

Proceedings of the 3rd BINA Workshop: Scientific Potential of Indo-Belgian Co-operation

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Paper presented at the 3rd BINA Workshop on “Scientific Potential of the Indo-Belgian Cooperation”, held at the Graphic Era Hill University, Bhimtal (India), 22nd–24th March 2023.

Abstract

In this report, we present an overview of the 3rd BINA workshop hosted by ARIES, Nainital on a broad theme the *Scientific potential of the Indo-Belgian co-operation*. Further, an introduction of the proceedings of the 3rd BINA workshop is also delineated along with possible areas where there is potential to extend Indo-Belgian cooperation in the current era of multi-wavelength astronomy. These proceedings contain a total of 94 articles that are based on results presented in the form of 35 oral and 59 poster presentations during the workshop. The participants of

the workshop strongly recommend the further continuation of the BINA activities since the necessary foundation work has already been accomplished.

Keywords: Network: BINA; Telescopes: ILMT, DOT; Funding agencies: DST, BELSPO

1. Introduction

The Belgo-Indian Network for Astronomy and astrophysics (BINA) was established about a decade ago with the aim to stimulate collaborations in space research between India and Belgium by uniting researchers of 13 Indian and 6 Belgian institutes (Joshi and De Cat (2019); Table 1). The Indian institutes, led by the Aryabhata Research Institute of observational sciencES (ARIES; Nainital), are located in different parts of the country while the Royal Observatory of Belgium (ROB; Brussels, Belgium) leads both federal and regional organizations of Belgium participating in the activities of BINA. Thus, a large group of researchers participate in joint activities such as workshops and mutual work visits organised by the BINA members. Such activities are fostering research in the areas of the solar system, galactic astronomy, and extra-galactic astronomy, as well as developing back-end instruments for the two Indo-Belgian telescopes, namely the 3.6-m Devasthal Optical Telescope (DOT) and the 4-m International Liquid Mirror Telescope (ILMT) located in the northern part of India at the Devasthal observatory. For the various activities of BINA organised so far, the International Division, Department of Science and Technology (DST, Govt. of India) funded over 53.55 lakhs of Indian Rupees (vide letter Nos. DST/INT/Belg/P-02/2014 and DST/INT/Belg/P-09/2017) while the Belgian Federal Science Policy Office (BELSPO, Govt. of Belgium) contributed $\sim 58\,000$ Euros (vide letters Nos. BL/11/IN07 and BL/33/IN12). This paper gives a detailed description of the third one in the series of BINA workshops (De Cat et al., 2018, 2019), hosted by ARIES at Bhimtal Campus of Graphic Era Hill (Deemed to be) University from March 22 to 24, 2023 (Fig. 1).

2. Organizing Committees

The 3rd BINA workshop was preceded by the inauguration of the ILMT on March 21, 2023 at the Devasthal Observatory. For both events, a local organizing committee (LOC) was constituted under the chairmanship of Prof. Dipankar Banerjee. He was actively supported by Drs. Brijesh Kumar, Santosh Joshi, Kuntal Misra, Vaibhav Pant, S. Krishna Prasad, and Virendra Yadav, by Engr. Sri Mohit C. Joshi, and by Sri Praveen Solanki from ARIES.

The scientific programme was conceptualized and structured by the scientific organizing committee (SOC). It was co-chaired by the Indian and Belgian PIs of the BINA project (Dr. Santosh Joshi, ARIES, Nainital; Dr. Peter De Cat, ROB, Brussels), who could count on the support from scientists from India (Dr. Drisya Karinkuzhi, University of Calicut, Calicut; Dr. J. C. Pandey, ARIES, Nainital; Prof. Shashikiran Ganesh, Physical Research Laboratory, Ahmedabad; Dr. Tapas Baug, S. N. Bose National Centre for Basic Sciences, Kolkata) and Belgium (Prof. Michaël De Becker, Université de Liège, Liège; Dr. Laurent Mahy, ROB, Brussels; Prof. Sophie Van Eck, Université Libre de Bruxelles, Brussels; Dr. Emmanuël Jehin, Université de Liège, Liège; Prof. Tom Van Doorselaere, KU Leuven, Leuven).



Figure 1: The poster of the 3rd BINA workshop. Social platforms and other modes of communication were used for a global advertisement of this event.



Figure 2: A photograph of the participants of the 3rd BINA workshop.

3. Participants

The 3rd BINA workshop was attended by more than 150 participants, including 143 registered ones listed in Table 2. The participants were scientists, postdoctoral fellows and PhD students from different parts of the globe (Fig. 2). About 27% of them were female researchers. As expected, the majority of them came from India (~78%), followed by Belgium (~13%) (Figs. 3 and 4). Another 9 countries were also represented (the USA (#3), Uzbekistan (#2), Thailand (#1), Sri Lanka (#1), Kenya (#1), South Africa (#1), Poland (#1), Canada (#1), and Ethiopia (#1)). It, thus, shows the international character and importance of the 3rd BINA workshop.

Indian Participating Institutes



Figure 3: Geographical locations of the Indian participants in the workshop.

Countries participating

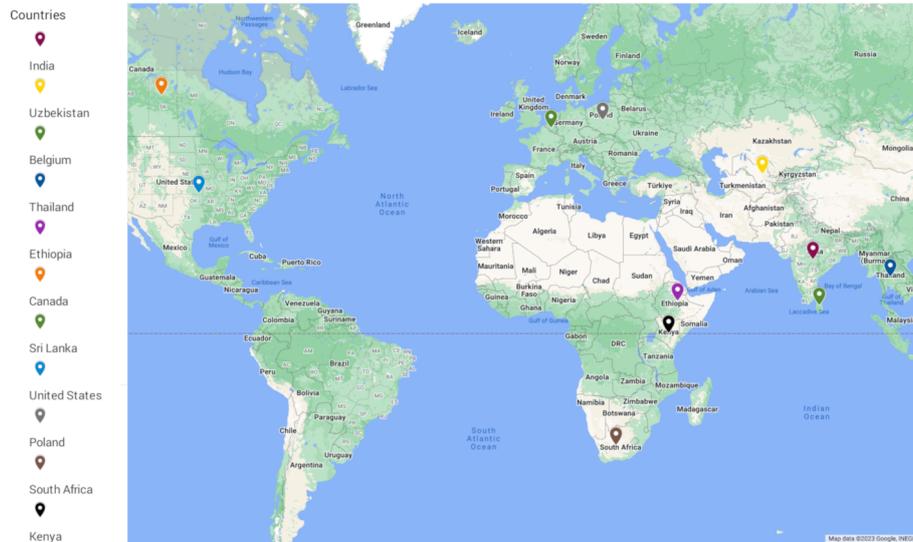


Figure 4: Geographical locations of non-Indian participants in the BINA.

