

International Dark Sky Preservation and Astro Tourism Conference 2023.

Organised and Hosted by AstronEra & Astron SHK Trust
 Funded by the Department of Science and Technology India
 Supported by Office of Astronomy Development, IAU

1. Introduction :

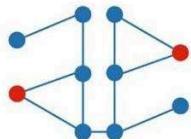
The International Dark Sky Preservation and Astro-Tourism Conference represented a groundbreaking event in India, shedding light on the critical importance of preserving Dark Skies and harnessing the immense potential of Astro-Tourism. The conference was held from 24th to 27th November 2023, encompassing a diverse range of plenary and independent talks delivered by students, young researchers, professionals, and entrepreneurs. Additionally, the conference facilitated interactive round table discussions, workshops, and working groups to encourage meaningful engagement and collaboration.

The inception of this conference can be traced back to the transformative experience of Ms. Shweta Kulkarni, the esteemed founder and Director of AstronEra, during her visit to the Exmoor National Park in the United Kingdom in 2016. Subsequently, her visionary ideas and insights were meticulously distilled into a comprehensive proposal which in 2023 was accepted and funded by the Department of Science and Technology, Government of India and supported by the International Astronomical Union and its Office of Astronomy Development.



The International Dark Sky Preservation and Astro-Tourism Conference served as a significant milestone in the ongoing efforts to raise awareness, foster scientific research, and promote sustainable practices in preserving the pristine darkness of our skies. By bringing together a diverse array of stakeholders, the conference provided a platform for exchanging knowledge, sharing best practices, and cultivating innovative solutions. It is hoped that the

outcomes of this conference will serve as a catalyst for future endeavours in safeguarding our dark skies and harnessing the potential of Astro-Tourism for the benefit of present and future generations.



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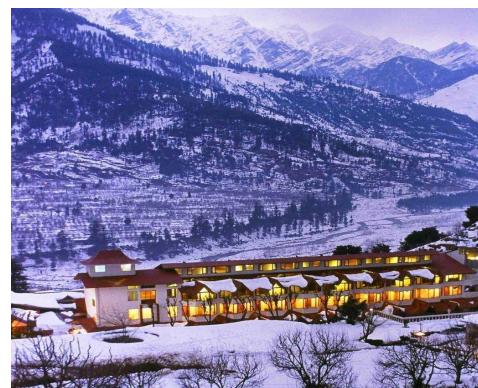
2. Gender Ratio and Geographical Distribution:

A total of 58 attendees actively participated in the International Dark Sky Preservation and Astro-Tourism Conference (IDSPAC23), with 41 attending in person and 17 engaging virtually. The conference featured a well-balanced and diverse assembly of 20 speakers, among whom 9 presented remotely, and 11 delivered their presentations in person. The gender distribution among speakers exhibited equity, with 11 female and 9 male speakers contributing to the conference's intellectual discourse. In terms of participant demographics, the in-person attendance comprised 15 males and 3 females, while the online participants demonstrated an equal gender distribution among the 8 individuals.

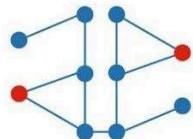
The organisational team, consisting of chairpersons, managers, and volunteers, was composed of 12 individuals, maintaining a gender-balanced representation with 7 females and 5 males. The geographical representation of attendees was extensive, encompassing participants from 13 states in India, as well as international representation from the UK, the US, South Africa, Spain, China, Iran, and Ghana. It is noteworthy that all team members were Indian nationals, primarily from the states of Maharashtra and Himachal Pradesh, with one member hailing from New Zealand, reflecting the conference's global outreach and collaborative nature.

3. IDSPAC23 Venue:

The conference was held at ManuAllaya, an exquisite luxury resort renowned for its celestial splendour. Nestled in the heart of Himachal Pradesh in India, this venue served as a celestial gateway, offering guests an enchanting experience under the vast expanse of the night sky adorned with a myriad of stars. Manu Allaya not only provided a luxurious setting but also embraced the rich history, art, and culture of the region, seamlessly blending it with modern elegance



Overall, the choice of ManuAllaya as the conference venue and the thoughtful selection of presentation themes contributed to creating an immersive and intellectually stimulating environment, enabling participants to engage deeply with the subject matter and further the objectives of the conference.



