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Invited talks

[A Mingling of Cosmos and Canvas: Constructing Astronomy Images and Art](#)

My somewhat unusual forte in public outreach is the construction and dissemination of striking astronomy images. The construction aspect includes training potential image-makers to employ techniques from art and design in order to more clearly illuminate the science inherent in their data or to express wonder in their citizen science observations. In terms of dissemination, I also reach out beyond the typical astronomy enthusiast to more atypical audiences associated with the arts. This presentation recaps parts of the Qilak talk presented at the meeting of the Canadian Astronomical Society/Société Canadienne d'Astronomie

(CASCA) meeting in 2021. While it touches on the topics above, it highlights the questions artists ask about public outreach images and the works that they produce reflecting the answers.

[A Touch of Space Weather - Outreach project for visually impaired students](#)

'A Touch of Space Weather' is a project that brings space weather science into the hands of blind and visually impaired high-school students. This project was awarded an EGU Public Engagement Grant in 2021.

Our project aims to offer B&VI teachers a new approach to teaching complex STEM topics in a creative way. One of the main activities is the creation of audio booklets, a type of media in high demand by B&VI teachers. These audio booklets address various scientific topics taught in science classes in public high schools, such as the Sun, Earth's magnetic field, Moon exploration, and more.

This project wants to highlight the importance of space weather, as it influences nearly every aspect of our modern life ranging from banking, navigation, and telecommunications to the power supply. It is an interdisciplinary subject and, therefore, ideal for explaining complex scientific topics. That is why each audio booklet includes a description of a space weather phenomena or effect relevant to the topic.

3D printed models and tactile images that are also developed within this project provide hands-on activities to complement the audio lessons.

Several 'A Touch of Space Weather' boxes will be distributed to the schools and organisations providing education to B&VI people in Belgium. Each box will include one USB stick with all audio booklets, 3D printed models and a set of tactile images. The tactile images will be prepared by non B&VI students, who will learn this way, within several sessions, not only about space weather but also about inclusiveness.

To make the materials accessible online, we will provide them publicly on our website in three languages. Tutorials and templates for tactile images will help teachers and parents to create tactile images; audio booklets will be streamable and downloadable.

To engage B&VI students from the beginning, we organised a contest searching for a jingle that will be used as an introduction to each of the audio booklets.

[CHANDRA'S ACCESSIBLE UNIVERSE:](#)

From Sight to Sound & Touch

We present results of three accessible data vivification projects to help connect users - particularly those who are blind or visually impaired (BVI) or have different learning needs - with the science of NASA's Chandra X-ray Observatory. Firstly, a 3D modeling and printing project, in development and then implemented for over a decade, resulting in a library of 3D printed cosmic objects. Secondly, a popular data sonification project was initiated in 2020 to provide additional means of access and meaning-making for astronomical data during the pandemic when in-person access for materials became greatly restricted or halted altogether. A study was conducted on the sonification project showing high engagement levels across multiple groups. Thirdly, a verbal description program of astronomical data (primarily images and data-driven movies or sonifications, as well as illustrations when required) commenced in 2021 to help further elucidate Chandra and other astrophysical data. Lessons learned from these three projects, which have each worked with BVI communities on improving the quality and accessibility of the data output, will be discussed.

[Citizen Science practices: One Million Galaxies and more!](#)

The One Million Galaxies project aims at involving citizens to get over the difficulty of examining the vast amounts of data collected by astronomers. Pune Knowledge Cluster has launched an interactive online platform for citizen science astronomy projects, of which One Million Galaxies will be the first one. A pilot program has been developed and tested with the help of amateur astronomers, college students,

homemakers, senior citizens and others. The program enables interested people, who may not have any training in astronomy, to help find features in galaxies. All that they will need is access to a basic computer, laptop, tablet or smartphone, and a reasonable internet connection, of the kind available through a cell phone data package.

Cosmic Curiosity: A University-Library Cross Disciplinary Collaboration

Parents and carers are a key influencer on a child's developmental science identity, but currently few astronomy outreach interventions include them. Their misconceptions surrounding science, scientists and science careers, as well as their own confidence in science, can have a large impact on a child's future science aspirations. As a result, the Department of Physics, Astronomy and Math at the University of Hertfordshire in the UK created "Cosmic Curiosity: Stories that Spark the imagination", which is a collaborative project with four Hertfordshire Public Libraries, located in the top 20% most deprived areas of Hertfordshire, England. Cosmic Curiosity aims to increase interest of astronomy in the local community, develop a long-lasting partnership between our department and the library services and broaden families' perceptions of astronomy by working with parents and carers and their children aged 4-7.

Libraries offer a welcoming and informal setting where parents and carers and young children can learn together about astronomy careers in a cross disciplinary way while also developing the parents and carers confidence in astronomy. Libraries have an established relationship with a diverse public however their literary events tend not to be based in science/astronomy. By working with local libraries, universities are not only able to reach new diverse audiences but also benefit from an exchange of skills and knowledge between university and library staff members.

In this talk, I will discuss the benefits of a university library collaboration, how to ensure the longevity of this partnership, why it is crucial to engage with parents and carers and young children, and how combining literary, craft and astronomy leads to impactful engagement especially with young families.

Diversity in the audience of public online lectures

Amid the COVID-19 outbreak, online events are getting popular and widespread. Our presentation aims to share our results obtained by analysing survey data asked participants of online public lectures we planned and conducted.

It is generally believed that young people tend to watch videos via the Internet and attend online events. Is this true for public lectures on Astronomy? Participants of conventional in-person public lectures tend to be relatively old (over 50s) and male. On the other hand, we learned more diverse people were interested in Astronomy through our experience of public events such as the open campus of institutes. Thus, we speculate if some people cannot simply attend in-person lectures yet are keen to listen.

A public talk held online may allow such people to listen to public talks on Astronomy, and we expect a more diverse audience than an in-person lecture. We investigate if a more diverse audience attends online public talks by surveying the participants. We also studied how speakers can engage with the audience.

Our survey shows that the fraction of 10s and 20s is twice or three times higher than an in-person lecture. The results indicate an online public talk or an online event provides us with a solution to reach the 10s and 20s who have thought it was not easy to.

Driving action on the climate crisis through Astronomers for Planet Earth and beyond

The climate crisis is among the most pressing issues for humanity worldwide to address. Physical scientists of all descriptions, including astronomers, hold an important position in communicating the reality of the climate crisis. We must set a positive example for making changes in our profession that alleviate the exacerbation of the crisis. Founded in 2019, the grass-roots organisation Astronomers for Planet Earth was established to unify a response to the climate crisis amongst the global astronomical community. We have

since grown to 1500 members across 75 countries. This presentation will cover the studies our members have conducted in measuring the carbon footprint of astronomy, and the initiatives we have led to not only reduce this, but also more broadly educate the scientific community and general public on the matter. Our continuing series of publications in Nature Astronomy includes carbon-accounting studies of the energy requirements of supercomputing facilities, observatories, and offices, as well as travel habits and the construction of facilities, and an assessment of sustainable and equitable meeting formats. Examples of improvements in several of these spaces in the last few years – including the wholesale purchases of renewable energy for astronomers' needs in Australia – will be discussed. But we still have a long way to go to become a carbon-neutral field. Emphasising the need to address this and offering solutions in our presentations to colleagues and the general public is a crucial aspect to our achieving the necessary goal of carbon neutrality.

Exoplanets through a literary view

In this talk I share my experience as a writer of scientific novels. The first of these novels, *Rose Point*, is dedicated to exoplanets. The narrative grows through real and imaginary events, episodes, announcements, dialogues, conversations, discussions, meditations, thoughts occurring in some real scientific centers of space research, chosen from the most important ones in the world.

The characters, a dozen, are researchers, invented persons and names, but with temperaments, personalities similar to several people I met in my scientific life. They share the same mission, the discovery of new planets outside the solar system.

What is special in this genre of science fiction? I'll try to explain.

Inviting the Public to Engage with Real NASA Data and Images: NASA's Astrophoto Challenges and AstroPix

The NASA's Universe of Learning (NASA's UoL) project creates and delivers science-driven, audience-driven experiences designed to engage learners of all ages and backgrounds in exploring the universe for themselves. The project's objectives include increasing learners' understanding of the process of science and key topics in astronomy, and increasing the role of subject matter experts as partners.

To help meet these objectives, NASA's UoL has created NASA's Astrophoto Challenges and supports AstroPix, two innovative ways for the public to engage with astronomical data and images. The NASA's Astrophoto Challenges provides a series of opportunities for public participation in authentic astronomical imaging. Each set of challenges features a target celestial object, the tools necessary to create their own version of the celestial object, and video briefings from astrophysicists. Participants can acquire their own FITS image data of that target using robotic telescopes, and they can work with real archival data from ground- and space-based observatories. Curated press-release images hosted on AstroPix are provided for comparison.

AstroPix is the "one-stop shopping" destination for locating the authoritative versions of visual assets at their highest quality, along with the institutionally-provided metadata and links to the original source material on the home institutions' websites. Over 8,000 images provided by many of the world's premiere observatories are offered in an easy to search archive, featuring rich metadata.

This presentation highlights how NASA's Universe of Learning is using evaluations to increase the effectiveness, impact, and reach of the NASA's Astrophoto Challenges and AstroPix. We also share how we work with partner networks to increase the reach and relevance of these resources. This presentation is based on work performed supported by NASA under cooperative agreement award number NNX16AC65A.

New Challenges During the Pandemic: APRSAF Water Rocket Event and Space Poster Contest

The Space Education for All working group, one of the working groups for the Asia Pacific Regional Space Agency Forum, has been holding two events. One is the Water Rocket Event which has been held onsite annually since 2005 until 2019 and the other is the Poster Contest which has been held since 2006. During the pandemic, we endeavored to organize these events online by using new methods.

The purposes for the water rocket event are to provide an opportunity for students to learn craftsmanship and technology through making rockets, learn about rockets and space, and enhance international exchange among participants from the Asia Pacific region. We managed to hold the entire event online in 2021. This included the award ceremony, and international exchange session.

By going online, new methods and rules were required for the competition. Students launched rockets in their own countries and tried to land them as close as possible to the target which stood 60 meters away. In contrast, before the pandemic, students gathered in a host country for the event. We also required them to install a device, which we newly invented for the online event, to their rockets and submit the information about their rockets' stability, height, etc.

The APRSAF Poster Contest is about the universe. The purposes for this contest are to enhance children's interest in and expand their imagination about the universe and to present the creative artwork of children in the Asia Pacific region.

To make the poster contest online, we made a website and widened the voter eligibility to include anyone who wanted to participate. In 2020, we presented 25 selected posters from 9 countries on our website and had 3,598 votes, which was 35 times more than in 2019.

During this talk, the advantages and challenges concerning this event will be presented. We will explain how we organized these events and discuss how we can improve the event from the lessons learned and analyze the responses from students.

Online Outreach in Bangladesh during Pandemic: Improving Astronomy Literacy using the 'Big Ideas in Astronomy'

There exists almost zero infrastructural support for astronomy education in Bangladesh. The global covid-19 pandemic hard-hit the education sector of the country. Amateur and activity-based astronomy outreach also came to a halt. However, the existence of social media and live streaming options have facilitated an alternate way to outreach. The national outreach coordinator of Bangladesh (NOC-bd), in association with other organizations, made significant attempts to outreach through online media which included live streaming by distinguished guests from within and beyond Bangladesh. During the pandemic period, the NOC-bd along with sister organizations organized quite a few online events and workshops. We report two online workshops' data where the booklet "Big Ideas in Astronomy: A Proposed Definition of Astronomy Literacy", published by International Astronomical Union (IAU), was used to design questions to improve the astronomy literacy. One workshop was an online 5-day astronomy workshop with total duration of about 25 hours. Each day had 4 consecutive sessions of 1.5 hours long in the night. About 27 participants, mostly university students, with 37% females and 44% from outside the capital attended. About 13 national and international instructors helped facilitate with a very wide range of topics covered. Considering the literacy level, an evaluation based on the workshop showed about 56% improvement. The other workshop was all female workshop including all women participants, facilitators and volunteers marking the Women in STEM theme. The second 3-days workshop had an approximate 13 hours contact time where 28 female students from middle school participated. All facilitators, volunteers and speakers were females. This workshop yielded 34% improvement in astro-literacy measured through well-chosen questions based on

the Big-Idea document. Materials from Universe Awareness, NASA planet hunter and astrobiology activity sheets, and astroEDU had also been used.