4. Activities

4.1. Opening ceremony

His Excellency, Mr. Didier Vanderhasselt (ambassador of Belgium in India) inaugurated the workshop on March 22, 2023, a historical birthday of ARIES (Sagar, 2022). Dr. S. K. Varshney (DST, Govt. of India) and Mr. Laurent Ghys (BELSPO, Govt. of Belgium) briefed the importance of the BINA network for the Indo-Belgian collaboration and expressed their gratitudes. Dr. Peter De Cat (Belgian PI of BINA) gave an overview of the evolution of BINA from its birth to its adulthood while Prof. Dipankar Banerjee (Director of ARIES, Nainital) gave an introduction to the Aditya-L1 and Orbiter space missions. Dr. Santosh Joshi (Indian PI of BINA and main organiser of the 3rd BINA workshop) ended this session by presenting a glimpse of the scientific programme of the three days of the workshop and a vote of thanks. The inaugural function was hosted by Dr. Kuntal Misra of ARIES. A group photograph of the dignitaries present during the inauguration of the workshop is shown in Fig. 5.

4.2. Scientific activities

Two special invited talks were delivered. The first one, entitled *The 4-m International Liquid Mirror Telescope: A Short History*, was presented by Prof. Jean Surdej during the inauguration of the ILMT on March 21, 2023 (Surdej et al., 2024). In the evening of March 22, 2023, to celebrate the foundation day of ARIES, the second talk on *Indo-Belgian co-operation in astrophysics: from inception to future prospects* was given by the founder director of ARIES, Prof. Ram Sagar (Sagar, 2024). In Fig. 6, the incumbent director of ARIES, Prof. Dipankar Banerjee is congratulating Prof. Ram Sagar on the occasion of the foundation day of ARIES.



Figure 5: Formal inauguration of the 3rd BINA workshop by the Belgian ambassador and other delegates. From left to right: Mr. Didier Vanderhasselt, Prof. Ronald van Linden, Prof. J. Kumar, Dr. Santosh Joshi, Dr. Peter De Cat, Dr. Narpinder Singh, Dr. S. K.= Varshney and Prof. Dipankar Banerjee.



Figure 6: Felicitation of the founder director of ARIES by the incumbent director of ARIES on the occasion of the foundation day lecture on March 22, 2023.



Figure 7: A snapshot of the invited talk given by Dr. Thibault Merle.

After evaluating abstracts submitted for presentations in the workshop objectively, the SOC members outlined the scientific programme. The scientific sessions were structured according to the theme of the workshop. It was divided into a main session (Section 4.2.1) and a solar session (Section 4.2.2). A total of 139 contributions (10 invited and 48 contributed talks, and 81 posters) were presented. Table 3 gives their distribution in the various sessions of the workshop. Public outreach activities conducted during the workshop are described in Section 4.2.3. Out of these presentations, these proceedings contain a total of 94 articles including 35 oral and 59 posters.

4.2.1. Main session

The main session of the scientific program is outlined in Table 4. It consists of presentations and discussions that are, in several cases, based on results obtained from observations with the Indo-Belgian telescopes and/or other telescopes accessible through Indo-Belgian astronomical collaborations. The topics that were discussed during this session include the observing strategy of the Indo-Belgian telescopes, upcoming observing facilities and back-end instruments, and research of solar systems bodies, galactic objects, and extra-galactic systems. Fig. 7 shows a snapshot of the presentation made in the main session by Thibault Merle (ULB/ROB, Belgium). His invited talk entitled *Dancing with the Stars* was well allured.

4.2.2. Solar physics

The solar physicists at ARIES (Nainital, India) and the Indian Institute of Astrophysics (IIA; Bangalore, India) have been collaborating with the solar astronomers of the ROB (Brussels, Belgium) and KU Leuven (Leuven, Belgium) for a long time. Therefore, to strengthen and expand the ongoing Indo-Belgian cooperation in solar physics, a parallel session was arranged during the 3rd BINA workshop dedicated to studies of the Sun (Fig. 8). The outline of this



Figure 8: Discussion held during the Solar session.

session is given in Table 5.

4.2.3. *Public outreach and education*

No one is better suited than a scientist to explain the fascination and mysteries of science to students and the general public. Thus, one of the mandates of the BINA project is to conduct outreach programmes to ignite young minds and educate the general public about the stars, planetary bodies, eclipses, black holes, and other celestial objects. Therefore, public outreach was an integral component of the scientific program of the 3rd BINA workshop.

This goal was achieved by organising several popular talks in diverse areas of astronomy and astrophysics. These talks were delivered by eminent scientists from India, Belgium, USA, Canada, South Africa, Ethiopia, and Sri Lanka to the students at public and private higher secondary schools, engineering colleges, and universities. Table 6 summarises the popular lectures delivered by more than a dozen speakers. Various visually appealing posters were displayed at the venues and on social media platforms to advertise the outreach activities. These popular lectures and posters successfully promoted outreach activities both during the workshop and on various social media platforms. Fig. 9 shows a moment captured during the close interaction between the public outreach speaker Prof. Greg Wade and students of Sainik School Ghorakhal, Nainital-Uttarakhand.

A sky gazing programme was also arranged at the workshop venue for the enthusiastic students and the public. Moreover, various creative visual posters were also displayed in the venues and on social media platforms to advertise the outreach activities of the 3rd BINA workshop. Overall, approximately 2 000 students and their teachers from a total of 15 schools and colleges in the area had the opportunity to experience a diverse range of topics in Astronomy and Astrophysics.



Figure 9: Prof. Gregg Wade from the Royal Military College (Canada) delivered a popular talk to the students of Sainik School Ghorakhal (Nainital). In the top left, a tableau of the Kumaun region of Uttarakhand is also depicted.

4.3. Social events

Human beings are both creators and products of culture, and culture is an integral aspect of what defines our humanity. To introduce the richness of Indian culture to the participants of the BINA workshop who came from various places around the world, a cultural evening was organized on March 23, 2023. Ms. Purvi Udhwani (student at ARIES) and Mr. Anil Ghildiyal (former staff artist from *Song and Drama Division, Nainital*) emceed the cultural program. The folk dances of Kumaon and Garhwal regions of Uttarakhand (Chhapeli, Chachari, Ghashyari, Cholia Panyar etc), Punjab, Jharkhand, and other parts of India were performed. This cultural function started with *Ma Nanda Sunanda* worship (top left panel of Fig. 10) followed by *Bhangara* jointly by the artists. Dr. Ronald Van der Linden (director of ROB) and Prof. Jean Surdej (head of the ILMT team) also took part in the *Mayur dance of Vrindavan region*. The bottom left panel of Fig. 10 shows a snapshot of a Garhwali folk dance in a Garhwali song *O Nileema Nileema, Ye Paki Jaula Kilma...* The highlight of the social activity was when the majority of attendees enthusiastically joined in the dancing. The cultural program concluded with a captivating traditional Indian dance performed by Dr. Nilakshi Veerabathina (alumna of ARIES) from the University of Texas at Arlington (right panel of Fig. 10). This dance was choreographed to three different devotional songs that beautifully depicted Lord *Krishna's* love for *Radha* and Lord *Shiva's* power and grace. Following the cultural program, the participants of the 3rd BINA workshop had the opportunity to enjoy a sumptuous dinner generously sponsored by the director of ARIES.