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4. Conference Themes:

The presentations and talks at the conference were meticulously curated under several key themes to ensure a comprehensive exploration of the subject matter. These themes included the impact of satellite constellations and space debris on astronomical observations, the integration of astronomy into everyday life to bridge the realms of science and culture, strategies for mitigating light pollution to enhance astronomical visibility, advancements in astronomy research and outreach initiatives, and the unveiling of the creative connections between art and astronomy.

The presentations and talks at the conference were categorized into several key themes, each encompassing a specific aspect of the subject matter. These themes included:

4.1. Satellite Constellations and Space Debris: Exploring the Impact on Observations

This theme delved into the effects of satellite constellations and space debris on astronomical observations. Attendees had the opportunity to discuss the challenges posed by these phenomena and propose potential solutions to mitigate their impact.

4.2. Astronomy in Everyday Life: Bridging Science and Culture:

Under this theme, the conference aimed to highlight the integration of astronomy into daily life, emphasizing its role in bridging the realms of science and culture. Talks and discussions explored how astronomy can inspire and enrich various aspects of society.

4.3. Controlling Light Pollution for Enhanced Astronomical Visibility:

This theme focused on the importance of controlling light pollution to optimize astronomical visibility. Participants engaged in conversations surrounding effective strategies and technologies aimed at reducing light pollution, thereby preserving the pristine darkness of our skies.

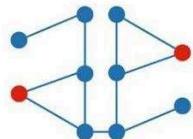
4.4. Advancing Astronomy Research and Outreach Initiatives:

Talks falling within this theme centred on advancing astronomy research and outreach initiatives. Attendees had the opportunity to share their research findings, discuss innovative approaches, and explore collaborative opportunities for furthering the field of astronomy.

4.5. Art and Astronomy: Unveiling Creative Cosmos Connections:

This theme celebrated the intersection between art and astronomy, showcasing the creative connections between these two disciplines. Presentations explored how art can be used as a medium to express the beauty and wonder of the cosmos, fostering a deeper appreciation for the universe.

By organizing the presentations and talks around these key themes, the conference aimed to provide a comprehensive and cohesive exploration of the subject matter. The diverse range of topics covered under each theme ensured a well-rounded and enriching experience for attendees, fostering meaningful discussions and knowledge exchange.



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5. Day-wise report:

5.1 Day 1: 24 November 2023



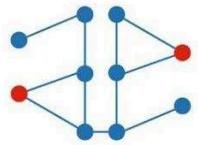
The conference began at 9.00 am with registration and check-in, which lasted until 11.00 am. Following that, the conference opening ceremony was conducted by Ms. Ruchira Huchgol, the chairperson, and concluded at 11.20 am.

Mr. Bhuvanaeshwar welcomed the guests on behalf of Manu Allaya and gave information about the property as well as instructed the rules and regulations.



At 11:30 a.m., the proceedings of the day commenced with the initiation of talks and presentations, marked by the delivery of the inaugural keynote address by Dr. Anita Gupta. Representing the Climate Change & Clean Energy (C3E) Division within the Department of Science and Technology, Government of India, Dr. Gupta underscored the government's cognizance of pressing concerns such as light pollution and its adverse effects on astronomy. She emphasized

the readiness of governmental entities to engage in collaborative endeavors with organizations, corporations, and non-governmental organizations (NGOs) to explore alternative strategies and foster the adoption of clean energy practices and sustainable initiatives.