Producing African Digital Dome Content for the Public: Challenges, Lessons Learnt and Next Steps

Are modern planetaria (digital domes) effective tools to communicate local scientific achievements and to celebrate our astronomy heritage? Over the last five years, the IDIA Visualisation Laboratory (hosted at the University of Cape Town, South Africa), in collaboration with the South African Astronomical Observatory has worked on the production of local digital dome content for both public viewing and research purposes. In doing so, we aimed to promote and celebrate Africa's scientific achievements, conduct innovative research, increase human capacity development in these fields, and encourage the next generation of astronomers.

The importance of producing local digital dome content became apparent when, despite major advances in astronomy development in South Africa (and Africa), the public still remained largely unaware of these scientific achievements and of their significance. In order to address the lack of African-themed digital dome material, we produced two planetarium films that celebrate South Africa's astronomy landscape, both the first of their kind to be produced in Africa: 'Rising Star', a full-length high-resolution film about South African astronomy, and 'Sida Tsoatsoas', a short film based on the cultural beliefs of the #Xhomi San people in the Kalahari. In terms of research content production, digital domes have proven to be very effective visualisation tools for immersive science communication purposes. This is especially true as we move into an era of 'Big Data', with massive upcoming surveys such as MeerKAT and LSST forcing us to develop innovative data exploration tools in order to redress old-fashioned and increasingly unsuitable data analysis methods.

For this presentation, we will discuss the challenges and lessons learnt from the last five years of content production. Lastly, we will discuss possible steps to take to ensure a sustainable future for local digital dome content creation in Africa.

SKAO Activities in the Vigyan Samagam: A Mega-Science Exhibition & Outreach Project

Vigyan Samagam was a first of its kind, multi-venue, mega-science exhibition, which was showcasing India's presence in the field of science on the international stage, as equal partners. And through this mega-science exhibition, its roots were aimed to inculcate scientific temperament amongst the young students and motivate them to choose science as a career in future. Bringing the world's major mega science projects together to exhibit, the SKAO was one of the main seven invited. The teams at SKAO and NCRA worked together to best produce an engaging and informative exhibiting experience for Vigyan Samagam. This talk explores and concentrates on the SKAO activities leading up to and during the 10-month period of Vigyan Samagam.

The Audible Universe

Incredible images of astrophysical objects in printed materials and in digital form are used by professional astronomers for research and by the general public for outreach and educational purposes. However, professional astronomers and the general public alike are blind to nearly all astronomical phenomena without technological and computational aids to produce the images that we are now used to "seeing".

Challenging the idea that we should always use visualisations of astronomical data (i.e., graphs or images), there has been an emerging research interest over the past decade in converting astronomical data and phenomena into sound ("sonification"). Motivation for this includes the potential to enhance scientific discovery within complex datasets, by utilising the inherent multi-dimensionality of sound and the ability of our hearing to filter signals from noise. Other motivations include creating engaging multi-sensory

resources, for education and public engagement, and making astronomy more accessible to people who are blind or have low vision, promoting their participation in science and related careers.

In this talk I will review the current status of the field of sonification in astronomy, based on the nearly 100 sound-based astronomy projects that we identified. I will describe potential benefits of sound in the context of research, outreach, and education. I will also discuss current limitations and challenges of the approaches taken and suggest future directions to help realise the full potential of sound-based techniques when applied within the astronomy community. Finally, I will discuss the specific application of “Audio Universe - A Tour of the Solar System”, a planetarium show where the soundtrack has the leading role and that can be enjoyed irrespective of the level of vision of the participants.

The IAU OAE experience at Dubai Expo

“Let’s light up the sky of the world” was an event hosted by the Italian Pavillion at EXPO Dubai organised by INAF and the IAU OAE Italy Center in a twofold event. The first part was a workshop (co-creation lab) for school girls of an International school in Dubai, stemming from the idea that the sky is indeed a common heritage of all peoples that have imagined figures among the stars, thus inventing the constellations. The students invented and “lit up” the constellations of their own culture or of their imagination, thanks to a low-cost kit for making paper circuits. In Dubai in fact they drew nice constellations such as dromedaries, oasis in the desert, Ramadan’s ending sweet and a Flamenco dress!

This hands-on activity was then presented as an example of good practice. It was the starting point for the following round-table discussion, addressed to astronomy communication experts, educators, teachers, astronomers and other stakeholders in education. In the round table Markus Poessel, Responsible for the IAU-OAE Office, Stefano Sandrelli and Sara Ricciardi of the OAE Center Italy, Hamid Al-Naimiy and Ilias Fernini of SAASST (Sharjah Academy for Astronomy, Space Sciences & Technology) and Pedro Russo of Leiden University/Ciência Viva discussed about the use of astronomy as an extremely useful tool for inspiring people and getting them passionate about STEM but also for addressing multicultural aspects, traditions, narration of stories, and for promoting creativity. The theme of the Dubai EXPO was sustainability. The world can only be sustainable if it cares for and promotes a culture based on hospitality, on the mutual respect for differences and on true and profound dialogue. That is why the main issue of the roundtable was the co-design, which OAE Center Italy is carrying out with all the countries bordering the Mediterranean. In this project, each country proposes activities which are shared, discussed and modified together.

The Inaf avatar Martina Tremenda: a free and professional maverick

How can we stage the concept of free thinking and learning which is at the basis of scientific research?

Martina Tremenda (MT) is the main character of science labs, games and other informal activities, organized by the Italian National Institute for Astrophysics (INAF) under the collective name of astrokids, and targeting 6 - 10 years old children.

MT is part of the literary tradition of Pippi Longstocking, an Astrid Lindgren’s character (International Andersen Prize 1958) and Giovannino Perdigiorno, a Gianni Rodari’s character (IAP 1970). MT is 12 years old and has five pigtailed: she breaks rules, expected behaviors and stereotypes. Hungry for food, knowledge and new friends, she builds her own pedal-powered spaceship and travels across the universe. Her name reflects her attitude: Tremenda means “naughty” and it rhymes with “merenda”, the typical afternoon snack time for kids.

After a book and some songs, in 2019 we created the play “Martina Tremenda in Space”, thanks to a collective process involving scientists and theatre professionals. This show is based on traditional and digital techniques (live acting, puppets, pre-recorded rear-projections, computer graphics), and it is

followed by a meeting with an astrophysicist. The results are flattering: 21 performances in 12 months (stopped by the pandemic), and more than 5,000 kids involved.

Since 2019, MT has been signing a column of astronomical news in the magazine Focus Junior (80 thousand copies per month).

MT just became the protagonist of a professional podcast, which allows children to consolidate or revise their ideas critically: space exploration, extrasolar planets, aliens, black holes. We also worked on an International version of MT producing a low cost turnkey kit. While in the original version MT is red-haired and pale skin, for the International version she can change, adapting her physical characteristics to the context, but retaining her wonderful five pigtailed and thirst for life.

[The One Sky Project: Bringing Cultural and Indigenous Astronomy to Planetariums Worldwide](#)

The One Sky Project is an international collaboration focused on increasing understanding about cultural and indigenous astronomy, its historical and modern applications, and how our one sky connects us all. Started in 2019, the project has resulted in six planetarium short films that touch on the topics of finding patterns and building tools, which foster connection to the sky and leverage astronomical phenomena to advance societal goals. Each short film represents the perspective of a different culture or Indigenous society from around the globe. Each film stands alone as a short story or in combination as a longer narrative experience. We will present how the close collaboration and a community of respect have produced these films, leveraging the creativity of our international and cross-cultural team. All elements, such as visuals, music, story, etc., are orchestrated to bring each idea to life in a distinctive, immersive way, taking care to be creative yet sensitive to the cultures they represent. Process and relationship are central to the One Sky Project. We will share our process of co-creation including identification of themes that resonate across different times and places, co-creation of visual and verbal storylines, and close collaboration with a full-dome producer who brought these visions to life.

[Towards Creating an Astronomy Card Game](#)

Fostering public interest in a field while retaining the essence of the science are at the core of any science outreach project, particularly those that are aimed at non-scientists. Astronomy communication is no exception to this and conception of novel methods of communicating astronomy that balance interest and enjoyability with retention of difficult astronomy knowledge are essential. We aim to achieve this balance through an astronomy based card game. Translating astronomy, or rather, any science, into games runs the risk of defaulting the gameplay to trivia games, which are only a genre in the extensive world of card games and may not be enjoyable to everyone. However, focusing on gameplay mechanics alone and letting astronomy take a backseat would instead risk diffusing the astronomy focus. Our card game attempts to bring intricate gameplay together with niche astronomy knowledge to create a game that can be well received in both gaming and astronomy circles as well as by those who only occasionally engage with card games at social gatherings. The gameplay design lets players adjust difficulty levels to their own taste while keeping the astronomy portions comparatively simple and yet at a substantially high level of knowledge. This project started as a part of a Toronto-based astronomy outreach event, AstroTours, as a means to feature queer astronomers as a part of their Pride themed event. The talk will discuss the journey of the project from its initial conception to now, as well as impact and feedback received during the initial event, leading to expansion of the game to all of astronomy and an eventual formation of a kickstarter project.

[Universe for everyone – An award-winning astronomical public outreach project](#)

This talk describes the unique public outreach program „Universe for Everyone – Astronomical Lunch Break“ which I had envisioned, planned and run in Heidelberg/Germany. It consisted of 70 short astronomy talks at 70 subsequent days on 70 different topics. Main features:

- (1) The frequency: 70 public talks by local astronomers at 70 subsequent days;
- (2) The duration: short 15-minute public lectures;
- (3) The Q&A: audience got 15 minutes as well;
- (4) The time: lunch break at 12:30 pm;
- (5) The topics: simple astronomical questions;
- (6) The location: University Church Heidelberg;
- (7) The videos: talks professionally recorded, all 70 online;
- (8) The book: 70 chapters, 6 pages each;
- (9) The connection: book chapters with QR-code link to videos;
- (10) The impact: format repeated by other departments in subsequent years.

The talks address simple questions, like “Why do comets have a tail?”, “Is there life elsewhere in the universe?”, or “Why is Pluto no longer a planet?”, but also topics like “What does an astronomer actually do all night?” or „How do stars and planets get their names?”. Speakers were 36 Heidelberg astronomers. After the presentations, the audience had 15 minutes for their questions.

The location was unusual as well: To keep the threshold for the general public low, we chose Heidelberg's University Church as the venue. Admission was free, the public enthusiastically accepted these 70 daily lectures from April 11 to July 22. Attendee numbers varied between 50 and 140, the closing event attracted almost 200 guests.

All 70 talks were recorded by a professional team, the videos are all on youtube – www.spektrum.de/universumfueralle – and very popular: Most have been viewed well over 10,000 times, the full list of all 70 videos over 120,000 times, so in total this means more than 9 million views! For this project, the author was awarded the Grüter-Prize for science communication and the Kerschensteiner-Prize for public outreach of the German Physical Society.

[Using celestial objects as characters in communicating astrophysics through audio-visual media for children](#)

Be it dark matter or a wormhole, be it the life cycle of a star or the mathematics of a black hole, terms related to astronomical objects are mostly alien to masses. To tackle this problem and make the world outside our planet more relatable, my project explores the possibility of using the celestial bodies as characters in an audio-visual story. Through my project, thirteen short films are being made using graphics and animation to tell the stories in first person. The pilot episode ‘The Pluto in Existential Crisis’ is running successful on India Science OTT Channel and has been shown to many students. The project will help us understand acceptance of new ways of telling celestial stories and how characters can be used to make them relatable.

[Virtual Reality and animation as tools for innovative astronomy communication.](#)

We present two innovative multimedia projects aimed at inclusive dissemination of astronomy and space exploration.

The short film “Pulsars: a Tale of Cosmic Clocks” is a EU funded collaboration to communicate the science of astronomical compact objects such as pulsars and black holes to a broad public, addressing at the same time the fundamental role of women in science to motivate school girls to consider a career in science.

To tackle the challenging objectives we followed an innovative approach, mixing live action footage and animation to build a compelling storytelling and to increase the empathic response of youngsters - especially high school girls, such as the lead character Alma. At the same time the screenplay was carefully tuned to convey rigorous scientific information on pulsars and black holes in an entertaining way. The animation layouts with cosmic objects and events were rendered using an innovative algorithm, which reduces rendering times considerably, without sacrificing quality. We managed to achieve a seemingly 2D rendition of 3D complex objects with pencil and crayon like strokes and close enough scientific precision. The processes chosen optimised time and effort, reducing the time/cost factor of the whole production.