Figure 10: The cultural event was onset with the worship of goddesses *Nanda Sunanda* (top left panel) followed by a glimpse of Indian culture. The Garhwali folk dance was staged by artists (bottom left panel). In the right panel, Dr. Nilakshi Veerabathina (UTA, USA), a former PhD student of ARIES, performed a classical dance during the social event.

4.4. Closing ceremony

Dr. Eugene Semenko (NARIT; Thailand) and Prof. Manfred Cuntz (UTA; Texas, USA), both originating from outside India and Belgium, were invited to present their fair feedback on the main and solar session of the scientific program, respectively (Fig. 11). The summary of these sessions can be found at the end of these proceedings (Semenko and Cuntz, 2024).

At the end of the workshop, the contributions of Prof. Ram Sagar, the founder director of ARIES, in observational sciences and in training a pool of researchers (now working in India and abroad) were acknowledged. He supervised 18 PhD students and authored over 300 research papers in the field of stellar variability, star clusters, afterglows of γ -ray bursts, active galactic nuclei variability, and atmospheric sciences. He was instrumental in the formation of the ARIES as well as in establishing world-class observational facilities and collaborations in the field of optical astronomy and atmospheric sciences (Sagar, 2022) including a 206.5 MHz Stratosphere Troposphere wind profiler (Bhattacharjee et al., 2023). Prof. Ram Sagar, therefore, received a lot of national and international recognition. For example, he received an award from

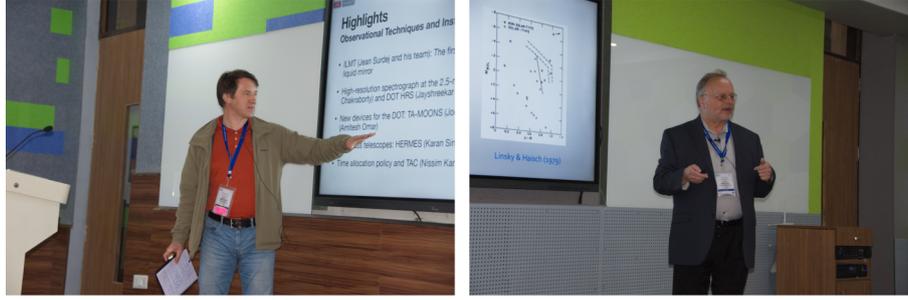


Figure 11: Summary of the 3rd BINA workshop presented by Dr. Eugene Semenko (left) and Dr. Manfred Cuntz (right) for the main program and solar session, respectively.



Figure 12: PhD students and collaborators of Prof. Ram Sagar presented a memento for his contribution to setting-up world-class observational facilities in India.

the Alexander von Humboldt Foundation (Germany) and was elected a Foreign Correspondent Member of the Academy of Royal Society of Science (Liège, Belgium). In recognition of all these contributions and also to mark the completion of his 70th year in July 2022, a memento was presented to him by his PhD students and collaborators (Fig. 12).

Prof. Dipankar Banerjee (Chair LOC) applauded the LOC members and volunteers for successfully organizing this international workshop (Fig. 13). The contributions by SOC and BINA members were also acknowledged for structuring the phenomenal scientific program.

5. Media Coverage

The 3rd BINA workshop received global coverage in social, printed, and digital media. Figs. 14 and 15 depict two such articles published in Hindi Newspapers. Formal statements of the Indian and Belgian eminent scientists on the importance of Indo-Belgium cooperation were recorded by the digital media (Fig. 16).

Apart from the coverage of the event by printed, electronic and social media, multiple press releases were issued on the 3rd BINA workshop. One of them was made by DST, India on March 22, 2023, entitled *Indian and Belgian astronomers highlight success of collaboration in space*



Figure 13: The members of LOC and volunteers of the 3rd BINA workshop.



Figure 14: For the general public's awareness, press coverage of the 3rd BINA workshop were published in various national newspapers. Dr. Narpendar Singh (Graphic Era University, Bhimtal Campus) and Prof. Ram Sagar (IIA, Bangalore) were interviewed by the media persons about this international event.

अंतरिक्ष विज्ञान में नए आयाम दिलाएगी कार्यशाला

संवाद न्यूज एजेंसी

भीमताल/भवाली (नैनीताल)। भारत में बेल्जियम के राजदूत डिडिएर वेंडरहासेल्ट ने कहा कि बेल्जियम विज्ञान नीति कार्यालय (बीपीएलएसपीओ) और विज्ञान एवं प्रौद्योगिकी विभाग साइबर सुरक्षा, जैव विज्ञान, समुद्री विज्ञान, ब्लैक होल, जलवायु परिवर्तन और कई

परियोजनाओं पर एक साथ काम करते हैं। वेंडरहासेल्ट ने यह बात बुधवार को भीमताल ग्राफिक एरा हिल यूनिवर्सिटी में बेल्गो इंडियन नेटवर्क फॉर एस्ट्रोनामि एंड एस्ट्रोफिजिक्स (बीना) की तीन दिवसीय अंतरराष्ट्रीय कार्यशाला में उद्घाटन सत्र में कही।

उन्होंने कहा यह कार्यशाला भारत-बेल्जियम सहयोग की वैज्ञानिक क्षमता पर जोर देगी। कार्यशाला में भारत, बेल्जियम के खगोलविदों के साथ संयुक्त राष्ट्र अमेरिका, कनाडा, पोलैंड, श्रीलंका, दक्षिण अफ्रीका, इथोपिया और केन्या के वैज्ञानिकों ने अंतरिक्ष विज्ञान में अत्याधुनिक गतिविधियों और

**भीमताल
ग्राफिक एरा में
तीन दिवसीय
कार्यशाला शुरू**



कार्यशाला में मौजूद वैज्ञानिक और परिसर के प्रोफेसर। संवाद

वैज्ञानिक सहयोग पर प्रकाश डाला। अंतरराष्ट्रीय सहयोग के प्रमुख एसके वार्शनेय ने कहा कि अनुसंधान के लिए नेटवर्किंग महत्वपूर्ण है।

एरीज के निदेशक प्रो. दीपांकर बनर्जी ने सौर अंतरिक्ष मिशन और सूर्य का अध्ययन करने के लिए मिशन आदित्य एल-1 के बारे में रूपरेखा प्रस्तुत की। बेल्जियम की रॉयल वैधशाला के डॉ. पीटर केट ने भी जानकारी दी। एरीज के डॉ. संतोष जोशी ने वैज्ञानिक कार्यक्रमों और तीसरी बीना कार्यशाला की नेटवर्किंग गतिविधियों का विवरण दिया। ग्राफिक एरा हिल यूनिवर्सिटी के कुलपति प्रो.