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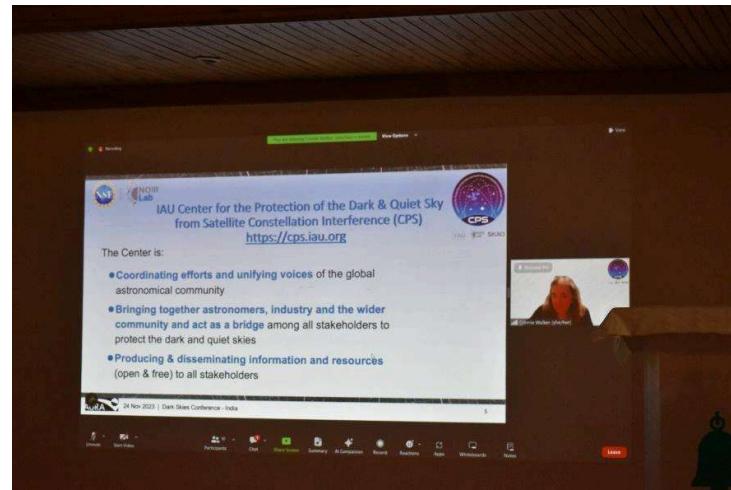
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The second keynote talk was delivered by Dr. Constance (Connie) Walker, the Head of the Office of Site Protection at NSF's NOIRLab, USA, and Co-Director of the IAU CPS. Her talk, titled "Astronomy and Satellite Constellations: Pathways Forward for Light Pollution from Space," highlighted the initiatives and programs supported by the International Astronomical Union (IAU) to promote and preserve Dark and Quiet Skies.

Dr. Walker emphasised the challenge posed by satellite constellations to observational astronomy and discussed the collaboration of working groups from various fields such as engineering, law and policy, pure sciences, astrophysics, and art. She emphasised that the field of space and astronomy requires contributions from individuals in every discipline and is a common heritage for all.



Following Dr. Walker's talk, Ms. Samyukta Manikumar, an Astro Tourism consultant and fellow at the International Astronomical Union, presented on the topic "Harnessing Dark Skies for Socioeconomic Development in Rural Areas." She highlighted the immense potential of astro tourism in involving,

educating, and uplifting rural populations. Ms Manikumar emphasized that rural areas still have the privilege of having dark skies, which can be leveraged by tourism companies through collaborations with the rural population. This, in turn, can help improve the social and economic conditions of these areas.

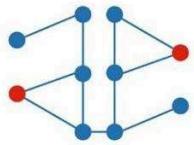
Ms. Upasana Dasgupta, a Postdoctoral Researcher at the Canada Research Chair in International Political Economy of Université Laval, presented "Intruders in the Dark Sky: The Mega Constellation Crisis." She outlined the current space policy framework, including the Outer Space Treaty, liability convention, and Moon agreement. Ms. Dasgupta highlighted the absence of dedicated regulations for satellite constellations and debris, underscoring their disruptive impact on observational astronomy by introducing additional noise into datasets, hindering scientific research.

Maria Alejandra Díaz is an astronomer with a Physics degree from UAM, Spain, and is pursuing a PhD in Turku. Passionate about astronomy's societal impact, she's contributed to IAU's OAD projects and operates a telescope in La Palma alongside her thesis. Her talk was titled *Astronomy's Impact on Sustainability*. In her talk, she gave a very brief overview of the various 200 projects funded by the IAU OAD and how these projects highlighted exactly the definition of sustainability and the harmony that it helps to maintain between economy, society and environment. She highlighted how these projects evolved in following Goal 4: quality education, Goal 8: Decent work and economic growth, Goal 5: gender equality, Goal 10: Reduced Inequality, and Goal 11: affordable clean energy. She also mentioned case studies that highlighted astronomy and its impact and relation with mental health, socio-economic development and preserving indigenous roots and knowledge of the night sky.

The final presentation of the day addressed the intersection of Mental Health, Arts, and Astronomy, delivered by Ms. Aishwarya Khade, a seasoned Psychologist and Mental Health Professional. Ms. Khade employs art and movement-based facilitation techniques in both educational and corporate settings. She provided a detailed account of her experiences while collaborating with the AstroTribe project in Nashik in 2022 and Ladakh in 2023. Ms Khade emphasized her work with tribal children who were undergoing training to become Astro guides. The incorporation of artistic elements proved instrumental in creating a comfortable environment, allowing the children to share their indigenous tribal stories related to constellations. This approach also facilitated discussions about the beliefs and superstitions prevalent in their respective tribal communities.