The second project, "Moon Landing VR", is a virtual reality game/simulation that combines physical realism with the exciting challenge of having to dose fuel and adjust the LEM speed to land softly. Thanks to VR technology, the user climbs aboard Apollo 11 to experience first hand the most famous moon landing in contemporary history. The highly entertaining immersive experience has an educational focus: thanks to the right balance between realistic physics and playability, every user can learn first hand what it feels like to land on the Moon, where gravity is about one sixth of Earth's.

Keynotes

Aboriginal Astronomy and Indigenous Science in contemporary Science Communication

Aboriginal people have been looking to the stars for the past 65,000 years and counting. There is a rich history of astronomy in Australia and it is filled with a wealth of knowledge. You can learn a lot about the world around you by looking at the stars, from navigating the landscape to predicting the weather, you can even use the stars as a seasonal menu. Despite this wealth of knowledge, there is a distinct lack of understanding and acceptance of Aboriginal culture in Australia, so where does Aboriginal Astronomy and Indigenous Science fit in with contemporary Science Communication?

Astronomy at Large – Strategies for effective communication

Astronomy outreach is a multi-faceted activity, ranging from entertaining pre-schoolers to informing politicians on issues of policy or funding. And, while it's relatively easy to inspire people with the excitement our science, there are those in the community who would question the relevance of what we do. Effective communication across this multi-dimensional spectrum requires a range of strategies – the wider the better. In Australia, this has been recognised with the creation of an outreach position attached to the government department responsible for the Square Kilometre Array and the nation's strategic partnership with ESO. These facilities provide a framework around which effective communication strategies can be built. This presentation by the first incumbent in the job will explain how the role came about, what it entails, lessons learned, and the strengths and weaknesses of astronomy outreach in the government sector.

Framework for Science Communication

Modern science communication emerged in the twentieth century as a field of study, a body of practice and a profession—and it is a practice with deep historical roots. We have seen the birth of interactive science centres, the first university actions in teaching and conducting research, and a sharp growth in employment of science communicators. Astronomy was always in the foreground: controversial, political, mystical – and posing the greatest philosophical questions of them all: where do we come from? Why are we here? Astronomers like all scientists have increasing demands to communicate. You need to publish in journals to win promotions; in the media to satisfy public curiosity about black holes; give public lectures to show the dazzling images from deep space; and write policy briefs to keep policymakers interested so they will fund bigger and better equipment. You may be involved in climate change and promoting peace and talking to the media. Your hand is full. This talk will suggest a framework, based on running 1,700 communication workshops in 30 countries for scientists of all disciplines. It begins with the Audience, and

focusses on three points: Who is your audience? What do you want to talk to them about? What's the best way to engage this group?

Strategies for Communicating the Impact of Satellite Constellations on Astronomy

Oral presentations

"Stargazing Forest" Project Taken by Students Who Had Never Studied Astronomy and The Partial Lunar Eclipse Viewing Event for The Public Held by Them

"Stargazing Forest" project is a good practice that people can participate in activities related to astronomy in a variety of ways, even if they do not specialize in astronomy. A "Satoyama", where residents to get goods necessary for daily life, recently many of them have fallen into disrepair, cause landslides and other disasters in Japan. To maintain and utilize "Satoyama" continuously, it is necessary to take people's attention on the role of "Satoyama" as a recreation place. Thus, the students at Agriculture and Forestry High School in Japan planed and proceeded the project of a "Stargazing Forest" with help by forestry experts and a scientist in astronomy. The three objectives were defined on the project as follows: 1. the students plan and proceed the project of "Stargazing Forest" initiatively while learning the role of "Satoyama"; 2. They held there the partial lunar eclipse viewing event on November 19, 2021 initiatively as astronomy communication with the public; and 3. They got people to know the important role of "Satoyama" and be interested in space and universe through the event. To decide the place for "Stargazing Forest", they surveyed the direction and altitude of the eclipse with instruments. Then, they cut down only non-useful trees which hide the eclipse. They explained with tablet PCs the importance of maintaining and utilizing "Satoyama" based on their experiences and how to occur and enjoy the eclipse to participants at the event with presentation materials prepared through group work activity. Considering the light pollution, they also set up LED lights underfoot for safety. About thirty people who got to know their project joined in and enjoyed the event. The project was widely known in the newspaper. In addition to the details of the project, we will show how to get the students to be interested in space and universe and support them, and introduce the tool "digital Diamond Mandala Matrix" used to support the students to compile their idea.

"Calling E.T." – A remote interactive school trip that replicates the Arecibo experiment

"Calling E.T." – A remote interactive school trip that replicates the Arecibo experiment

The CoViD-19 pandemic left schools and research institutes with the responsibility of providing distance learning through video lessons and conferences. Educational trips were no longer allowed and, often, both students and teachers were tired of taking lessons remotely. Nevertheless, the Italian Space Agency (ASI) and the National Institute of Astrophysics (INAF) tried to overcome the difficulties of the moment, creating a very engaging space initiative for primary and secondary school students, in collaboration with the radio amateurs of AMSAT Italy and ARISS Europe.

The aim of the contest was to create an encoded message to be sent to potentially habitable exoplanets. In addition to the school contest, a Cody Trip, organized in collaboration with Alessandro Bogliolo from the University of Urbino (Italy), allowed students, teachers and families to join the interactive virtual journey from Earth to Space, visiting the city of Matera, European Capital of Culture in 2019, and the "Giuseppe Colombo" Space Center of ASI.

Indeed, on May 13th, 2022, three messages were sent in live streaming to the exoplanets compatible with forms of extra-terrestrial life and to the moon, using the large radio telescope (VLBI) of the ASI Space Center in Matera, repeating in some way the experiment carried out at Arecibo in the distant 1974. In addition to any alien intelligence, even radio amateurs on Earth could receive it due to its reflection on the lunar surface.

CodyTrips are educational trips, to be enjoyed in the classroom and with the family, using digital technologies in an original and very simple way to bridge distances without mobility, allowing everyone to actively participate.

There were 15124 actual participants connected from about 420 cities across Italy for an interactive live broadcast of 431 minutes.

[“TRAILBLAZER'21” – A Competitive Opportunity for Highschoolers to improve analytical thinking in major areas of Astronomy and Astrophysics.](#)

“TRAILBLAZER'21” – A Competitive Opportunity for Highschoolers to improve analytical thinking in major areas of Astronomy and Astrophysics.

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Abstract: **TRAILBLAZER'21** is a competition that was organized by Nalanda College Astronomical Society and the Hillwood College Astronomical Society which was specifically designed to encourage the analytic thinking of Highschooler in the areas of observational Astronomy, Cosmology, Astrophysics and Rocket Science. The problem we observed in general competitions is that they question theoretical problems but don't facilitate critical thinking, further basic written questions don't grab a student's attention. In **TRAILBLAZER'21** we designed our problem statements as multi-tier puzzles to encourage interactivity and by designing the competition in such a way that each team gets a major goal while breaking that goal into subsections at each stage we promoted “out of the box thinking” among our participants. The competition consisted of 5 tiers with each tier consisting of multiple puzzles with elimination at the end of each tier. Eliminated teams were directed to a workshop conducted by our judge panel. The event started on the 08th and concluded on the 09th of January 2022 with the participation of 40 teams from 28 different High schools around the country.

[29th National Astronomy Week \(NAW\): Introducing Ethnoastronomy to the public amidst the pandemic](#)

The National Astronomy Week (NAW) is an annual celebration in the Philippines observed every third week of February. The Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA) held online events for the 29th NAW celebration with the theme “Ma(g)laya(g) Tayo Sa Mga Tala.” This year's celebration focused on Philippine Ethnoastronomy, a relatively new topic among Filipinos. The NAW celebration aimed to introduce and discuss the current development in the Philippine Ethnoastronomy through the invited researchers in the field, and for Filipinos to connect to the Philippines' rich culture and knowledge of astronomy even during the pre-colonial era. The online activities conducted for the celebration include a 2-day webinar session, research symposium, virtual planetarium show, virtual telescope viewing session, and Astro vlog contest. The activities were held via Zoom and posted on the PAGASA Facebook page to reach a wider Filipino audience nationwide. Post-event assessment revealed that the NAW activities garnered an overwhelming number of participants, views, and responses on social media platforms. The webinar session and research symposium spurred a lively discussion about possible multi-sectoral initiatives and collaborations for Ethnoastronomy research. Generally, virtual activities held for the NAW celebration served as a powerful tool to popularize and raise astronomy awareness among Filipinos of all ages and all walks of life, especially during the pandemic where physical activities are unavailable.

A french event “the Night of the stars” : from national to international?

In 1991 a new event was organized in France, the 10th of August ... The french name of the event was “La Nuit des étoiles filantes” or in english the “Night of the meteors” . Indeed during summer, this period is that of the Perseids. It was thought that this event - back every summer - could be an opportunity to invite the public to gaze at the stars and at the heavens : Milky way, globular clusters, binary stars, nebulae etc...

The public french TV named “Antenne 2” was the main partner of the project and accepted to dedicate its prime time to it.

This particular 1991 August 10th, La nuit des étoiles filantes started at 8: 30 pm for more than 4 hours. Many professional astronomers were part of the TV Show and explained many simple facts of astronomy (meteors, solar systems etc..). Among them: Hubert Reeves, André Brahic, Catherine Cesarsky etc... Simultaneously 200 clubs and associations of non-professional astronomers were welcoming the public, everywhere in France.

Thousands of telescopes were in operation for this particular night.

It was such a success that Antenne 2 re- iterated the following years during more than 15 years. Antenne 2 is now named France 2.

At present the name of this event is: La Nuit des étoiles (The night of the stars) . Each year since 1991 a new topic is chosen (Mars, Saturn, Cosmos, Solar system, Asteroids, Moon, Life in the Universe etc..). Millions of people participate and meet with professionals and non professional astronomers, young and older people. I will explain during my talk the origin of this project, its development and implications. At the end this could call for a “World Wide Night of the Stars” event. Basically my talk is motivated for such goal.

About thirty years of communication with the public in Astronomy in Morocco: What results obtained and what prospects?

We propose to relate here the Moroccan experience of openness to the general public on the part of professional astronomers.

It began with the creation of an association of Amateur Astronomy in Rabat (1985), the capital of Morocco, following the establishment of the first research laboratory in the Astrophysics specialty in the same city. A few years later, a second, even more dynamic Association was born in Marrakech in the dynamics of the concretization of the first University Astronomical Observatory on the High Atlas Mountains: Oukaimeden Observatory. Since then, both this last association and the Oukaimeden observatory have played a leading role in the development of the Moroccan associative fabric in Astronomy in several cities in Morocco, some of which are very active in the remote regions of the underserved countryside.

We will review some of the most successful initiatives and take advantage of the current context (Pandemic, political tensions in several regions of the world,) to remind and underline the role of Astronomy Communication to promote peace and bridging Cultures.

Accessible astronomical observations: Telescope Nights in Real Time

The world has changed in the last 2 years with the pandemic, and astronomical communication has to adapt to it. We would like to share our experience adapting astronomical observations from a face-to-face format to an online one, where inclusion and accessibility have a unique opportunity.

Since the beginning of 2021, we had the chance to use academic telescope time to make outreach observations, modifying the goals of a regular star party, in an online format. We started a monthly event on YouTube and Facebook, called “Noches de Telescopio en Tiempo Real” (Telescope Nights in Real Time).

We were able to open the experience to people from all the world, and people with disabilities, by including sign language interpreters, and image description techniques that enabled audience participation, and evolved over time.

Since January 2022, we started a collaboration with “ACRUX Festival de poesía y ciencia desde el Estrecho de Magallanes” (ACRUX Poetry and Science Festival from the Strait of Magellan), and in each session we have 3 guest poets to describe the images in an artistic way, even creating music on the spot. This has enhanced the experience for the entire audience, including the astronomers, poets, and sign language interpreters involved.

[Ada's Adventures in Science: using comic books to educate and empower](#)

Illustrations are an excellent way to communicate science, particularly a highly visual science like astronomy. We created the comic book series, Ada's Adventures in Science as a way to empower children at the key transition between primary and high school to keep asking questions, as the fundamental step in doing science. Through the narrative and diverse characters we sought to show that anyone can do science and readjust preconceptions of what scientists could look like. In this talk we will discuss the dissemination of 15,000 copies funded by a Kickstarter campaign in 4 languages to 17 countries, the impact Ada continues to have to variety of audiences, and lessons learned.