नरपिंदर सिंह प्रो. जे. कुमार ने कहा कि एरीज और ग्राफिक एरा भीमताल के बीच समझौता ज्ञापन के रूप में इस कार्यशाला का आयोजन किया गया है। वैज्ञानिकों ने कहा कि बीना एक नेटवर्क है जो बेल्जियम और भारतीय संस्थानों के बीच अंतरिक्ष अनुसंधान में सहयोग को बढ़ावा देता है। इसका परिणाम है कि देवस्थल में सबसे बड़ी दूरबीन स्थापित की गई है।

कार्यशाला में बताया कि जिले के स्कूलों और कुमाऊं विश्वविद्यालय में विद्यार्थियों के लिए इस तरह के व्याख्यान आयोजित किए जा रहे हैं।

Figure 15: Media coverage of the 3rd BINA workshop. From left to right: Dr. Santosh Joshi, Mr. Didier Vanderhasselt, Mr. Laurent Ghys, Prof. J. Kumar, Dr. Narpinder Singh, Dr. Manoj Kumar Lohani, Dr. Pushpa Negi, Dr. S. K. Varshney, Dr. Peter De Cat, Prof. Dipankar Banerjee and Mr. Mohit C. Joshi.



Figure 16: Joint media interaction by Indian and Belgian delegates. From left to right : Dr. Ronald van Linden (ROB), Mrs. Brigitte Decadt (BELSPO) and Dr. S. K. Varshney (DST).

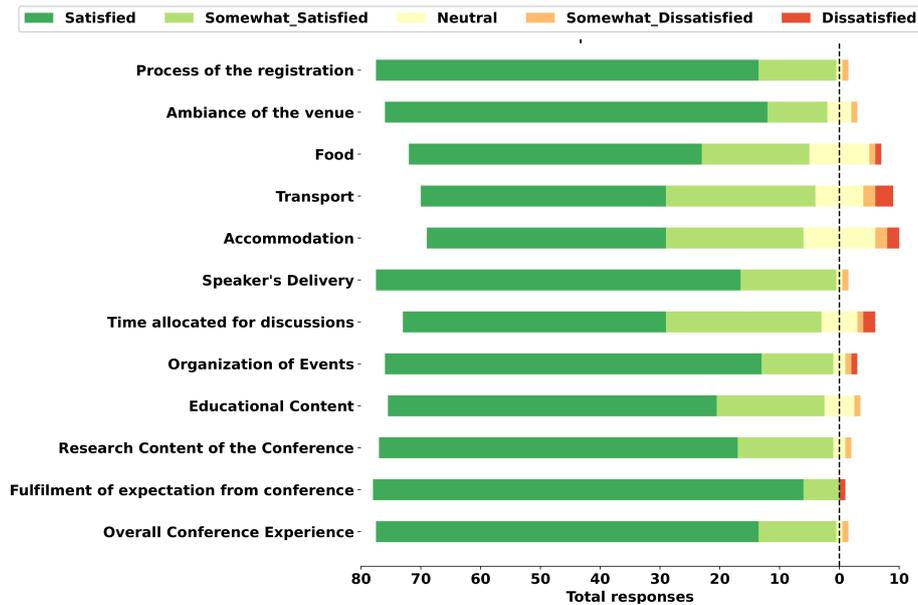


Figure 17: Pictorial representation of the response received from the participants on their experience during the 3rd BINA workshop.

sciences (<https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1909670>). Similar press releases were also made from the Belgian side (e.g., <https://www.astro.oma.be/en/belgian-and-indian-astronomers-celebrated-their-successful-collaboration-during-their-third-workshop/>).

6. Post-event Survey

In order to measure the success level of the 3rd BINA workshop, a post-event survey was conducted by circulating a Google form to all the participants. This web based document contained questions on specific areas, including the venue, date, speakers, vendors, catering, quality of sessions, amount of sessions, comments, ratings, or testimonials etc. Such feedback helps in understanding the strengths and weaknesses and knowing the audience’s satisfaction and expectations. A significant number of BINA participants took part in the poll. Fig. 17 shows the participants’ responses in a pictorial diagram. From this figure, one can perceive that the event was very successful, giving great satisfaction to the organizer.

7. Retrospection and Recommendations

The four-day BINA workshop concluded with an open discussion session co-hosted by Dr. Michaël De Becker (University of Liège, Belgium) and Dr. Nilakshi Veerabathina (University of Texas at Arlington, Texas, USA). The discussion focused on the past, present, and future prospects of research, scientific endeavours, collaboration, and outreach activities. The discussion began by acknowledging the ambiguity surrounding the term “BINA” and its various associated definitions. BINA operates as an exchange program under the Indian and Belgian governments’ bilateral initiative. The BINA collaboration has transcended its initial scope, embracing a more ambitious vision in astronomy. A testament to this transformation was evident at

the workshop, where diverse papers on various astronomical topics and experimental techniques were showcased. Undoubtedly, the evolution of BINA represents a positive and promising development for the future of astronomical research. The key points and recommendations made during the discussion session and collected through the post-event survey are summarized below.

7.1. Science and research

- *Broadening BINA's scope:* It was emphasized in the discussion that BINA should be seen as a platform for collaboration and networking among individuals, not just about hardware and facilities.
- *Spreading awareness and encouraging inclusivity:* There is a need to propagate information about BINA to encourage inclusivity and a wider participation. The participants were encouraged to be ambassadors for BINA and dispel misconceptions about the program.
- *Expanding collaborations:* The BINA program should be expanded to collaborations within the present and upcoming other worldwide space and astronomy initiatives.
- *Extending the frequency and duration of workshops:* The BINA workshops should be conducted every two years. Additionally, it would be preferable for the BINA workshops to be one day longer to allow more time for discussions and the viewing of posters. A special session should be organized during the workshop, dedicated to poster presentations accompanied by flash talks. This session should aim to recognize the presenters and their research work and to engage the audience in meaningful scientific discussions.
- *Enhancing parallel sessions:* Building upon the success of the solar session and public outreach activities in this workshop, it is recommended to incorporate a dedicated parallel session focused on astronomical instrumentation, including telescopes and back-end instruments, during future workshops. Allocating at least one day to this session would provide valuable opportunities for in-depth discussions and advancements in the field.

7.2. Outreach and education

- *Generating interest:* It was suggested to incorporate more visual aids, science demonstrations, and engaging activities during outreach programs to kindle the interest in astronomy among students.
- *Empowering science teachers:* A dedicated special session for science teachers should be arranged at the workshop venue itself. This session should include hands-on experiments on practical astronomy to enhance their teaching skills. Additionally, provide teaching kits to teachers, enabling them to distribute these kits to their students to foster a greater interest in astronomy.