The fruitful discussions of the day were then ended with an interactive and informative stargazing session held by the astroguides trained under Astronomers's Astro Tribe project. The students gained a chance to hone their public speaking, presentation and technical skills in front of a diverse audience. Their efforts were also highly praised, acknowledged and supported. With this, day 1 on the conference paved way not only for the up-coming talks and discussions, but in the words of Ms. Shweta Kulkarni herself, "- new change in the field of Dark Sky preservation, astro-tourism and science communication."



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5.2 Day 2: 25th November 2023

Moving on to Day 2 of the conference, which focused on astronomy and education, the keynote address was delivered by Dr. Kiran Kulkarni (IAS), former Commissioner of the Tribal Development Department, Gov. of Maharashtra. While Dr. Kulkarni's primary professional focus may not directly involve astronomy, his extensive involvement in

education and governance innovations suggests potential avenues for fostering astronomy-related initiatives within tribal communities. His talk was titled "Sustainable Development through Astronomy: A Tribal Perspective."

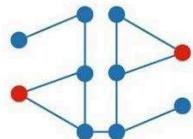


During his presentation, Dr. Kulkarni drew attention to the critical distinctions between tribal and rural communities. He prompted contemplation on the unique characteristics of the locations inhabited

by tribal populations, characterized by their remoteness, isolation, and freedom from the impact of pollution, including light pollution. Dr. Kulkarni suggested that these remote and quiet locations might be ideal for establishing dark skies, encouraging further assessment and consideration for similar initiatives.

During the in-person international session, David Ault, the Director of Education for Immersive Experiences, a UK-based planetarium and interactives company, adeptly showcased the use of domes as an interactive tool for educating intricate concepts in astronomy. Through collaborative discussions, plans were formulated to deploy these inflatable portable domes in schools and remote areas, creating a mobile planetarium. This initiative aims to reinstate and enhance outreach efforts in the field of astronomy.





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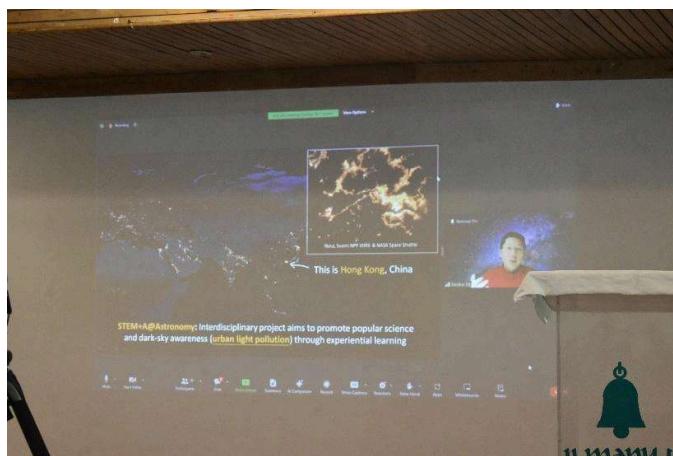
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Following Mr. Ault, Ms. Bhakti Mithagri, an MSc Astrophysics graduate and avid astronomy enthusiast, delivered a presentation titled "Indian Successors to the Indian Gamma-Ray Observatory (IGRO) Mission." Alongside her colleague Mr. Kshitij Pawar, they elucidated an indigenous alternative mission concept in its initial stages. The presentation also addressed the issue of insufficient data democratisation within the research domain, particularly for students and young researchers.

The next speaker, Amshu CR, an entrepreneur from Thapasu Foods LLP, presented on "The Ancient Science of Space and Agriculture for Sustainability and Harmony." She effectively explained the significance of Vedic knowledge in assessing the night skies based on seasons and how this knowledge can be applied to enhance agricultural conditions. Emphasizing the revision and implementation of this ancient approach in the form of Biodynamic farming, Amshu CR left the audience with thought-provoking insights. The presentation highlighted how actual sky observations, in addition to satellite imagery and mapping, can assist farmers in optimizing their agricultural practices.