[An Analysis of the Astronomy Communication Actions in Brazil During the COVID-19 Pandemic](#)

In early 2020, the world was surprised by the spread of the Covid-19 disease caused by an unknown coronavirus. This outbreak was later characterized by the World Health Organization as a pandemic, urging actions to slow down the infection rate. Social distancing was a widespread method taken in order to avoid the collapse of the national health systems worldwide. As expected, the effects of the pandemic have been significant, forcing many changes of habits on people's everyday lives and work. This was not different for the community of the Brazilian astronomy communicators who had to adapt their activities in order to follow the recommendations aiming to mitigate these effects, a situation worsened by a negligent and denialist government which continuously promoted budget cuts for essential areas such as science and education. This presentation describes how this community faced the challenges derived from social distancing while still offering activities to the public. A survey was prepared and disseminated within astronomy communicators, aiming to shine a light on questions such as whether the astronomy community has been motivated during this period and how the community reacted to the new way of promoting activities. We have identified that the pandemic has also been a source of motivation for science outreach practitioners to also address contemporary topics during their activities, such as gender and ethinical diversity in science. Moreover, the widespread use of fake news in the country is considerable, urging a systematic and substantial increase in the investment in science outreach and education.

[Astro\[sound\]bites: A free audio resource for informal astronomy education](#)

Astro[sound]bites is a graduate-student-led astronomy podcast designed to communicate recent research results to early-career scientists and the general public in an engaging and accessible manner. Each episode centers around a theme, and the podcast regularly incorporates additional topics in academia such as representation in astronomy and atypical career paths. While COVID-19 limited the number of in-person outreach opportunities available to the public in 2021, astro[sound]bites conducted its first Sonification Competition and delivered an array of new episodes employing interviews with early-career academics spanning subfields as diverse as heliophysics, black hole accretion, and galaxy evolution. Astro[sound]bites has now published over 55 episodes across multiple platforms, totaling 12,700+ downloads from 18 different countries. As a public resource for auditory learning in a visually-dominated field, astro[sound]bites makes astrophysics accessible to a diverse listenership. In this talk, we will provide an

overview of the astro[sound]bites podcast, discuss our ongoing initiatives, and outline our plans for expansion in upcoming seasons.

[AstroBiology for Climate Change Awareness - The ExoWorld Walk Project Approach](#)

Climate Change and Global Warming are global challenges whose subtle effects are easily overlooked in our daily lives. Hence, awareness is key in joining efforts to protect and rescue our planet. We present a way of raising climate change awareness through connections between Astronomy and Biology, between Nature and the Universe and reflections on why Life should be celebrated. The “ExoWorld Walk” Project was selected to be funded by the Europlanet Society in the 2021 call of the Public Engagement Funding Scheme. Our project is addressed to the great public and proposes to the visitors of the Botanical Garden of Cluj-Napoca a new walk path with 5 stops, each stop designed to connect the Nature elements at that specific location to the Nature on Earth and the Earth as part of the Universe and inspire reflection upon how miraculous Life in the Universe really is. The walking path has the shape of the Big Dipper constellation. In the Rose Garden (1st stop) we tell the public about the how Unique Earth and Life are and in the Japanese Garden (2nd stop) about when Life appeared. At the Water tower (3rd stop) we reflect on the diversity of organisms, whereas in the Vegetable Garden(4th stop) we learn about the formation of planetary systems. The last stop at the GreenHouse (5th stop) is all about the ingredients of Life and the message that life as we know it depends on us harnessing the greenhouse effect. At each stop a poster is placed to educate our public even when casually walking in the Botanical Garden. People can learn at their own pace, regardless of the COVID restrictions. And when they are curious for more we have a website ready and a workshop.

“ExoWorld Walk” project is a simple, innovative acknowledgement that sometimes a simple change of perspective inspires deeper understanding. With understanding comes awareness and with awareness comes action.

[Astrofísicos en Acción: astronomy outreach for “Hispanos” in the digital era](#)

According to the 2018 CAP report, the vast majority of astronomers prefer to interact with the public in traditional ways, through lectures and school talks, and less than 20% use social media and digital platforms for outreach activities. However at every step humanity takes, we embrace technology that allows us to stay connected to each other. This situation increases potentially with the COVID-19 world crisis, where social media takes the most important role in our digital lives. Science communicators have to take advantage of it and create strategies to spread science on the digital population.

Astrofísicos en Acción is an astronomy outreach project formed by professional Mexican astronomers interested in spreading knowledge of the Universe to every Spanish speaker in the world, regardless of their economic or academic level. Our aim is to provide quality digital astronomy content in Spanish on social media responsibly, with veridical information from professional sources. But always communicating science with a friendly face and digestible language, as an entertainment medium, managing to naturally form a large and committed audience. We are present on the most used social media platforms (Facebook, Youtube, Instagram, Tiktok, Twitter, Telegram, Twitch, Spotify) with a community of more than 270,000 followers worldwide and we want to share the strategies we have used since the beginning of our work.

[Astronomical heritages and facilities in Tunisia](#)

Dates back to around 1981, the AJST- Nabeul Club in collaboration with some students from the ENIT School, succeeded to build the first astronomical observatory in Tunisia, which is located in the coast of the Nabeul city. This astronomical observatory was mainly dedicated to outreach activities of the AJST and public events. Although the observatory was in a strategic location for public access and in close vicinity to schools and institutes, the geographic location was not very adequate, since it was close to the sea, and consequently, the building was damaged by the high humidity and the salinity of the water. A few months later, the astronomical observatory of Nabeul was closed, for safety reasons, since the building was in a bad

situation and all equipment was taken away for independent use in open space, and the observatory was saved as a historical monument.

Thirty-seven years later, and in August 2018, a group of amateur astronomers from AJST, Djerba Club, directed by Lassaad Akrouf, decided to build an astronomical observatory with personal funding and a local donation from citizens without any support from the governmental institutions and the concerned ministries. The Observatory is located on the roof of a Mosque, in an isolated zone, far away from light pollution under a nearly dark sky, and in an easily accessible location. The main objective of this observatory is also outreach activities in the context of the AJST events and summer schools.

Besides the astronomical observatory of Nabeul and Djerba, Tunisia owns many important organizations that hard work to sensitize the public about the importance of astronomy, astrophysics, and space sciences in the development of education quality and equal society. In this work, we will present the astronomical heritages and the facilities in Tunisia as a country in the stage of developing astronomy and space sciences with its society and join the parade of space and universe exploration.

[Astronomy for Mental Health](#)

Mental health is our fundamental human right as much as physical health. In fact, it is even more important, as there is “no health without mental health” - a central principle in global health actions (i.e. WHO Comprehensive Mental Health Action Plan).

Globally there are close to one billion people with mental health disorders. Though invisible and overlooked, these issues have a major impact on quality of life, health, education, employment, and social relationships of people.

As a crucial factor for development, mental health is part of the UN development agenda. SDG 3 commits to promote mental health and well-being. Still huge treatment gaps remain. The COVID-19 pandemic became a major wake-up call for the need of mental health support.

The astronomical community has worked, for many years, toward creating a better world. Astronomy is deeply rooted in our history and culture as human beings, and can be an excellent tool to promote change and address the UN Sustainable Development Goals.

Astronomy perfectly combines the feeling of awe produced by looking at the vast, starry sky with being located in a (nocturnal) natural environment, which contributes to increased positive emotions and reduced negative emotions, and has a huge potential to be a unique and strong tool for mental well-being.

OAD's Astronomy for Mental Health project explores how the inspirational and cultural aspects of astronomy can help improve the mental well-being of vulnerable communities (refugees, displaced people, people in disaster zones, etc.), as well as other groups negatively affected by the pandemic (elders, women, youth, migrants, etc.).

The project relies on multidisciplinary collaboration between the astronomy community, psychologists, mental health specialists, educators, humanitarian workers and others. The results of this collaboration and the findings of the project will be presented during the CAP2022.

[Astronomy outreach for a continent – the African Astronomical Society](#)

The African Astronomical Society set up its Outreach Committee three years ago, with an ambitious mandate to promote astronomy across all of Africa. Imagining a meaningful role for the committee in such a vast and diverse continent was a challenge, and this was initiated through consultative dialogues with various stakeholders in each country. Our collective efforts leading up to the 2020 annual solar eclipse helped build collaborations and trust amongst all of us. Since then, the committee has focussed on providing a platform for international collaboration, creating quality multi-lingual resource material,

encouraging the formation of many stakeholder networks, and coordinating efforts during astronomy themed events across Africa. The annual meetings of AfAS, where half the time is allotted to outreach, education, and development, has also been effectively used to bring the community together and build capacity. This talk will discuss our successes and challenges, as well as our priorities and strategies for the future. In particular, plans for utilising the upcoming IAU General Assembly 2024 in Cape Town (the “African GA”) as a pivotal opportunity will also be discussed, especially in reference to the proposed flagship projects.

[Astrotourism: Star Gazers, Eclipse Chasers, Eclipse Chasers and the Dark Sky Movement](#)

To communicate astronomy it is first necessary to meet the public where they are at and why in this talk the promotion of astrotourism is the focus as markets and monetary gain drives policy more so than ethical behavior.

Due to social media and the digital world we all live in the attention span of people is shorter than ever before. Storytelling is a way to engage the minds of the public which explains the popularity of books, movies and television shows. What we forget is

the oldest stories ever told on Earth are those of the stars. To enact the change we hope will happen to protect our rapidly disappearing night sky, it isn't enough that the listener consumes the content but responds and acts upon their new knowledge. Take into consideration how people respond to –“Once upon a time” vs “The formula for that equation is” or “The moral of the story is” vs .

Before humanity understood the science of the stars they were telling the great myths and legends about them for tens of thousands of years. These stories wound their way into our ‘collective unconscious.’ Cultivating curiosity is the both the goal and the seed to inspire a new audience to look up and out; To catch (and release) the imagination. Engaging the public requires a hook, something sticky that they can't forget. Asking the question “Do you know another star besides the sun” immediately engages the mind as many people don't, but know they should. Tidbits like, “In Western civilizations the constellations were named by the Greeks, the planets after Roman gods while the stars have mostly Arabic names” is the trail of breadcrumbs the public can easily pick up and follow. People wish upon a falling star but don't know why or why the expression “So above, So below” is so readily apparent watching the dark cloud constellations of South America as hibernating creatures are reflected in the movement of the stars. It was our knowledge of the stars that allowed us to spread our species across the planet and provide the information necessary for civilizations to grow.

The night sky and the stars within has been stitched into the history of humanity and light pollution is unraveling that tapestry at an unprecedented rate. Engaging the public to take an interest in astronomy is more important now than at any time in our history.

[AstroTribe : Astronomy Guide Training for the Tribal Students in India](#)

Our initiative to help the tribal students gain the knowledge of skill training in the field of astronomy, is now supported by the Office of Astronomy Education, International Astronomical Union. The project, AstroTribe aims to develop an ‘earn & learn’ opportunity for economically backward tribal students who will be trained as AstroGuides.

The AstroTribe Project seeks to empower tribal students of age 14 – 18 with knowledge in Astronomy and be self-sustainable through the skill training provided as part of this project. Initially, 30 students will be selected for the Level 1 Training (Theoretical Learning) and after conducting a knowledge-interest assessment, 15 final students will be selected for further astronomical skill training. AstronEra will collaborate with the resorts located near to the areas of the AstroGuides after the training and will be

responsible of organizing stargazing events, travel arrangements and revenue distribution through the project period. Web community platform developed under this project will later help with the same.

AstroViz Project: Multi-wavelength, Multi-format, and Multi-sensory Astronomical Visualizations

The AstroViz Project combines multi-wavelength data from NASA's space telescopes to create cinematic visualizations for the public domain. Awesome sights such as Eta Carinae, the Whirlpool Galaxy, and the Ultra Deep Field are presented in 3D to enlighten and engage learners of all ages. When possible, these visuals are translated to multiple formats, including planetarium dome and VR 360. In addition, sonification of the visuals and 3D printing of the models can provide accessible, multi-sensory experiences for broad audiences. AstroViz is part of NASA's Universe of Learning, funded by the NASA Science Mission Directorate Science Activation program.

Best Practices to Achieve Multiple Outreach Goals

Most astronomical research organizations such as national labs and university research centres conduct activities under the general category of "outreach". One of our organizations even conducted over 200 outreach events in one year! Outreach has many different goals that are quite disparate. These include: educating local, regional, and national audiences about the research conducted, improving astronomical science literacy through events, organizing star parties, maintaining booths at street fairs and conferences, conducting science cafés, and running visitor center programs, to name a few. Some forms of outreach are designed to improve community partnerships and to burnish the reputation of the research organization in the local community. Another set of goals can be education-oriented, such as training educators who serve in in and out-of-school settings.