- *Enhancing participation and interactivity:* The future workshops could be arranged in a hybrid mode to increase the number of participants. The availability of a Slack channel or similar tools would facilitate discussions and sharing of other important information.
- *Developing skills:* Skill development programs and hands-on sessions should be arranged to train the interested individuals, students, and teachers in astronomical data collection and reduction, specifically, focusing on available instruments on the 3.6-m DOT.
- *Including different types of schools:* Efforts should be made to include state board public schools as well as private and other schools in outreach activities to reach students from diverse backgrounds.
- *Expanding outreach activities beyond workshops:* Expanding the outreach beyond the period of the workshop and conducting regular, structured outreach programs throughout the year at ARIES campus was strongly suggested.
- *Creating online resources:* Create and make educational materials, demos, and resources available online for students and teachers to access and use at their convenience.
- *Incorporating social media:* Various social media platforms should be utilized in the future to share educational content and reach out to a larger audience, especially the younger generation.
- *Collaborating with other organizations:* Partner with experts and other astronomy organizations around the nation to enhance the outreach programs and leverage the knowledge and experiences.
- *Long-term engagement:* Explore programs with long-term involvement, similar to astronomy training for Girl Scouts of the USA and other initiatives around the world, to promote sustained student involvement and leadership.
- *Evaluation and improvement:* ARIES and BINA should evaluate the impact of outreach initiatives and seek ways to continuously improve and expand the programs.

8. Future Prospects

BINA has proven to be a successful network. It provided financial support for organising three international workshops (two in India and one in Belgium) and several work visits in both directions to discuss scientific and instrumentation projects. These personal contacts between Indian and Belgian scientists have led both to the strengthening and/or the start of new collaborations in different fields of astronomical research. The joint workshops are an ideal forum to present the scientific results of Indo-Belgian collaboration and to allow face-to-face discussions to set up a path for future cooperation. A one-day workshop is also planned at the ROB during the fall of 2023 to evaluate the outcome of BINA so far and to discuss concrete plans for a long-term continuation of the network. The short-term continuation is already guaranteed as both DST and BELSPO agreed to fund the project *Belgo-Indian Projects on Precision*

Astronomical Spectroscopy for the Stellar and Solar system bodies (BIPASS) for three years (2022-2025). During the workshop, it has become evident that an Indo-Belgian collaboration provides access to a large arsenal of telescopes and instruments (to both sides), opening the door to many scientific fields and new possibilities in space research. Various invited reviews highlighted the connection between efficient instrumentation and the quality of the scientific output. The network that emerged from this collaboration is still expanding as astronomical institutes worldwide have shown keen interest in joining the consortium, forging it a multi-national venture.

Acknowledgments

The 3rd BINA workshop was supported by the Belgo-Indian Network for Astronomy and Astrophysics (BINA), approved by the International Division, Department of Science and Technology (DST, Govt. of India; DST/INT/BELG/P-09/2017) and the Belgian Federal Science Policy Office (BELSPO, Govt. of Belgium; BL/33/IN12). The PIs of the BINA project (SJ & PDC) acknowledge Prof. Ram Sagar for his encouragement to execute this bilateral project and his valuable inputs that helped improve this manuscript.

Further Information

Author contributions

This paper reports on a collective work where all co-authors contributed at various levels before, during and after the workshop. The first draft of the paper was prepared by SJ and PDC. All other co-authors contributed to the text.

Conflicts of interest

The authors declare no conflict of interest.

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Table 1: Overview of the Belgian (top) and Indian (bottom) partner institutes of BINA. The top institutes (given in italics) host the PI's of BINA. The other institutes are listed in alphabetical order according to their acronym.

Belgian Partner institutes	
<i>Royal Observatory of Belgium</i>	ROB, Brussels-Belgium
KU Leuven	KU Leuven, Belgium
Universiteit Antwerpen	UAntwerpen, Antwerp-Belgium
Universiteit Gent	UGent, Ghent-Belgium
Université Libre de Bruxelles	ULB, Brussels-Belgium
Université de Liège	ULiège, Liège-Belgium
Indian Partner institutes	
<i>Aryabhata Research Institute of Observational Sciences</i>	ARIES, Nainital-India
Delhi University, North Campus	DU, Delhi-India
Homi Bhabha Centre for Science Education	HBCSE, Mumbai-India
Indian Institute of Astrophysics	IIA, Bangalore-India
Indian Institute of Space Science & Technology	IIST, Thiruvananthapuram-India
ISRO Satellite Centre	ISRO, Bangalore-India
Inter-University Centre for Astronomy and Astrophysics	IUCAA, Pune-India
Kumaun University	KU, Nainital-India
National Center for Radio Astrophysics - Tata Institute of Fundamental Research	NCRA-TIFR, Pune-India
Physical Research Laboratory	PRL, Ahmedabad-India
Pt. Ravi Shankar University	RSU, Raipur-India
S.N. Bose National Centre for Basic Sciences	SNBNCBS, Kolkata-India
Tata Institute of Fundamental Research	TIFR, Mumbai-India

Table 2: List of the participants (in alphabetical order) of the 3rd BINA workshop held at Graphic Era Hill University Bhimtal from 22–24 March 2023.

Nr.	Name(s)	Affiliation
1	Alisher Hojaev	Ulugh Beg Astronomical Institute (UBAI), Tasjkent-Uzbekistan
2	Abhay Pratap Yadav	National Institute of Technology (NIT), Rourkela-India
3	Abhijit Chakraborty	PRL, Ahmedabad-India
4	Akhunov Talat	National University of Uzbekistan, Tashkent-Uzbekistan
5	Alaxender Panchal	ARIES, Nainital-India
6	Alok Durgapal	Kumaun University, Nainital-India
7	Amar Aryan	ARIES, Nainital-India
8	Ambika Saxena	ARIES, Nainital-India
9	Amit Kumar	ARIES, Nainital-India
10	Amitesh Omar	Indian Institute of Technology (IIT), Kanpur-India
11	Anandmayee Tej	IIST, Trivandrum-India
12	Anindya Saha	IIST, Trivandrum-India
13	Anju Panthi	Birla Institute of Technology and Science (BITS), Pilani-India
14	Ankur Ghosh	ARIES, Nainital-India
15	Anna Pospieszalska-Surdej	ULiège, Liège-Belgium
16	Anwesh Mazumdar	HBCSE, Mumbai-India
17	Anwasha Maharana	KU Leuven, Louvain-Belgium
18	Aravind K.	PRL, Ahmedabad-India
19	Arpan Ghosh	ARIES, Nainital-India
20	Arpit Shrivastav	ARIES, Nainital-India
21	Aruna Goswami	IIA, Bangalore-India
22	Arvind Dattarey	ARIES, Nainital-India
23	Athul Dileep	ARIES, Nainital-India
24	Bharti Arora	ULiège, Liège-Belgium
25	Bhavya Ailawadhi	ARIES, Nainital-India
26	Bhupendra Tiwari	Awadhesh Pratap Singh University, Rewa-India
27	Bhuwan C. Bhatt	IIA, Bangalore-India
28	Bhuwan Joshi	PRL, Ahmedabad -India
29	Brajesh Kumar	ARIES, Nainital-India
30	Brijesh Kumar	ARIES, Nainital-India
31	C. S. Stalin	IIA, Bangalore-India
32	David Berghmans	Royal Observatory of Belgium (ROB)-Belgium
33	Deepak	ARIES, Nainital-India
34	Devendra K. Ojha	Tata Institute of Fundamental Research (TIFR), Mumbai-India

Table 2: Continued.

