeting of the Astronomical Society of India (ASI-2025), hosted by the National Institute of Technology Rourkela, Odisha during 15-19 February 2025.
5. Prachi Dhruw (MSc 4<sup>th</sup> Sem) was selected to carry out a project work at ARIES, Nainital under Dr. Priyanka Srivastava from 18<sup>th</sup> Feb to 19<sup>th</sup> Apr, 2025.
6. Jhamendra Kumar Sahu and Skand Soni (MSc 4<sup>th</sup> Sem) were selected for Visiting student program at CREST-IIA Bengaluru during 14 March – 13 May, 2025.





7. Vinay Kumar Yadav and Kavita Verma (MSc 4<sup>th</sup> Sem) participated in the 9<sup>th</sup> Aditya-L1 Support Cell Workshop at IIT Guwahati, during March 24 - 26, 2025.



8. Chandra Kumar Chandravanshi and Daneshwar Bhandari (PhD scholars) participated in 2nd Daksha Workshop at IUCAA, Pune during 30-31 March 2025.
9. Nikhil Manikpuri (MSc 4<sup>th</sup> Sem) was selected for An Introductory Workshop on Exoplanet Detection and Characterization, at IIT Kanpur during 4-6 Apr 2025.



10. Vinay Kumar and Vamkindini Prajapati (MSc 4<sup>th</sup> Sem) were selected to participate in the second International Liquid Mirror Telescope (ILMT-2025) Workshop at ARIES, Nainital during 14 - 17 April, 2025.



11. Kavita Verma and Damini Sahu (MSc 4<sup>th</sup> Sem) were selected for the ARIES Training School in Observational Astronomy and Atmospheric sciences (ATSOAA 2025) at ARIES, Nainital during 21 Apr – 2 May, 2025.
12. Damini Sahu, Jhamendra Kumar, Kavita Verma, Neeraj Kumar Lahare, Nikhil Kumar Manikpuri, Parmeshwar, Prachi Dhruw, Sonam Verma, Skand Soni, Vamakundini Prajapati, Vashundhra Dutta, Vinay Kumar Yadav, twelve students from MSc 4<sup>th</sup> sem completed their project work.

## 2. Outreach activities

1. NK Chakradhari was invited for a discussion on “India’s Space Saga” on the eve of National Space Day 2024, by Doordarshan Raipur on 22 August 2024. The programme was broadcasted live.

[https://youtu.be/FrGimNxIzdI?si=NNkhyGDhXV5d\\_kzh](https://youtu.be/FrGimNxIzdI?si=NNkhyGDhXV5d_kzh)



2. Given an invited talk (online) at Vivekananda Global University Jaipur on “Understanding our Space” on the occasion of National Space Day 2024 on 23 August 2024.
3. Given an invited talk on “Space Science & Astronomy” in a One Day Workshop on National Space Day 2024 at Govt Niranjana Keshawani College, Kota, Bilaspur, on 30 August 2024.





4. Given an invited lecture on “Sky and the twinkling stars” at Maharaja Agrasen International College, Raipur on 19 Sep 2024.



5. Students of Shyama Prasad Mukharjee Hr Sec School WRS Colony Raipur visited the Lab on 24 Sep 2024.



6. Students from Maharaja Agrasen International College, Raipur visited the Lab on 07 October 2024.
7. Newly admitted Students from BSc-B.Ed., PRSU Raipur visited the Lab on 21 October 2024.





8. Students from Govt Higher Secondary School Katora Talab, Raipur visited the Lab on 24 October 2024.



9. Given an invited lecture on “Night Sky and Telescope” and organized sky watching program at Swami Atmanand Govt. English Medium School of Excellence (SAGES), Nayabazar, Rajhara on 7 December 2024.



10. Sky watching was organized at Revati Agriculture Farm, Gariaband on 11 January 2025.
11. Given an invited talk on “Twinkling Stars: ek nazar aasaman ki or” and organized sky watching program at Govt P.G. College Arang on 10 Feb 2025.



12. Given an invited talk on “Physics and Space Science” at Govt College Kohka-Neora, on 18 Feb 2025.



13. Given an invited talk on “The star died to give you life” at Vivekananda Global University Jaipur (online) on 19 Feb 2025.

14. Given an invited talk on “Space Science” at Govt Mahaprabhu Vallabhacharya P.G. College Mahasamund on 24 Feb 2025.



15. Given an invited talk on “Stars, Planets, and Constellations” at Govt College of Education, Raipur, on 28 Feb 2025.





16. Given an invited talk on “Empowering Indian Youth for Global Leadership in Science and Innovation for Viksit Bharat: A reference to Astronomy and Astrophysics” at Govt College Kharora, Raipur on 1 March 2025.



17. Sky watching program was organized at Govt Science college Raipur on 05 March 2025.

18. Given an invited talk on “The life of Stars” at Govt Niranjana Keshawani College, Kota, Bilaspur on 11 March 2025.



19. Sky watching programme was organized at NIT Raipur on 28 March 2025.