Unfortunately, not all outreach efforts are equally effective, even if the motivation to conduct them is enthusiastic and altruistic. This talk describes how astronomical organizations can strategically plan and implement outreach efforts in more effective ways.

Bringing an astronomy show to the world's largest arts festival

In February 2021 and 2022, the Adelaide Fringe Festival in Australia was the largest arts festival in the world.

Fringe festivals, which happen all over the globe, give artists permission to present the strangest, most daring, most ridiculous and most amazing works, and find new audiences. Science comedians are using this fertile ground to germinate content that goes beyond your typical children's science show.

Both years I performed my comedy show, A Flying Photon, to sold out audiences and won the Science at the Fringe Award, sponsored by Inspiring Australia. The show explores the electromagnetic spectrum and quantum mechanics, using astronomy subjects and featuring telescopes from around the world to do so.

In this presentation I will introduce the Fringe setting, science comedy as a genre, the accessibility of occupying an entertainment niche beyond 'a show for children', and the logistics of such an endeavour.

I will use my show and its intended purpose as a case study for unconventional outreach, discussing the lessons I gained from bringing it to the stage - including getting community buy-in from arts and science organisations, marketing challenges as well as audience expectations and reactions. I will outline how my artistic practice has changed throughout the experience and shaped my future projects.

Ultimately, the comedy or fringe-show format offers the chance to build frank and funny conversations about the wonders of the Universe, and so this genre is important to explore as a viable option for communicating astronomy to the public.

During the CAP Conference, A Flying Photon will be onstage at the Erskineville Town Hall for the Sydney Fringe Festival.

Challenges and solutions in building non government astronomy outreach institutions. Apadilangit; Universe Awareness Malaysia case study.

“Most science communicators are depending on government funds to run their outreach activity. Obviously non governmental outreach institutions have financial challenges in organising events. Furthermore most of the members are part timers, thus it affects the sustainability of the project. Lack of leadership, management skills, networking and objectives that suit local astronomy needs added more issues in maintaining the outreach. At the same time it is important to the team to learn and relearn and equip themselves with pedagogy to reach the public.

To solve that, we Apadilangit is building Malaysia sustainable non government astronomy and space education academy. We aimed to provide a sustainable outreach and space education programme for Malaysia kids. At the same time providing jobs and careers in space and astronomy education for Malaysian local graduates. We also offer internship places for undergraduates and the community to be involved in outreach.

To sustain the activity we have innovated Apdilangit Space Academy, Apanakbeli (an astronomy instrument online shopee for Malaysia) and Apadilangit Astro tourism (Astro tourism services) to help fund our outreach project.

We collaborated with a number of universities to build the academy and industry to connect our participation with the skills required in astronomy and space technology.

Lots of impact has been seen since then, among it was hiring astronomy and physics graduates from local universities to run our astronomy outreach. We allow interns and the community to be involved in research, planning and organizing our event. We also trusted by the MYSA, government institutions and corporate companies to run astronomy and space related events and Corporate Service responsible for Malaysia public and kids.

We would like to share lessons on building non government sustainable space education institutions. Do and don'ts in building effective astronomy outreach teams and success story of Apadilangit.”

Co-creating Immersive Environments for Astrobiology Research and Astronomy Outreach: A Story from Lake Bangweulu, Zambia

Lake Bangweulu in Zambia has been identified in literature as a lake that may have been caused by a meteoric impact in the distant past. A study looking at this possibility was undertaken with the support of funding from the National Geographic Society. Preliminary results to investigate this hypothesis are presented including chemical, biological and geological lines of evidence. The local community at Lake Bangweulu worked together with undergraduate students from the Copperbelt University to co-create a “living lab” to do astrobiology research and astronomy outreach. Community engagement using focus group discussion to determine the possible astrotourism projects were enabled and shared most effectively using social media.

Mapping tools were created to point out sites of interest for astrobiologists and astronomers in Zambia. Educational material using the Zambian context was developed for use in teaching astrobiology to Zambian students.

Communicating Light Pollution with the Public: The Australasian Dark Sky Alliance

Artificial light at night is currently one of the fastest growing and least regulated forms of environmental pollution, not only degrading astronomers’ view of the stars, but also creating a broad range of negative

ecological, cultural, and health impacts. The Australasian Dark Sky Alliance (ADSA) is a registered charity formed in 2020 aimed at raising awareness of the broad impacts and specific challenges of light pollution within the Australasian region, educating the public and policy makers about the benefits and opportunities of a protected night-time environment, and engaging local and national government agencies in developing strategies and best practices around lighting management. Astronomy remains a key vehicle for connecting the public with light pollution. In 2020, ADSA successfully set a new Guinness World Record for the most number of people participating in an online sustainability lesson, which included obtaining over 10,000 night sky brightness measurements for the Globe at Night project – a well-established citizen science project that uses naked-eye measurements of stars and constellations. I will present a summary of this event, including outcomes and lessons learned. I will also provide an overview of ADSA's activities in relation to connecting astronomy with the broader landscape of ecology, sustainability, cultural heritage, and economic development.

Communicating Science worldwide with UNESCO's International Day of Light (IDL)

UNESCO's International Day of Light (IDL) is a global initiative that provides an annual focal point to light and the role it plays in science, technology, art and culture, education, and sustainable development, and in fields as diverse as medicine, communications, and energy. The four IDL celebrations held since 2018 reached a global audience estimated at over a million, with more than 1500 events taking place in over 70 countries. The cross-cutting theme of light allows us to collaborate with many different sectors of society and scientific communities. For instance, IDL's partnership with the International Astronomical Union (IAU) played a crucial role in engaging a wider audience during the pandemic through diverse astronomy-related programmes. For 2022 events include linking with the IAU Office of Astronomy Outreach (OAO) Dark & Quiet Skies Programme, Astrophotography exhibition at Old Observatory Leiden, citizen science activities, astronomical spectroscopy lectures, lunar eclipse observations and more [1].

The pandemic saw many IDL events adopt online formats. While this facilitated easier international participation, the statistics of events held in the last four years still reveal a lack of participation in some countries. Our focus this year is to understand the challenges faced by the outreach network in these regions.

This contribution aims to demonstrate the significance of a global celebration like IDL in furthering collaborations to engage a wider audience in science, the role of astronomy in achieving wider reach and impact, and the lessons learnt during the pandemic on our societal responsibilities as scientists and educators to communicate to broader audiences to build their trust in science. "We've arranged a society based on science and technology in which nobody understands anything about science and technology. And this combustible mixture of ignorance and power sooner or later is going to blow up in our faces."~ Carl Sagan. [1]lightday.org"

Community Astronomy: TMT's Approach to Education, Outreach and Community Engagement in Hawai'i

With Maunakea as its preferred site, TMT is invested in serving as a conscientious and committed partner with the Hawai'i community. TMT is listening to and learning from

communities in Hawai'i, particularly Native Hawaiian communities, and investing in a future

together. TMT recognizes that in order to build an enduring community-based observatory, the focus must be on creating meaningful long-term partnerships with local communities based on respect, trust, and the protection of nature. Respecting indigenous culture encompasses many aspects, including people, history, traditional knowledge and view of science, and the ancestral connection to land and nature.

In this presentation, we describe TMT's ongoing and planned activities in an integrated program of education, outreach, broader impacts, and community engagement in Hawai'i. Themed "Community Partnership in Education," the program is built on the principles of true partnership with Native Hawaiians and local communities, and on diversity, equity, and inclusion. The program is based on inputs from communities in Hawai'i, developed and executed in partnership with local schools, and consistent with Astro2020's

vision of community astronomy.

Creating Effective Visualizations: Case Studies to Highlight Best Practices and Equitable Tools for Great Results

Compelling visualizations are a critical element in many forms of astronomy communication. These may be data presented as beautiful images or plots, diagrams to convey a technical idea, or artwork that reveal unseen phenomena. The presentation will showcase several recent astronomical visualizations completed by our team at Caltech-IPAC highlighting how active collaboration workflows between scientists, communicators, and artists can lead to effective results. Considerations including accessibility, as well as equity, will be considered, with a focus on how inexpensive, or free, creation tools can be used to generate high quality visualizations.

Crowdsourcing a map of 300+ astronomical locations to create the first international astrophysical online code-hunting game

Five languages, six continents, over three hundred places to discover. Places from which we observe, study, narrate and make sense of the Universe. The International Astrophysical Code-Hunting game is a public engagement activity open to everyone, everywhere in the world, who wish to discover astronomical observatories, research institutes, planetaria, museums, birthplaces of scientists, historical artefacts, meteorites, and more, by using only a smartphone or tablet and the instant messaging app Telegram. The Code-Hunting game is a virtual treasure hunt developed by University of Urbino and its spin off, Digit srl, to practice digital skills and computational thinking by solving coding challenges while exploring the map of a certain territory. The Play.Coding group at INAF, the Italian National Institute for Astrophysics, personalised the game to encompass astronomically relevant locations. The map production was a unique crowdsourcing endeavour that involved over 70 scientists and outreach practitioners from 33 countries around the globe, many of them IAU National Outreach Coordinators. This collectively created map includes famous places and notable people along with intimate locations that are only known locally. We received proposals from all continents, and especially many from Chile, India, the Czech Republic, Mauritius, Slovakia, Slovenia, Spain and Turkey. In the presentation, we outline the various phases of project production and coordination. This activity offers the opportunity to be together, across distances, developing digital skills while discovering the places that have made the history of astrophysics, and keep doing so. The International Astrophysical Code-Hunting game was launched in September 2021 by INAF along with partners in India, the UK, Portugal and Spain. It is currently available in Italian, English, French, German and partly in Spanish at the following URL: <https://play.inaf.it/en/international-code-hunting-game/>

Cultural Astronomy: a tool for communicating Astronomy

Humans have always looked up to the sky regardless of colour, age, race, belief, and education. Celestial bodies have been used by people of the ancient ages to plant and harvest food, travel, tell time, create art and literature, and develop myths, beliefs and practices.

The unique uses of Astronomy in each culture are usually passed down through oral traditions. And with advances in science and technology, this cultural Astronomy knowledge is now usually limited to remote

people with less access to formal education. Some scientists even tend to view this old science as invalid and inapplicable to today's Astronomy.

However, as certain space professionals began to bring together science and cultural knowledge into a "dual" learning environment, where both are viewed as equals, we discovered that these cultures have some factual information about celestial bodies. The cultural representatives shared their stories, myths and knowledge and the science educators taught the young ones about modern Astronomy.

With culture and Astronomy, we hope to bring together people from across the world and educate one another about these ancient cultures, how they have impacted science and what Astronomy is today.

I am proposing a panel discussion of professional cultural Astronomers that will share insights of their experiences, the success stories, setbacks and how culture & Astronomy can promote inclusion, diversity, equity and empathy in STEM.

Dark skies: the first Astronomy Festival in Asiago

The first edition of the Astronomy Festival - Dark skies - took place in Asiago (Italy), from May 12 to 22, 2022. The Festival has been entirely focused on the light pollution problem and the protection of the dark sky as an essential part of the scientific, cultural and natural heritage of humanity. Dark sky areas also offer unique and sustainable tourism experiences, alongside numerous benefits for local communities. Asiago is the venue of the greatest astronomical observatory in Italy and the region around is attractive for thousands of visitors from nearby areas because it is an ideal destination for your holidays every season of the year.

For the first time, such an astronomical event for a large public has been framed here. Main goals of the Festival are: promoting the dissemination of astronomical culture, linking the research institutes with schools and policy makers, promoting "Dark Sky tourism" (astrotourism) as an engine for sustainable socio-economic development. It included two exhibitions: (1) "Above and Beyond", IAU; (2) "In chiara difficoltà", on biodiversity; planetarium shows; astronomical trekking; conferences for public, professionals and amateurs; observations with telescopes and visits to the observatory.

The Festival has been organized in the framework of the financed EU project Skyscape that aims to value the starry sky by promoting a policy of raising awareness on the issue of light pollution not only targeted for professionals in the field.

The main organizer is Comune di Asiago with the partnership of University of Padova, INAF Istituto Nazionale di Astrofisica, IAU Centre for the Protection of Dark and Quiet Sky from Satellite Constellation Interference and Arpav (Agenzia Regionale per la Prevenzione e Protezione Ambientale del Veneto).

Given the success of the first edition, we are now organizing a second edition for next year. I would like to do a report of this experience by discussing the best practices and the critical issues.