Nr.	Name(s)	Affiliation
35	Dibya K. Mishra	ARIES, Nainital-India
36	Dimple Panchal	ARIES, Nainital-India
37	Dipankar Banerjee	ARIES, Nainital-India
38	Diya Ram	SNBNCBS, Kolkata-India
39	Dorothy M. Mwanzia	University of Nairobi, Nairobi-Kenya/SNBNCBS, Kolkata-India
40	Drisyia Karinkuzhi	University of Calicut (UoC), Calicut-India
41	Eswar Reddy	IIA, Bangalore-India
42	Evgenii Semenko	National Astronomical Research Institute of Thailand (NARIT), Chiangmai-Thailand
43	Farha A. Gaffur	UoC, Calicut-India
44	Gajendra Pandey	IIA, Bangalore-India
45	Getinet Ayane	Kotebe University of Education, Addis Abeba-Ethiopia
46	Girjesh Gupta	PRL, Ahmedabad-India
47	Gourav Banerjee	CHRIST (Deemed to be University), Bangalore-India
48	Gregg Wade	Royal Military College of Canada, Kingston-Canada
49	Gurpreet Singh	ARIES, Nainital-India
50	Haritma Gaur	ARIES, Nainital-India
51	Janaka Adassuriya	University of Colombo, Colombo-Sri Lanka
52	Jayanand Maurya	PRL, Ahmedabad-India
53	Jayshreekar Pant	ARIES, Nainital-India
54	Jean Surdej	ULiège, Liège-Belgium
55	Jeewan C. Pandey	ARIES, Nainital-India
56	Jincen Jose	ARIES, Nainital-India
57	Joe Ninan	TIFR, Mumbai-India
58	Jyoti Sheoran	ARIES, Nainital-India
59	Jyotirmay Paul	ULiège, Liège-Belgium
60	Jyotirmoy Dey	IIST, Trivandrum-India
61	Karan Dsilva	ULB, Brussels-Belgium
62	Katrien Kolenberg	KU Leuven, Louvain-Belgium
63	Kaushar Vaidya	BITS, Pilani-India
64	Khushboo Rao	BITS, Pilani-India
65	Komal Chand	BITS, Pilani-India
66	Krishan Chand	ARIES, Nainital-India
67	Kumar Pranshu	ARIES, Nainital-India
68	Kuntal Misra	ARIES, Nainital-India
69	Lokesh Dewangan	PRL, Ahmedabad-India
70	Laurent Mahy	ROB, Brussels-Belgium
71	Maheswar Gopinathan	IIA, Bangalore-India

Table 2: Continued.

Nr.	Name(s)	Affiliation
72	Madhurjya Changmai	KU Leuven, Louvain-Belgium
73	Manfred Cuntz	UTA, Texas, USA
74	Margarita Safonova	IIA, Bangalore-India
75	Mathieu Vander Donckt	ULiège, Liège-Belgium
76	Meenakshi Purandardas	IIA, Bangalore-India
77	Michaël De Becker	ULiège, Liège-Belgium
78	Mohit C. Joshi	ARIES, Nainital-India
79	Monalisa Dubey	ARIES Nainital-India
80	Mrinmoy Sarkar	ARIES, Nainital-India
81	Muhammed Riyas	UoC, Calicut-India
82	Namita Uppal	PRL, Ahmedabad-India
83	Naveen Dukiya	ARIES, Nainital-India
84	Neelam Panwar	ARIES, Nainital-India
85	Nikita Rawat	ARIES, Nainital-India
86	Nilakshi Veerabathina	UTA, Texas, USA
87	Nissim Kanenkar	NCRA-TIFR, Pune-India
88	Nitin Vashishtha	ARIES, Nainital-India
89	Pallavi Saraf	IIA, Bangalore-India
90	Partha Pratim Goswami	IIA, Bangalore-India
91	Peter De Cat	ROB, Brussels-Belgium
92	Prachi Prajapati	PRL, Ahmedabad-India
93	Shashi B. Pandey	ARIES, Nainital-India
94	Priya Hasan	Maulana Azad National Urdu University, Hyderabad-India
95	Priyanka Jala	Aleja Lotnikow, Warszawa-Poland
96	Purvi Udhwani	ARIES, Nainital-India
97	Rahul Gupta	ARIES, Nainital-India
98	Rajab Ismayilli	KU Leuven, Louvain-Belgium
99	Rajib Kumbhakar	SNBNCBS, Kolkata-India
100	Ram Sagar	IIA, Bangalore-India
101	Ramakant Yadav	ARIES, Nainital-India
102	Ramesh Chandra	KU, Nainital-India
103	Ritesh Patel	Southwest Research Institute, Boulder-USA
104	Ronald Van der Linden	ROB, Brussels-Belgium
105	S. Anantha Krishnana	NCRA, Pune-India
106	S. Krishna Prasad	ARIES, Nainital-India
107	Sachindra Naik	PRL, Ahmedabad-India
108	Sadhana Singh	PRL, Ahmedabad-India
109	Sahel Dey	IIA, Bangalore-India

Table 2: Continued.

Nr.	Name(s)	Affiliation
110	Santosh Joshi	ARIES, Nainital-India
111	Saurabh	ARIES, Nainital-India
112	Shashikiran Ganesh	PRL, Ahmedabad-India
113	Shivangi Pandey	ARIES, Nainital-India
114	Sneh Lata	ARIES, Nainital-India
115	Somak Raychaudhury	Ashoka University Sonipat, Haryana-India
116	Soumen Mondal	SNBNCBS, Kolkata-India
117	Srinivas M. Rao	ARIES, Nainital-India
118	Srinjana Routh	ARIES, Nainital-India
119	Sudha Anantha Krishnan	NCRA, Pune-India
120	Sugyan Parida	NIT Rourkela-India
121	Suman Bhattacharyya	CHRIST (Deemed to be University), Bangalore-India
122	Suman Saha	IIA, Bangalore-India
123	Sunetra Girdhar	IIA, Bangalore-India
124	Sunil Chandra	South African Astronomical Observatory (SAAO), Cape Town-South Africa
125	Susanta Kumar Bisoi	NIT, Rourkela-India
126	T. P. Prabhu	IIA, Bangalore-India
127	Tanmoy Samanta	IIA, Bangalore-India
128	Tapas Baug	SNBNCBS, Kolkata-India
129	Tarun Bangia	ARIES, Nainital-India
130	Théo Furst	ROB, Brussels-Belgium
131	Thibault Merle	ROB, Brussels-Belgium
132	Tinatin Baratashvili	KU Leuven, Leuven-Belgium
133	Tirthendu Sinha	SNBNCBS, Kolkata-India
134	Tom Van Doorselaere	KU Leuven, Leuven-Belgium
135	Upasna Baweja	ARIES, Nainital-India
136	Vaibhav Pant	ARIES, Nainital-India
137	Vibhore Negi	ARIES, Nainital-India
138	Vijayakumar H. Doddamani	Bangalore University, Bangalore-India
139	Vinit Dhiman	ARIES, Nainital-India
140	Virendra Yadav	ARIES, Nainital-India
141	Vivek Kumar Jha	ARIES, Nainital-India
142	Virendra Yadav	ARIES, Nainital-India
143	Yogesh C. Joshi	ARIES, Nainital-India

Table 3: Statistics of the invited talks (IT), contributed talks (CT), and poster presentations (PP) that were presented during the different sessions of the 3rd BINA workshop. The chairperson acts as the guest editor for the corresponding session in these proceedings. (Note that the presentations of the session indicated with † were originally included in the other sessions when they were presented during the 3rd BINA workshop. They are grouped here to enhance the visibility of the first results based on observations with the ILMT.)