Exodus Chun-Long Sit addressed the integration of astronomy education in an interactive classroom and the escalating issue of light pollution, proposing a DIY light shielding solution. He also explored the interconnectedness of entrepreneurship and space arts with astronomy. Additionally, he advocated for biodiversity conservation, suggesting the establishment of Dark Sky Parks. Mr. Sit emphasized the IDEAS framework, encompassing

Immersivity, Diversity, Equity, Access, and Spreading awareness, as a strategy for advancing astronomy education and outreach efforts.

Mr. Dinesh Nisang, Science Communicator and founder of Sunday Science School shared his talk "Stellar Education: Unveiling Interactive Space and Astronomy Activity Centre" (ISAAC). His entire conversation was focused on how astronomy deserves and hands on approach to improve and enhance better understanding the concepts. He demonstrated very well by showing the kits of innovative models, one of them was a GMRT telescope which helped understand the engineering aspect as well as the working of the observatory. His talk very well complemented the tone of the day's inclusion of astronomy and space science in the educational curriculum.

5.3 Day 3: 26th November 2023

The last day of the conference was designed to focus more on the action points to conserve the dark skies and conclude the learnings through the IDSPAC23. The day started with the keynote speech by Shweta Kulkarni. Shweta, the director of AstronEra and CEO of Astron SHK Trust, initiated the conference to bridge the link between conserving dark skies and sustainable socio-economic development. She introduced herself as an "AstroPreneur," emphasizing her dual roles as a part-time astronomer and full-time entrepreneur. Shweta identified key problems including the lack of authentic astronomy knowledge, scientific temperament in society, and diminishing dark skies due to light pollution.

She introduced the "AstroTribe" Project, funded by IAU and OAD, aimed at training tribal children in astronomy to empower them economically. This initiative incentivizes students by enabling them to generate income through bridging technical astronomy with entertainment through astrotourism, thereby promoting awareness about dark skies and addressing SDGs of quality education and sustainable economic growth.

Shweta outlined action points post-conference, focusing on understanding the problem of light pollution, identifying target areas and audiences, determining mediums and expected outcomes, and establishing frameworks aligned with the human right to dark skies. She emphasized leveraging resources available on darksky.org to find solutions and highlighted the historical contributions to astronomy, underscoring the responsibility to conserve night skies for future generations.

Following Shweta's talk, a significant event took place where the Astroguide's batch in Manali was honored with certificates and recognized for the income they earned from their stargazing event. This event served as their graduation ceremony, marking the culmination of their training. The Astroguides introduced themselves and shared their experiences gained through the training program. They expressed heartfelt gratitude towards the AstronEra team for their support and guidance throughout the journey. This ceremony not only celebrated the achievements of the Astroguides but also highlighted the impact of empowering individuals with astronomical knowledge and skills for economic sustainability in the region.





Mr. Sonam Wangchuk, a prominent figure in education reform, delivered a keynote speech at the conference, commending the AstronEra team's efforts and announcing a collaborative effort between SECMOL, HIAL, and AstronEra to safeguard Ladakh's starry skies. He drew parallels between Ladakh's rugged terrain and Mars, highlighting its rich cultural diversity.

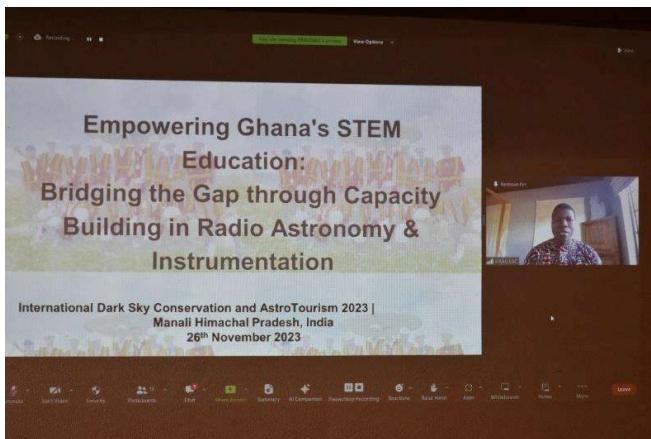
Wangchuk stressed the impact of climate change on Ladakh and emphasized the need for sustainable living practices to preserve the environment. Introducing SECMOL, an innovative school focusing on practical learning and sustainable living, Wangchuk emphasized Ladakh's natural sky as a gateway to understanding the universe. He advocated for promoting eco-friendly tourism in Ladakh, envisioning it as a pilgrimage site for experiencing its majestic landscapes and pristine night skies. Proposing an astrotourism campaign to ignite youth interest in astronomy, Wangchuk emphasized the importance of conserving Ladakh's dark skies while providing livelihood opportunities. Expressing concern over light pollution's effects on wildlife, he highlighted the "I Live Simply" movement, urging simplicity to combat climate change's impact.