Dark Sky Educational Outreach Through Art & Collaboration

Recent research estimates suggest that 99% of U.S. and European populations live under light-polluted night skies. Whereas, Pakistan still has so many dark sky places to protect them from light pollution. Moreover, according to the light pollution map, the trend of

growing light pollution in Pakistan is +3.90% per year because of lack of awareness about this critical issue in this region. There is a need for rigorous awareness activities to engage the public/audience to understand the need of the dark sky and protect them for astronomical observation. This presentation will talk about methods that have created an impact using an interdisciplinary approach for public awareness. How art, media and influencers can play a key role in communication of dark sky protection. These methods demonstrated a huge impact to communicate this critical issue of light pollution in a highly

effective manner. These methodologies helped to inspire the audience in dark sky protection as well as engages stakeholders and authorities to move forward in direction of dark sky protection policy implementation in Pakistan.

[Desert Stars: an experience of transmedia strategy in scientific communication.](#)

The transmedia strategy presupposes the creation and dissemination of different, albeit related, content on different platforms and is built in the relationship with the public [1]. Thus, transmedia strategy can be a rich resource for scientific communication, glimpsing the gradation of public knowledge on the topic addressed. This presentation describes the creation process of Desert Stars, a transmedia narrative composed of six different products: Desert Stars VR (virtual reality documentary), Desert Stars 360° (360° documentary), Searching for Stars is (interactive docugame), A Refuge in the Stars (Feature-length film), GalileoCast (podcast series) and Irifi (art gallery installation). Each piece explores a complementary approach and user experience, based on the specific media and platform [2]. The aim was to reach a varied audience, regardless of their level of access to technology and, by doing that, to approach scientific knowledge from a decolonial perspective [3]. Thus, using Desert Stars as an example, this presentation seeks to enlighten the potential of the transmedia strategy in science outreach. This project is part of a master's degree at the PPGMC of the Federal University of Rio de Janeiro in partnership with GalileoMobile and was carried out during project Amanar: 'Under the Same Sky' - an outreach project that aims to empower and inspire the Sahrawi refugee community through astronomy and promote peace [4].

[Digital and Accessible Communication of Science \(DACS\)](#)

The field of science communication has long been dominated by men in white lab coats and dark suits sharing science with the public in the form of dry facts and esoteric formulae. While this method - the deficit model - was prevalent in the past, it was very much a 'one size fits all' attitude that tended to leave people behind; creating generations of adults who often felt that they simply weren't 'science people'. Our project focussed on the growing success of non-traditional science communication, from scientists, educators, and artists.

We organised a science communication conference to spotlight some of these incredible communicators, who ranged from deep space artists to astronauts. In a series of talks and panel discussions, experts in their fields provided inspiration and insights into key components in producing effective science communication.

The event was streamed live to the public and recorded for future use by educators, communicators, and anyone with a passion for space and science; as well as academics interested in hearing about methods of communicating scientific content.

My presentation discusses the planning and motivation behind this project, as well as some of the key takeaways from its sessions.

[EARLY REVIEW ON SPACE SCIENCE ARTICLES IN MALAY LANGUAGE PRESS NEWSPAPER FROM YEAR 2018 UNTIL 2021](#)

This research being conducted to know the frequency of news article about space in Malay newspapers from the year of 2018 until 2021. News is one of the medium of learning and to connect with people about space science. Although in news also can have some misconception and would cause chaos if it's not being arisen to take action from now. Second objective of this research is to analyse the articles through 5 types of analyzing. This research use manual reading by using digital platform of 5 different Malay's language press (Berita Harian (BH), Harian Metro (HM), Utusan Malaysia (UM), Sinar Harian (SH), Kosmo! (K!)). There are five types of analysis that had been done towards the articles which are analysis characterization, location, source scientific events and science contents. Results shows that the company with the highest published about space science article in Malay's language press is BH that used Agence France Presse (AFP) as their main source. Another finding from characteristics analyses, there was increasing in trend of

publishing from year 2018 to 2021. Next, location analysis shows that Malaysia was the most reported country on overall articles. In extra, scientific event finding gave information about highest reported main scientific event and scientific areas studies were related to astronomy in general (48.3%) and followed by astronomy communication (21.9%) for the second highest reported on scientific areas studies.

[Elimisha Msichana Elimisha Jamii na Astronomia \(EMEJA\)](#)

In Kenya, although 70.4% of girls (15-19yrs) achieve some sort of primary education, only 4.5% complete secondary education-World Bank, 2012. In rural Kenya, the situation is even direr where almost an equal number of both boys and girls sit for the Kenya Certificate of Primary Education (KCPE) but only a small % of these girls sit for the Kenya Certificate for Secondary Education (KCSE). 86.5% of girls aged 9-13 years live in rural Kenya, with 80.8% of them attending primary school but only 14.3% enrolling for secondary education-UNESCO, 2012. These high school dropout rates are due to many socio-economic challenges such as teenage pregnancies, early marriages, female genital mutilation (FGM), poverty and lack of mentorship.

EMEJA is helping to tackle some of these socio-economic issues and to increase the number of girls completing secondary education in rural Kenya. This IAU-OAD funded project is supporting girls and their families through Astronomy outreach, mentorship and inspirational programs, targeted STEM workshops and scholarship opportunities. These programmes are guided and supported by long-term student tracking and monitoring. I will present our work with the local communities in: i) fighting early marriages and teenage hood pregnancies; ii) providing leadership programmes for young schoolgirls (12-20 year-olds); iii) promoting early participation of girls in STEM and thus increasing the number of girls enrolling for STEM subjects through the Astro-STEM workshops; iv) developing resources for these often underfunded and underdeveloped schools (regions); and lastly, v) creating computer literacy which is almost non-existent in these regions. This project has positively impacted over 1,000 schoolgirls, their parents and teachers, and has shown the potential that such Astronomy-led interventions could have in addressing the issue of gender disparity and equality in education in these marginalized regions.

[Encouraging young women to approach astronomy in Colombia](#)

There is a common belief in Colombia that studying hard sciences or mathematics is not a profitable career path; hence, it is highly discouraged in secondary and high schools. This scenario becomes even more dramatic for young women and other minorities, usually associated with social studies and nursing roles but not STEM. This work shows the efforts that I have been carried out to engage these demographic groups in STEM, particularly physics and astronomy. As a woman, I recognize a huge bias in my society toward men leading careers in STEM (most likely due to cultural issues and historical reasons), leaving aside young women that could make remarkable contributions to the field. This proposal develops a thorough description of the different outreach and science communication strategies that I have implemented (while working in Colombia) to invite young people in my country to get involved in science and astronomy, but that can be extended to other developing countries.

The main goal of this work is to motivate young people to choose a STEM career and promote women and other minorities already involved in science-related disciplines. Finally, I mention a few examples of how these actions have positively impacted women who have approached astronomy research at a professional level.

As scientists, we should aim to bring closer science to non-experts, effectively communicate the results from our investigations, and fight fake news and misconceptions widely spread nowadays in the general public. This work is a humble attempt to contribute to this ambitious task.

Engaging the public with Citizen Science

I will present the Hubble Asteroid Hunter project (www.asteroidhubter.org), the first ESA-Zooniverse citizen science project. For one year, 11,000 people engaged in the classification of the famous Hubble Space Telescope archival images for asteroid and artificial satellite trails and strong gravitational lenses (see recent highlight, <https://skyandtelescope.org/astronomy-news/citizen-scientists-find-1000-asteroids-photobombing-hubble-images/>) . Through their classifications, the volunteers provided useful catalogues to different astronomical communities. I will discuss results from this project, as well as how scientists used the forum of the Zooniverse project to engage in meaningful conversations with the volunteers, leading to new surprising discoveries. I will also present a second, ongoing ESA citizen science project, asking volunteers to look for changes in the surface of comet 67P - Rosetta Zoo (<https://www.zooniverse.org/projects/ellenjj/rosetta-zoo>). I will argue that Citizen Science is both an effective data analysis tool in astronomy and efficient for public engagement.

Enhancing the collaborations between professional and amateur astronomers in Spain: the role of the ProAm Commission of the Spanish Astronomical Society

Non-professional astronomers can significantly contribute to key research projects in Astronomy. The collaboration between professional and amateur astronomers is known as ProAm collaboration. Since 2009 the Spanish Astronomy Association (SEA) has housed a specific working group promoting the relationship between professional and amateur astronomers: the ProAm Commission.

The SEA ProAm Commission has just published a report analyzing the status of the ProAm collaboration in Spain. It is the first time that such analysis has been performed in Spain.

This report confirms that Spanish amateur astronomers collaborate significantly with professional astrophysicists, with around a 100 of them being regularly included in science publications and astronomical circulars. The number of ProAm collaborations is steadily increasing with time. More than 200 peer-reviewed publications and almost 5000 astronomical circulars including Spanish amateur astronomers have been published to date.

Both amateur and professional astronomers requested to improve communication channels in both directions. The SEA ProAm Commission is addressing this issue with the development of a specific webpage, <https://proam.sea-astronomia.es> .

In addition, since 2021 the SEA ProAm Commission organizes informative sessions on a monthly basis with the aim of promoting the visibility of the ProAm collaboration in Spain.

The SEA ProAm Commission is also coordinating several training courses to increase the observing and data processing skills of amateur astronomers. All the training courses (material and recordings of the sessions) and the dissemination sessions of the ProAm projects are publically available in the SEA ProAm Commission webpage.

Finally, a code of good conduct applicable to ProAm collaborations and relationships in astronomy has been defined, where the rules and good practices to be followed are brought together to guarantee the well-being of all the people who participate in ProAm projects.

Europlanet: making planetary science relatable and relevant in a post-Covid world

Planetary science can help unravel mysteries of our planet, its origins, its evolution, the conditions needed for life, and threats from our space environment, as well as help inspire the next generation in STEAM. Since 2005, Europlanet (through EU-funded projects and now a membership society) has provided the planetary community with a research infrastructure to share data and facilities, define science goals for the future and bring together ideas and projects. With socioeconomic impact and social responsibility

becoming increasingly a core part of research activities, involving the public and other stakeholders is a priority for planetary science. However, when daily challenges include pandemics and climate change, exploration of our Solar System can appear an expensive luxury. Europlanet thus has goals of (1) engaging European citizens in dialogue, and (2) creating and curating high-quality educational and outreach resources that help communicate the scientific, social, economic, and cultural impact of planetary science. With our pan-European and international remit, we aim to provide resources that can support the planetary community to engage at a local and regional level with outreach activities that can be tailored to different linguistic, societal and cultural needs. This includes fundings and prizes for innovative projects, training, workshops and conference sessions, competitions, social media, and evaluation tools. Support for early careers and widening participation are priorities. Restrictions on face-to-face activities due to Covid have presented both challenges and new opportunities to reach audiences through virtual means, and have also led to new collaborations. In this talk, we will give an overview and practical examples of engagement activities, discuss potential reach and impact, and reflect on diverse and innovative ways to share science. Europlanet 2024 RI is funded by the European Union's Horizon 2020 programme (grant agreement No 871149).

Even with very big news, you should apply embargoes

Even with very big news, you should apply embargoes. That's the statement of David Redeker, a press officer in the Netherlands with a track record in press releases on astronomy. In his talk, David, accompanied remotely by his colleague Marieke Baan (who does not agree with David on all points), introduces three camps. The goal of this talk isn't to convince you to join David's camp, although that would be nice of course. The goal is that you are aware of embargoes and their consequences. So that the next time you are under pressure from scientists, journalists, or from your colleagues or superiors, you can make an informed choice.

In short, there are three embargo camps. The first (David's) is the always embargoes camp. The second camp is the never embargoes camp. And the third camp (Marieke's) is the sometimes embargoes camp.

The first camp (David's) wants embargoes to trusted reporters because it produces better-researched stories with room for independent expert opinions. This is especially important in the age of disinformation. In addition, says this camp, embargoes provide peace of mind for everyone involved. So researchers, spokesmen, and journalists do not have to rush to deliver. Thanks to embargoes, they can still have a private life, in our 24-hour economy. ESO, the European Southern Observatory, is in this camp with 39 of its last 40 press releases. The one without embargoes (and that didn't happen without a struggle) was on the first image of the black hole in the center of our Milky Way

In 2020, an international group of public information officers in astronomy published the white paper "Best Media Practices for Multi-institutional Science Collaborations" (NOIRLab, October 2020:

<https://noirlab.edu/public/products/techdocs/techdoc005/>). David Redeker wasn't one of the authors, but he likes the paper very much. The paper proposes an "all or nothing" approach to embargoes. It says that all trusted reporters should receive materials or no one gets anything.