Chairperson	Session	IT	CT	PP	Total
Katrien Kolenberg	DOT : Observing strategy and upcoming back-end Instruments	3	1	3	7
Soumen Mondal	New Observing Facilities and back-end Instruments	2	1	4	7
Sunil Chandra	Science with the ILMT [†]	1	1	15	17
Shashikiran Ganesh	Solar System Bodies and Exoplanetary Science	-	4	8	12
Laurent Mahy	Multiple Stellar Systems	1	3	21	25
Drisya Karinkuzhi	Spectroscopy of Galactic Sources	1	3	6	10
Abhay Pratap Yadav	Massive Stars	1	3	4	8
Tapas Baug	Multi-wavelength studies of star formation regions	1	3	7	11
Jeewan C. Pandey	Compact Objects	-	3	-	3
Kuntal Misra	Transients	-	2	4	6
C. S. Stalin	Extra-galactic astrophysics	-	3	9	12
Bhuwan Joshi	MHD waves and small-scale transients	-	10	-	10
David Berghmans	Physics of Flares and CMEs	-	8	-	8
Tom Van Doorsselaere	Long Term Studies	-	3	-	3
<i>Total</i>		<i>10</i>	<i>48</i>	<i>81</i>	<i>139</i>

Table 4: Scientific Program of the Main Session of the 3rd BINA workshop (IT = invited talk; CT = contributed talk).

Session 1: DOT: Observing strategy and upcoming back-end instruments	
(Chairperson: Katrien Kolenberg)	
IT	Nissim Kanekar (NCRA, India): <i>How do I get observing time on the DOT ?</i>
CT	Jayshreekar Pant (ARIES, India): <i>DOT HRS : A high-resolution spectrograph for Devasthal Optical Telescope - Status and Update</i>
IT	Joe Philip Ninan (TIFR, India): <i>A new instrument for conducting world's largest spectroscopic survey of YSOs from DOT</i>
IT	Amitesh Omar (IIT-Kanpur, India): <i>Prospects for polarization observations capabilities using ADFOSC on 3.6-m DOT</i>
Session 2: New observing facilities and back-end instruments	
(Chairperson: Soumen Mondal)	
CT	Brajesh Kumar (ARIES, India): <i>Observing preparations and commissioning of the 4-m ILMT</i>
IT	Abhijit Chakraborty (PRL, India): <i>PRL 2.5-m telescope : first light instruments and projected science cases</i>
CT	Jyotirmay Paul (ULiège, Belgium): <i>Enhancing the capability of future medium-size telescopes : First light of the SALTO demonstrator</i>
IT	Karan Singh Dsilva (ULB, Belgium): <i>High-resolution spectrograph at a 1-m class telescope: what can we gain?</i>
Session 3: Solar system bodies and exoplanetary science	
(Chairperson: Shashikiran Ganesh)	
CT	Aravind K. (PRL, India): <i>Optical spectroscopy of comets</i>
CT	Mathieu Vander Donckt (ULiège, Belgium): <i>Photometric and spectroscopic study of periodic carbon-chain depleted comets from Belgian and Indian observatories</i>
CT	Anandmayee Tej (IIST, India): <i>Stellar Occultation with DOT : Probing Planetary Atmospheres</i>
CT	Suman Saha (IIA, India): <i>Detection and characterization of habitable exo-moons in the JWST era</i>

Table 4: Continued.

Session 4: Multiple stellar systems

(Chairperson: Laurent Mahy)

-
- IT Thibault Merle (ROB/ULB, Belgium):
Dancing with the stars : a review on stellar multiplicity
- CT Alaxender Panchal (ARIES, India):
Characterization of K2 eclipsing binary candidates
- CT Gurpreet Singh (ARIES, India):
An X-ray Study of Coronally Connected Active Eclipsing Binary, XY Uma
- CT Namita Uppal (PRL, India):
Optical polarization study of Galactic Open clusters

Session 5: Spectroscopy of galactic sources

(Chairperson: Drisya Karinkuzhi)

-
- IT Aruna Goswami (IIA, India):
On the potential of Carbon-enhanced metal-poor stars for Galactic Archaeology
- CT Deepak (ARIES, India):
3.9-m AAT's contribution in addressing the mystery of Li-rich giants' origin and valuable lessons for 3.6-m DOT
- CT Pallavi Saraf (IIA, India):
Connecting Chemistry and kinematics of r-process enhanced stars to trace their origin
- CT Gajendra Pandey (IIA, India):
Measuring helium abundances of cool stars

Session 6: Massive stars

(Chairperson: Abhay Pratap Yadav)

-
- IT Gregg Wade (Royal Military College of Canada, Canada):
Magnetism of Massive Stars, on and after the main sequence
- CT Bharti Arora (ULiège, Belgium):
Multi-wavelength view of massive binaries
- CT Anindya Saha (IIST, India):
Are isolated single Wolf-Rayet stars capable of accelerating particles to relativistic speed?
- CT Gourav Banerjee (CHRIST (Deemed to be) University, India):
Spectroscopic studies of Galactic classical Be stars using Indian optical telescope facilities

Table 4: Continued.

Session 7: Multi-wavelength studies of star forming regions

(Chairperson: Tapas Baug)

-
- IT Devendra K. Ojha (TIFR, India):
Understanding the outbursts in young low mass stars
- CT Arpan Ghosh (ARIES, India):
Spectro-Photometric Monitoring of Eruptive Young Stellar Objects
- CT Jyotirmoy Dey (IIST, India):
A study of ultracompact HII regions with extended emission - their importance, origin, and evolution
- CT Lokesh Kumar Dewangan (PRL, India):
Multi-wavelength Study of the Star Formation in the Sh 2-305 HII Region

Session 8: Compact objects

(Chairperson: Jeewan C. Pandey)

-
- CT Suman Bhattacharyy (CHRIST (Deemed to be) University, India):
Unraveling the recent X-Ray flare from MAXI J0709-159 using Indian optical telescope facilities
- CT Nikita Rawat (ARIES, India):
Confirmation of Two Magnetic Cataclysmic Variables as Polars - 1RXS J174320.1-042953 and RX J1039.7-0507
- CT Sachindra Naik (PRL, India):
Optical and X-ray studies of Be/X-ray binary 1A 0535+262 during its 2020 giant X-ray outburst

Session 9: Transients

(Chairperson: Kuntal Misra)

-
- CT Dimple Panchal (ARIES, India):
Multi-wavelength analysis of short GRB 201221D and its comparison with other high & low redshift short GRBs
- CT Rahul Gupta (ARIES, India):
Recent observations of peculiar Gamma-ray bursts using 3.6-m Devasthal Optical Telescope (DOT)

Table 4: Continued.