In conclusion, Wangchuk urged action to tackle Ladakh's environmental challenges, signaling a new beginning in conservation efforts.

Dr. Priya Hasan, a distinguished astrophysicist and co-chair of the International Astronomical Union's Women in Astronomy, delivered a presentation titled "Dark Skies and Bright Satellites." Dr. Hasan highlighted the disruptive impact of the launch of numerous satellites on astronomical observations, particularly during twilight after dawn and dusk. She elucidated that the brightness of satellites depends on various factors, including inclination, altitude, attitude, orbital position, wavelength, and time of the year. Focusing on the Vera Rubin Observatory (LSST), which scans the skies for transients and near-Earth objects, Dr. Hasan discussed the adverse effects of satellite trails in science images. These effects encompass the loss of information on pixels, cross-talk in electronics, ghost images, and residual images, varying depending on the telescope and detector used.



Furthermore, Dr. Hasan addressed potential solutions and mitigation strategies, referencing the SATCON1 report. These strategies include reducing reflectivity through the application of dark paint, redirecting light away, deploying fewer satellites to minimize the issue, designing smaller satellites to mitigate their impact, and ensuring predictability to facilitate scheduled observations.



On a different note, Mr. Albert Kuntu Forson, a Ph.D. Research Student and the IAU-OAD National Astronomy Education Coordinator for Ghana, presented on "Empowering Ghana's STEM Education: Bridging the Gap through Capacity Building in Astronomy Instrumentation." Mr. Forson emphasized Africa's growing presence in the field of space sciences and discussed initiatives such as the AtroPhy project. This project serves as a catalyst for graduate and

undergraduate students, offering hands-on experience in radio telescope engineering and operational techniques. Utilizing the Table Top Radio Telescope (TTRT) for Galactic Hydrogen Emission (HI) studies and developing small parabolic dish antennas, AtroPhy contributes significantly to addressing socio-economic challenges, including poverty, hunger, and illegal mining in Ghana. By nurturing practical skills, fostering scientific curiosity, and promoting collaboration, AtroPhy plays a pivotal role in advancing STEM education and capacity building in the region.

Ms. Nadia Makhijani and Mr. Udish Sharma, both BSc Physics students with a primary focus on radio astronomy, its applications, and cosmology, presented a talk titled "Affordable Radio Astronomy Lab." During their presentation, they introduced an economically viable radio telescope – a pyramidal horn – that was constructed in-house using low-cost equipment. This telescope is designed for use in college laboratories and outreach programs, providing an accessible platform for students. The duo utilized the horn antenna for a Radio Frequency Interference (RFI) survey of their campus, observed the H-21 emission from our galaxy, and plotted the rotation curve. They also highlighted the versatility of this affordable setup for various experiments in college laboratories, such as satellite and meteor tracking, receiving weather images, and collecting GPS data. The objective of their presentation was to emphasize how cost-effective experiments can be implemented in undergraduate labs.

Mr. Vedvrat Vinayak Bedekar, a BE IT student and amateur astronomer overseeing an astronomy club in college, presented insights as one of the youngest speakers. His talk centred around the proposal to include a new category, 'Average Light Pollution,' in the daily regional weather report to raise awareness about the severity of light pollution. He further suggested the observance of a designated day, 'Dark Sky Preservation Day,' during which residents of villages and cities would turn off their lights temporarily to observe, enjoy, study, and appreciate the beauty of the universe. Additionally, he advocated for the initiation of a nationwide movement called 'Dark Sky Preservation Mission,' similar to the 'Swachh Bharat Mission.' This initiative would recognize and award villages and cities making exemplary efforts to raise awareness and reduce light pollution with a unique 'Dark Sky Preservation Award' at both state and national levels.