Facilitating group discussions about the societal impact of large astronomical infrastructures through a PlayDecide activity

The construction of large telescopes for modern astrophysics fosters the advancement of scientific knowledge and requires the development of new technologies which have applications in everyday life, medicine, the production of new materials, etc. Such projects, which are increasingly important as astronomy becomes a driver for development in many countries, could on the other hand disturb local communities, occupying private property or spaces important to local people, using resources or changing the environment, disturbing the habitat of endemic species. This requires a mediation between the needs

of the scientific community and those of environmental and cultural conservation of the chosen location and the communities that inhabit it. The selection of a location for such a project has therefore a remarkable societal impact involving a variety of stakeholders, with a spectrum of advantages and disadvantages for different interest groups that are not always presented in full to the general public. In this context, the working group for inclusion in public outreach and education at the National Institute for Astrophysics (INAF) in Italy has developed a group learning activity based on the PlayDecide format to get acquainted with major issues linked to the construction and management of astronomical infrastructures and to discuss the various interests and opinions at play. PlayDecide is a Creative Commons format for a card game to facilitate simple, respectful and fact-based group discussions, supported by Ecsite, the European network of science centres and museums. This activity can be implemented with students in formal and informal teaching contexts, where debate has become an increasingly popular teaching tool, to practice civic competences and critical thinking in the context of a scientific topic, as well as in informal settings such as science festivals, museums and community centres for adults and general public.

First astronomy science park project in Iraq

(for children who have been affected by the war)

More than ten years, EQSci group has been doing outreach and educating activities by science and astronomy parks. We have used the fascinations of astronomy to draw public attention to science, scientific methods and thinking.

In developing countries, the need to have an interactive astronomy park for example next to an educational observatory or planetarium is recognized as one of the most effective methods of science communication and generalization. It also aims at sustainable economic and cultural development by creating human communities as a tourism element in a smart city!

In this presentation, we share our experience of designing and building an astronomy park in Iraq, as well as attracting the attention of the client (decision makers).

This park is in the final stages of installing equipment, with the start of operation has a capacity of eighty thousand people in a year. Its target audience is children and families affected by the war, but it can be used by the public too. We hope that mentioned astronomy park, decrease pseudo-science, and given the history of Iraq in ancient astronomy, and the development of other Arab countries, it will motivate and boost the self-confidence of Iraqi children to advance of science in their country.

For example, when they are riding a Martian vehicle simulator on Mars with VR glasses and after performing space missions, they raise their flag on the Mars.

We will see the day when these same children return to this center after graduating from the world's top universities to participate in outreach and sci-comm events; As has happened many times in another project (Science and Astronomy Center of Tehran) and our hearts are affected by hearing the memories when they were teenager which how they find out their mental sparks by their presence in our center.

Four astronomy projects to break frontiers

“Space has no limits”, “We live under the same sky”, “the sky is a world heritage”: these are a few common expressions reflecting the idea that our Universe has no frontiers and belongs to everyone. Nevertheless, people from disadvantaged socio-economic backgrounds and/or with physical limitations often lack access to science education.

We will present four projects that aim at breaking down frontiers and bringing astronomy closer to communities which are often excluded from science communication activities and from interacting with scientists and science facilities. We will show how these activities address different types of frontiers:

language, socio-economic circumstances, physical limitations and access to research infrastructures and resources.

“From SKA to the world” project promotes radio astronomy in Spanish and Portuguese speaking countries, dedicating specific efforts to reach rural regions in America. The second project is promoting education in internally displaced communities in Burkina Faso through themed workshops in refugee camps, with the goal of alleviating the trauma endured by this population and stimulating in the children the will to learn and attend school. A third project consists of inclusive visits to Calar Alto Observatory (Spain), focusing on blind, visually impaired and mentally disabled communities, using specific material and methodologies designed for this purpose that can be adapted to other facilities and improve the overall accessibility of a larger public to observatories. Finally, we will talk about why Open Science can be a tool to achieve Equity, Diversity and Inclusion and how facilities, such as the SKA Regional Centre prototype that we are developing at Instituto the Astrofísica de Andalucía (CSIC, Spain) can be used for research, training, education, science communication and public outreach and therefore help to bring big data science to disadvantaged communities and communicate science to the public in an attractive way.

Free astronomy booklets for everyone

Download a small pdf file, print it on a double-sided sheet of paper and fold it into a 16-page booklet with plenty of illustrations. Or read it on your mobile phone. This is what TUIMP (The Universe In My Pocket, www.tuimp.org) proposes to children from 9 to 99 years old curious about Astronomy. The booklets are suitable for schools, astronomy festivals and visits of planetariums.

There are already over 30 issues written by astronomers from different parts of the world. 14 languages are presently available. The project is open to everyone wishing to translate the booklets in their own language.

From a smartphone to the Universe: a virtual reality journey

Nucleosynthesis in stars is a complex phenomenon. It combines the microscopic with the enormous scales of astronomy. It has no obvious links to daily life or macroscopic equivalent phenomena. All of this combined make it a challenging topic for science communication. Furthermore, both astronomy and nuclear physics are (regarded as) male dominated fields, further complicating science communication to female audiences.

A consortium of the Université Libre de Bruxelles (ULB), KU Leuven and the planetarium of the Royal Observatory of Belgium composed a virtual reality experience to explain the origin of the elements in the universe. To capture the attention of the youngsters (the main target public), the immersive journey starts inside a smartphone: the different elements found in the components are identified before their origins are revealed in an impressive 360° visualization of the Big Bang and stellar nucleosynthesis processes. A significant part of the narrative and historical illustrations is devoted to the presentation of the role of the women in the scientific progresses in the field.

This VR experience was presented to the general public during a science festival (N=79) and to visitors of the planetarium (ongoing). Visitors that experienced the VR visualization at both locations were interviewed. Analysis of the interviews shows that visitors, both young and old, both male and female, were impressed and generally enjoyed the experience. What the visitors learned from the VR experience was mostly correct, though very scattered. Most of the visitors indicated they were not likely to look further into the subject. The focus on the role of women in astronomy and nuclear physics was not mentioned by the visitors.

Beyond its innovative aspects in communicating astronomy with the public and its appeal to the young, the case is studied as an example of using VR for science outreach, the first outcomes of which are presented here.

[From Australia to the Universe: developing meaningful engagement with our astronomy research](#)

CSIRO, as Australia's national science agency, has a long history in astronomy research and communication, as well as managing astronomy infrastructure across our country. Australia's leading observatory for radio astronomy, our Australia Telescope National Facility (ATNF) is used by astronomers from around the world, 24 hours a day, every day, to learn about our Universe.

From engaging with the traditional owners of our sites and our first nations communities, through to balancing the needs of our astronomy sites with public access and community engagement, we have more than 50 years' experience in communicating astronomy and space research.

Engaging with more than 150,000 visitors each year, our visitor centres are popular destinations for the local community and tourists. We operate dedicated visitor centres at three sites, and offer events and bespoke media access at our other sites.

Our wide public engagement has led to our telescopes being integrated into Australia's popular culture, featuring on a bar of chocolate and starring in a cult-classic feature film.

We will share some of our more recent lessons learned in our decades of experience:

- using our visual assets, and media and social media engagement, to build awareness of astronomy research outcomes
- engaging with traditional owners and first nations communities, including in communicating research results
- the community benefits that flow from our astronomy research and telescopes
- how we balance local community interest and needs at our restricted access sites
- engaging the community through access to data generated by our instruments, and
- the success we've found with community events held at our sites.

[From the First Fleet to the Harbour Bridge: Sydney's astronomical beginnings](#)

The voyage of the First Fleet from Britain to "Botany Bay" (New South Wales, Australia) was more than a convenient way to rid Britain of its convicts. It was a military invasion, an open prison, a start-up and an experimental community. Largely unknown, it was also a scientific

expedition of sorts. I will discuss the establishment of the first permanent astronomical observatory in Australia by William Dawes, astronomer, engineer, surveyor and ordnance officer---from his arrival in 1788 until the construction of the Sydney Harbour Bridge in 1932. Whereas Dawes' achievements are commemorated in a number of locations around Sydney, many memorials are incomplete or incorrect. We are working with the Sydney City Council to remedy the public messaging, while educating the public by spreading the word to numerous civic societies on behalf of the Australian National Maritime Museum.

[GALAXY CRUISE: What Motivates the General Public in a Citizen Science Project](#)

GALAXY CRUISE is the first citizen science project of the National Astronomical Observatory of Japan (NAOJ) using big data taken by the Subaru Telescope near the summit of Maunakea, Hawai'i. Citizen Astronomers classify and identify interacting galaxies in vast cosmic images, which are displayed one after another on a

PC or tablet screen. Its website has some unique features like detailed training sessions and gamification events.

Season 1 started on November 1, 2019, in Japanese and on February 19, 2020, in English, which was completed in April 2022 with enough classification results for each galaxy. As of April 1, 2022, 9,742 people (of which 6,854 are from Japan) from 92 countries and regions have signed up, and the total classification results have exceeded 2.5 million. Season 2 started with fainter galaxies on April 18, 2022 (in Japanese and English).

In our talk, we will present our key factors to engage Citizen Astronomers and keep their motivation based on the results of the users' questionnaire conducted from July 1 to 25, 2021. The preliminary users' questionnaire results can be read as our NEWS article on October 1, 2021 at:

https://galaxycruise.mtk.nao.ac.jp/en/news_e/20211001.html

How to make your own videos (when you're not really a video producer)

Many communications professionals must now embody several roles which might traditionally be thought of as independent jobs with different skill-sets. In a small communications team this can be a challenge, adapting to new responsibilities outside of our comfort zones, but it also brings great benefits. In the case of video production, these include cost savings, creative control, quick turnaround times, and job satisfaction from learning a new creative skill!

Videos for online do not have to be Hollywood quality to achieve their aims. Informal, behind-the-scenes peeks can be just as effective and popular as flashy, cinema-style creations if they have a clear purpose and suit the audience you are aiming to reach. They are also well-suited to in-house production where budgets may be limited (or non-existent), but where access to people is easy, and knowledge of the organisation is plentiful.

This talk aims to provide a framework for how to produce short videos from start to finish, from the initial planning through to promotion, for those who aren't experts in video production. By sharing what I have learnt through trial and error from my own video production experiences (as a writer with a smartphone), I'll present simple steps that show how with only a few tools, you can produce videos that are professional, shareable and meet your communications goals.

IAU Office for Astronomy Outreach 10-year Anniversary: Astronomy for Everyone Through Access, Communication and International Cooperation

Almost ten years ago, after the unprecedented success of the International Year of Astronomy 2009, the IAU, in a joint venture with the National Astronomical Observatory of Japan (NAOJ), established the IAU Office for Astronomy Outreach (IAU OAO) to coordinate and implement the IAU-led outreach and public engagement initiatives.

In the following decade, the IAU OAO would be involved in the coordination of largescale transnational projects, such as Cosmic Light (during the International Year of Light, 2015), NameExoWorlds (2015) and the IAU 100 years celebrations (2019), relying on the network of National Outreach Coordinators (NOCs) in over 120 countries and territories as the backbone for its international implementation.

With the IAU Strategic Plan for this decade, 2020-2030, the IAU wishes to continue to engage the public in astronomy through access to astronomical information and communication of the science of astronomy.

With ten years of experience informed by our community of amateurs and professional astronomers, outreach professionals and educators, the IAU OAO intends to celebrate its 10 years of existence by scaling up its programs and activities with an emphasis on providing support and "to give back" to this community

that has deeply contributed to the advancement and promotion of astronomy and the IAU mission as a whole through international cooperation over the past 10-years.

This work provides an overview of a decade of establishing a sustainable network for public engagement and outreach initiatives through a collaborative framework facilitating a direct involvement of nearly 1 million people each year in astronomy-related initiatives for the public.

[In the shadow of a successful communications campaign: how to live up to the hype of the first black hole image?](#)

In April 2019, the Event Horizon Telescope (EHT) Collaboration showed the world the first image of a black hole. This breakthrough was the result of years of work by a large team of international experts, and the presentation of the image itself followed an unprecedented communications campaign coordinated by EHT scientists and communicators. This promotion and dissemination campaign was a huge success with potentially billions of people viewing the image.