Session 10: Extragalactic astrophysics	
(Chairperson: C. S. Stalin)	
CT	Krishan Chand (ARIES, India): <i>Intra-night variability of UV emission from powerful blazars</i>
CT	Priyanka Jalan (Polish Academy of Science, Poland): <i>Discovery of lensed quasars using multiply imaged quasar candidates</i>
CT	Vivek Kumar Jha (ARIES, India): <i>New accretion disk size measurements for reverberation mapped AGN</i>

Session 11: Summary of the workshop	
IT	Eugene Semenko (NARIT, Thailand): <i>Main Program Sessions</i>
IT	Manfred A. Cuntz (UTA, USA): <i>Solar Sessions</i>

Open discussion	
(Chairpersons: Michaël De Becker & Nilakshi Veerabathina)	
Planning of strengthening the ongoing Indo-Belgian collaboration in Science	
Instrumentation and Public Outreach & Education in Astronomy	
Concluding Remarks by Director, ARIES	

Table 5: Scientific Program of the Solar Session of the 3rd BINA workshop (CT = contributed talk).

Session 1: MHD waves and small-scale transients

(Chairperson: Bhuwan Joshi)

- CT David Berghmans (ROB, Belgium):
Science opportunities by the Extreme Ultraviolet Imager (EUI) onboard Solar Orbiter
- CT Girjesh Gupta (PRL, India):
Tracing the source region of waves in coronal fan loops anchored in the sunspot umbra
- CT Ramesh Chandra (KU, India):
Characteristics of solar EUV wave events
- CT Van Doorselaere (KU Leuven, Belgium):
Observations of short-period oscillations in Solar Orbiter/EUI
- CT Arpit Kumar Shrivastav (ARIES, India):
Study of the Impact of Coronal an on Kink Oscillations of Coronal Loops
- CT Ambika Saxena (ARIES, India):
Exploring spectral line asymmetries due to the propagating MHD waves in the solar atmosphere
- CT Rajab Ismayilli (KU Leuven, Belgium):
Nonlinear self-deformation of unidirectional surface Alfvén waves and properties of Uniturbulence
- CT Upasna Baweja (ARIES, India):
Coronal Magnetic field estimation using Bayesian inference
- CT Tanmoy Smnta (IIA, India):
Generation of solar spicules and subsequent atmospheric heating
- CT Sahel Dey (IIA, India):
Insgts into the genesis and dynamics of the solar spicule forest: aided by laboratory experiment

Table 5: Continued.

Session 2: Physics of flares and CMEs

(Chairperson: David Berghmans)

-
- CT Bhuwan Joshi (PRL, India):
Onset and evolution of solar flares : application of 2D and 3D models of magnetic reconnection
- CT Madhurjya Changmai (KU Leuven, Belgium):
Exploring magnetic reconnection due to Rayleigh-Taylor Instability induced turbulence in Solar Prominences
- CT Anwasha Maharana (KU Leuven, Belgium):
Towards improving CME forecasting with MHD modelling and observations
- CT Nitin Vashishtha (ARIES, India):
Numerical simulation and forward modelling of a breakout CME
- CT Jyoti Sheoran (ARIES, India):
Evolution of the Thermodynamic Properties of a Coronal Mass Ejection in the Inner Corona
- CT Ritesh Patel (Southwest Research Institute, USA):
Advance image processing algorithm rCMEs studies with Aditya-L1/VELC
- CT Tinatin Baratashvili (KU Leuven, Belgium):
Icars a new highly optimized heliospheric model for forecasting purposes
- CT Susanta Kumar Bisoi (NIT-Rourkela, India):
Origin of Extremely Non-radial Solar wind

Session 3: Long-term studies

(Chairperson: Tom Van Doorselaere)

-
- CT Manfred Cuntz (UTA, USA):
Evolution of Solar-Type Activity: An Observational and Theoretical Perspective
- CT Dibya Kirti Mishra (ARIES, India):
Variation in the Chromospheric Differential Rotation over the Century
- CT Srinjana Routh (ARIES, India):
Study of Variation in the Rotational Profile of the Sun Beyond Photosphere

Table 6: Program of the Public Outreach Education.

Nr.	Speaker (Affiliation): Title of the popular lecture	(Venue)
1	Anwesh Mazumdar (HBCSE, India): <i>Worlds around distant stars</i>	(St. Joseph's College, Nainital)
2	Nilakshi Veerbathina (UTA, USA): <i>Light: A visible and invisible messenger</i>	(Mohan Lal Sah Bal Vidya Mandir, Nainital)
	<i>Opportunities at the University of Texas at Arlington (UTA)</i>	(D. S. B. Campus, Kumaun University, Nainital)
3	Katrien Kolenberg (KU Leuven, Belgium): <i>Echoes from the cosmos</i>	(St. Mary's Convent College, Nainital)
4	Margarita Safonova (IIA, India): <i>Space: the final frontier: from stargazers to star ships</i>	(Lakes International School, Bhimtal)
5	Priya Hasan (MANUU, India): <i>Exploring our Universe</i>	(Hermann Gmeiner School, Bhimtal)
6	Sunil Chandra (SAAO, South Africa): <i>What does the multi-wavelength sky tell us about the Universe</i>	(Birla Vidya Mandir, Nainital)
7	Gaurav Banerjee (Christ University, India): <i>Astronomy for everyone</i>	(Longview Public School, Nainital)
8	Janaka Adassuriya (UOC, Sri Lanka): <i>Detecting exoplanets</i>	(Jawahar Navodaya Vidyalaya, Rudrapur)
9	Kaushar Vaidya (BITS, India): <i>Knowing our magnificent Universe</i>	(Birla Institute of Applied Sciences, Bhimtal)
10	Gregg Wade (RMC, Canada): <i>Life and learning at Royal Military College of Canada</i>	(Sainik School, Ghorakhal)
11	Maheswar Gopinathan (IIA, India): <i>JWST: Piercing at the Universe through infrared eyes</i>	(M.B.P.G., College, Haldwani)
12	Getinet Feleke Ayane (KMU, Ethiopia): <i>Unexplained mysteries in modern astronomy</i>	(Himalayan Progressive School, Kiccha)
13	Dipankar Banerjee (ARIES, India): <i>ADITYA L1 mission to study the variability of our nearest star</i>	(Graphic Era Hill University, Bhimtal)
14	Manfred Cuntz (UTA, USA): <i>Opportunities at the University of Texas at Arlington</i>	(DSB Campus, Kumaun University, Nainital)
15	David Berghmans (ROB, Belgium): <i>Observing the solar corona with the Extreme Ultraviolet Imager onboard Solar Orbiter</i>	(Graphic Era Hill University, Bhimtal)