Mrs. Neethu Susan George, a member of the Society of Light & Lighting (MSLL) and a Dark Sky Advocate, presented "Lighting for Dark Skies," focusing on fundamental strategies to combat light pollution. She advocated for installing motion sensors or timers to regulate light usage efficiently and advocated for the adoption of lower-intensity lighting to minimize unnecessary illumination. Mrs. George emphasized the importance of properly aiming and shielding outdoor lights to prevent glare, light spill, and skyglow.

Additionally, she recommended the implementation of louvers, baffles, or shields to direct light where needed and prevent it from dispersing into the sky or neighboring areas. To further mitigate light pollution, she suggested the use of curtains or blinds indoors to contain light within the premises, thus safeguarding the night environment from artificial light intrusion.

Ms. George emphasized the importance of educating oneself and the community about the impacts of light pollution on the environment, human health, and astronomical observations. She encouraged support for organizations like the International Dark-sky Association (IDA), which actively promotes responsible outdoor lighting and the preservation of dark skies. Additionally, Ms. George advocated for increased involvement from stakeholders, companies, and government bodies to engage in discussions and collaborate on implementable solutions to address the issue of light pollution.

6. Working groups:

The conference organized three working groups on its second and third days, dedicating one hour to each. These sessions aimed to initiate discussions and outline objectives. Comprising diverse stakeholders and experts, participants engaged in focused dialogues to address specific challenges and devise strategies. Through intensive exchanges of ideas and expertise, attendees collaboratively formulated innovative solutions. The structured format enabled thorough exploration of key issues, fostering synergy among participants. Each group leveraged collective knowledge to develop actionable plans tailored to their respective domains. These working groups served as vital platforms for collaboration, driving progress towards the conference's overarching goals within their allocated time frame.

6.1 Working Group 1: Dark skies a need of astronomy.

Led by Ms. Shweta kulkarni Founder and Director of Astronomers awarded as one of the prominent 100 entrepreneurs. This group discussed how existing natural resource of Dark skies can be utilised for astronomy and outreach as well as ways to preserve and reduce the light pollution, Following are the action points that the group discussed:

- Organizing a trekking and star-gazing event.
- Conducting site analyses for existing installations and collaborating with manufacturers to incorporate anti-glare shields. This is crucial to prevent losses and ensure optimal energy efficiency.
- Collaboration with designers and manufacturers from the early stages of project design.
- Raising awareness among urban planners about the impact of lighting on dark skies.
- Verifying the inclination of pole arms, ensuring they are not positioned above the horizontal. Local modifications can be implemented to restrict the pole arm inclination to below 90°, minimizing sky glow and preserving dark skies.

6.2 Working Group 2: Satellite Constellations as a Threat to Astronomy:



Led by Ms. Ruchira Huchgol, Organizing Committee Chairman of IDSPAC23 and Operations Manager at AstronEra (an Analog Astronaut with a background in aerospace engineering), this working group addressed concerns related to mega constellations and their impact on optical and infrared observational astronomy. The group proposed potential solutions, including:

- Establishment of a committee comprising astronomers, stakeholders, engineers, and government/private entities to provide certification for satellite operators. The certification would be based on parameters such as brightness level, inclination, and mitigation strategy to ensure minimal damage to data sets.
- Creation of a citizen scientist program akin to tracking Near-Earth Objects (NEOs) to monitor active and passive space debris, which contribute to extra Signal-to-Noise (S/N) and contaminate received data.
- Focus on the policy framework regarding the manufacturing and mitigation aspects of satellite constellations. The recommendations generated by the working groups will be refined to become implementable solutions, contributing to the resolution of existing issues within the field.

6.3 Working group 3 : Art and Astronomy.



The Art and Astronomy Working Group explored the creative intersection between artistic expression and astronomical concepts. Participants engaged in collaborative storytelling activities, where each individual contributed to the creation of a collective narrative. This exercise demonstrated the power of collective imagination and highlighted the diverse themes related to cosmic wonders and the human experience of the universe. Additionally, the group composed a collective poem, distilling the essence of the narratives into a creative expression of the intersection between art and astronomy. Through multimedia presentations combining music and movement, the group conveyed their interpretation of cosmic themes and the human connection to the cosmos. Overall, the Art and Astronomy Working Group's exploration underscored the potential for creative activities to enhance engagement with astronomical concepts and inspire further collaboration within the community. The key aspects addressed are as follows:

- Interdisciplinary Synergy: Highlighted the value of integrating art and astronomy to foster creativity and engagement, enriching understanding across disciplines.
- Creative Communication: Emphasized the effectiveness of collaborative storytelling and poetry in making complex scientific ideas accessible and memorable to a broader audience.
- Emotional Impact: Recognized the power of multimedia presentations, including music and movement, in evoking emotions and inspiring curiosity about astronomical concepts.
- Community Collaboration: Fostered a sense of community and collaboration, showcasing the benefits of collective creativity in exploring scientific topics.
- Inspiration for Engagement: Provided inspiration for future exploration of creative approaches to science communication, encouraging continued use of artistic expressions and interdisciplinary connections to ignite curiosity about the universe.

7. Round Table Discussion:

7.1 Day 1:



To foster engagement among attendees and speakers, a congenial round table seating arrangement was implemented. During free time and between sessions, participants addressed the following questions:

- Identification of primary sources and contributors to light pollution in the area.
- Strategies for effective measurement and monitoring of light pollution levels in the region.
- Exploration of the most effective lighting regulations and guidelines to mitigate light pollution and preserve dark skies.
- Methods to raise public awareness regarding the negative impacts of light pollution on astronomy and the benefits of preserving dark skies.
- Implementation of strategies to engage local communities and stakeholders in the effort to reduce light pollution.
- Collaboration with lighting manufacturers and designers to advocate for the use of dark-sky-friendly lighting solutions.
- Examination of successful examples of dark sky preservation in urban areas and ways to replicate and adapt them.
- Advocacy for the establishment and proper management of dark sky reserves and protected areas in the region.
- Exploration of innovative technologies and approaches to mitigate skyglow and enhance visibility for astronomical observations.

Discussions among participants culminated in the presentation of summarised solutions.

7.2 Day 2:



In alignment with the day's theme focused on the inclusion of astronomy in educational curricula, discussions were organised according to specific classroom/standards groups, ranging from 1st to 12th grades, undergraduates, and postgraduates. Participants explored the importance of incorporating astronomy into everyday education and proposed practical implementation strategies tailored to different age groups.

8. Cultural Event:

This conference that celebrated diverse and varied cultures and social practices, an award-winning local dance group from Kullu district, showcased their talent and enticing performance for everyone present. Their performance was not limited to only their group but encouraged audience participation and interest, ending the conference with glowing faces and bright ideas under and towards a clear starry sky.



9. Conclusion:



The conference effectively laid the groundwork for substantive discussions concerning the preservation of dark skies and the promotion of astro-tourism in India, successfully achieving its stated goals and objectives. In light of the insights garnered from this conference, the subsequent steps entail the organization of an in-person workshop spanning 2-3 days, aimed at convening stakeholders, government officials, engineers, architects, and space policy representatives. This workshop will be instrumental in addressing the pervasive issue of light pollution and formulating actionable solutions to mitigate its impact, thereby taking a significant stride toward preserving dark and tranquil skies. Additionally, plans are underway to convene an online summit to synthesize the discussions held and distill key themes for consideration in future in-person conferences. Moreover, a collaborative endeavor is ongoing to host a dedicated in-person conference focusing on "Preserving the Night Sky for Astronomy and Sustainable Development," which will bring together government officials and industry experts to engage in substantive discussions and collectively devise pragmatic solutions. Subsequent initiatives will include the dissemination of research findings through the publication of articles, reports, and papers across various platforms, including the CAP conference, IAU publications, and esteemed scientific journals.

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