How do you follow that? The Earth-sized EHT is, in theory, capable of imaging two supermassive black holes that have roughly the same size in the sky: that at the centre of our galaxy and the giant in the Messier 87 galaxy. The latter was the subject of the first image of a black hole published in 2019. Three years later, the EHT Collaboration announced that they were going to share their “groundbreaking Milky Way” results with the world.

In this presentation, two communicators from ESO and the JAO, who were strongly involved in the campaign to promote the EHT's Milky Way results, will share their experiences. While ESO is not member of the EHT Collaboration, it plays a major role by funding and operating two of the EHT telescopes (ALMA and APEX, both in Chile). Further, the ESO Department of Communication was tasked with organising the European press conference to announce the new EHT results, becoming one of the major partners in the communications campaign. The JAO, while not a member of the collaboration, also plays a major role in it through managing ALMA activities in Chile. Further, the JAO organised a press conference in Santiago, building from the experience of organising a similar event in the 2019 communications campaign.

The presentation will focus on the challenges of planning major communication events during a time when the covid pandemic was still upending lives around the world, and of attempting to live up to the hype of showing the world the first ever image of a black hole.

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INCLUSIVE ASTRONOMY COMMUNICATION FOR THE DEVELOPMENT OF STEAM EDUCATION IN DEVELOPING COUNTRIES

This project highlights the use of Astronomy to foster inclusiveness and also as a tool to counsel, heal and educate traumatized children from conflicts related to farmers-herdsmen and Boko Haram insurgency in Nigeria. According to UNICEF and National Bureau for Statistics, about 13.2 million, up from the 10.5 million children from previous year, are out of school in Nigeria. <https://www.unicef.org/nigeria/education.html>

The number of displaced persons in Nigeria has since increased further due to the constant attacks by Boko Haram Insurgents on villages in many parts of Northern Nigeria. This situation has the potential to cause greater problems of inequality, poverty and reduced opportunities for children caught up in these conflicts.

The project provided solar powered Astronomy Learning Hubs for IDP camp kids. The hubs have helped to create awareness about Astronomy with children that have been displaced due to the insurgency. Communicating Astronomy in indigenous languages has helped to improve learning and understanding among kids. Project activities included many hands-on Activities, such as educative documentaries, Star gazing with Telescopes & several others. A major aspect of the project featured counselling sessions by professional counsellors to carry out Cognitive Behavioral Therapy (CBT) on IDP kids who are mostly traumatized.

We used Astronomy as a tool to educate the children that participate in the outreach, using the installed solar powered learning hubs to conduct follow up e-sessions. This project has helped to get many out of school kids interested in enrolling in schools provided by the government for the IDPs. With this project, we have also used Astronomy as a tool to popularize STEAM among the IDP kids.

Some of the reports of this project can be found on our blog at <https://awbnigeria.org/idp-children-astronomy-outreach-project/>

Some of the activities of AWB Nigeria team are documented on our website at <https://awbnigeria.org/>

[Inclusive educative outreach for people with motor impairments in planetariums and observatories](#)

We represent the IAU Equity and Inclusivity Working Sub-group on Motor Impairments for the IAU, and seek to develop strategies, programs, and activities that will inspire planetarium and observatory workers to consider and act on the accessibility limitations of their facilities for better practices of outreach. Our first goal was to collect data on how visitors and employees with motor disabilities can access and enjoy these planetariums and observatories. For this purpose, we have carefully developed a survey which is currently being disseminated worldwide. In this talk, we will present the preliminary results from this survey.

[Inclusive Outreach subWorkgroup: sharing, learning, experimenting, connecting](#)

Would you like to show the sky to a blind person, or allow a person in a wheelchair look through a telescope? It's easier than you think. Just read on!

Public engagement in astronomy is an extremely important activity for professional and amateur astronomical communities, and for all of society. One specific strategic goal of the IAU Strategic Plan 2020-2030 is to “Engage the public in astronomy”.

There are many outreach activities taking place worldwide all year but, unfortunately, most are not designed to be accessible to people with disabilities, excluding the disabled from equal access to astronomical information and communication of the science of astronomy.

There are many examples of interesting inclusive practices and skills developed by amateurs and professional astronomers in different countries, developed through years of practice. But these examples are usually isolated and unknown to others, known only to the team that developed them rather than at a regional or national level.

In 2020, the IAU Executive Committee WG Astronomy for Equity and Inclusion introduced the “Inclusive Outreach (Inspiring Stars) subWorkgroup” (IO-sWG), with the mission to foster and facilitate the adoption of inclusive practices in astronomy outreach activities around the world.

The working group has created a publicly available “Inclusive Outreach Starter Kit” to assist outreach practitioners in adopting inclusive practices, and has been developing a community to spread these practices. The group is now running quarterly online symposia to share concrete examples of inclusive outreach activities, and is working on a development program to assist individuals in their inclusive outreach learning path.

This presentation will cover the details of the “Inclusive Outreach (Inspiring Stars) subWorkgroup”, the “Inclusive Outreach Starter Kit”, other planned activities of the IO-sWG, and how you can join and participate the program and the community supporting it.

[Inclusive Universe: Language of astronomy accessible for all.](#)

Nepal being a zone prone to natural calamities comprises of people from different caste, religions, ethnicity and needs. Among which people of disabilities are more prone to less resources and information for their holistic growth. Particularly when it comes to STEM field, people with special needs see no scope and are confined to very limited dreams. Nepal Astronomical Society (NASO), having its network around the globe is now trying to make astronomy accessible to all, have started collaborating with groups of special needs along with those from minority and underprivileged groups. This has not only created an environment to communicate astronomy through some prevailing language but has tried to incorporate the language that a blind can see and a deaf could hear and minority group can embrace the right to have its accessibility.

Thus, my paper will be sharing about the activities NASO has initiated to bring awareness about the scopes of astronomy and space science through various modes of communication to give a light to everyone enthusiastic along with its impact, challenge, and its mitigation measures.

[Increasing astronomy outreach in Romania with science festivals](#)

Eastern European countries, in particular Romania, offer much fewer opportunities for science and astronomy outreach compared to the West. Romanian Science Festival (www.romaniansciencefestival.ro) was founded in 2018 with the aim of answering questions raised by the inquisitive minds of children all over the country. In 2019, we reached over 20,000 people with our live events: open-air science festivals, space talks, and astronomical observations. During the COVID-19 pandemic, we organised 58 live webinars of over 75 hours in total, one of the largest scientific resources in the Romanian language. Moreover, we visited 150 schools across the country, including rural areas, providing an opportunity for students to meet scientists online.

Space-related topics are a key focus of the science festival as they are not included in the Romanian school curriculum and the active research in the country is rather limited. That is why the resources in the form of the expertise and career orientation offered by our mentors from the academic diaspora are so valuable to the students. The topics we address include asteroids, black holes, extrasolar planets, the Milky Way, space exploration and satellite design. In the last two years, we organised a 'Space month' during which students had the opportunity to discover careers in space, participate in competitions, meet the only Romanian astronaut, Dumitru Prunariu, in celebrations of 40 years' of his space flight and a former NASA Director of Astrophysics. All these activities expose the public to the latest discoveries in the field, thus highlighting the importance of investing in fundamental research. This is just the beginning. The Romanian Science Festival story will continue because our team is determined to create a systemic impact in the country. We will continue to add new chapters, stimulating the curiosity and imagination of people fascinated by science and space.

Inspiring inclusion in Astronomy with "Inspiring Stars"

The IAU celebrated its 100th anniversary in 2019 by organizing activities and exhibitions all around the world. One of those exhibits was "Inspiring Stars", which mainly focused on inclusion in astronomy by highlighting, in particular, the need to include underrepresented groups and people with disabilities in order to make Astronomy a more diverse science, and to benefit from the talent that these persons can bring into the field of astronomical research and outreach. The exhibit aims to inspire the love for science and to foster a committed engagement to the equal participation of people with disabilities in the field of astronomy.

"Inspiring Stars" is an itinerant international exhibition promoted by the IAU to support and promote initiatives all over the world that are addressing and encouraging inclusion in outreach, in education at schools, and on a professional level in astronomy. The final goal is to guarantee equal participation for everyone in the world of professional astronomy and outreach, and to broaden the horizons of children, parents, teachers, and astronomers. The exhibit targets all publics from ages 8 to 100.

"Inspiring Stars" is a collaborative experience where physical resources related to astronomy Research, Communication and Development are requested and collected from astronomers around the globe, and eventually combined in a unique event. The materials are designed to allow persons with visual impairments (BVI) to have direct contact with and to explore the most relevant features of a range of different celestial bodies, like a particular set of tactile 3D globes of the terrestrial planets and the Moon, or mockups of telescopes. The Inspiring Stars exhibition also showcases assistive research tools and inclusive practices.

The exhibition has raised the interest of international organizations like the United Nations (UN). Some representative elements of Inspiring Stars are showcased in a permanent exhibition at UNOOSA in Wien.

International Tourism development; with combination of culture, environment and astronomy

Tourism is one of the most important industries in the world and it directly effects the economic system of each country. However it also has a strong connection between culture, history, environment and education of each country. Astronomy is a field that combine all of these areas and using astronomy we can connect special areas together and improve the tourism business in a country.

Iran is a country which a huge culture and history and contains a special nature and society. Iranian people experience a life of many cultural ceremonies and special events during each year of the Persian calendar. There has been some events of Persian ancient ceremonies in cooperation of ADIS and many countries have been participating in these events and enjoyed a event of ceremony, astronomy and culture.

Our idea is about to use our experience in Iran and increase in other countries in order to develop the tourism industries. One part can be carrying out special ceremonies. One can be using deserts of Iran which are very great places to have a very clean sky for observation. There are also some special educational festival such as “sky explorations” in order to combine all of these aspects and help students understand more about the importance of tourism and culture.

LCO web in Easy Read: Inclusive Astronomy Communication for People with Intellectual Disability

Las Campanas Observatory (LCO), part of the Carnegie Institution for Science (USA), has been consolidating its science outreach project in Chile over the last year. One of its goals is to make science outreach accessible to everyone regardless of their social, economic, ethnic, gender or disability status.

Thus, within the outreach activities developed by the observatory we can see accessibility tools, such as sign language and the support of tactile material as a way to connect people with disabilities with the development of science in a close way, adapting our way of doing outreach. The good experience of previous activities motivated us to continue adding new audiences, this time people with intellectual disabilities.

“LCO in easy”, is the creation of the web www.lecturafacil.lco.cl, a web page adapted in easy reading and with visual accessibility tools of the original web of the observatory.

The easy reading is a way of adapting text in its entirety, including images and layout in order to make it as understandable as possible for people with intellectual disabilities where they are adapted in a close way, using familiar vocabulary, simple but concise sentences. The use of easy reading helps people with intellectual disabilities to have access to information, encourages reading as a form of entertainment and also promotes their independence.

The process of carrying a text to easy reading consists of 3 parts: adaptation, validation and publication.

We highlight the validation step as the most important process, since this is the one that links us directly with people with intellectual disabilities, who give us their feedback and that ensures that the information is completely understandable.

Memories from Sahara nights. Preserving traditional astronomy of Western Sahara with Amanar

The Sahrawis are a traditional bedouin society descendant of the Arab tribe Beni Hassan, that migrated from Yemen and expanded throughout the Western Sahara desert in the early Middle Ages. Because of their semi-nomadic lifestyle, they developed a deep knowledge of the sky that is seriously threatened due to the predominantly oral way of transmission of their culture and the dramatic break with the traditional practices, which started with the Spanish colonization in the late 19th century and the later Moroccan occupation of the territory. This fact forced thousands of people to exile and settle in refugee camps around Tindouf (Algeria). This work is part of the project ‘Amanar: Under the same sky’ by the volunteer science education initiative GalileoMobile (GM) and the Canary Association of Friendship with Sahrawi People (ACAPS), in collaboration with the Instituto de Astrofísica de Canarias (IAC). One of the main aims of Amanar is the preservation of the Sahrawi traditional astronomical knowledge and during an expedition to the refugee camps in 2019, a number of interviews were carried out. Going a step further, in 2021 Amanar offered five grants to Sahrawi researchers in the camps, who are now part of the team and are leading the efforts recovering several testimonies from their elders. Furthermore, all these wisdom has been incorporated in astronomy workshops for Sahrawi teachers and will be included in the activities for students in order to increase their interest in astronomy. Here we present the previous results obtained from the first interviews carried out in 2019, which suggest that an older cultural heritage remained for

centuries in the Sahrawi conceptions of time, space and rituality. But more importantly, we will show how the results of these initiatives are offering alternative educational opportunities and support to people that are actively participating in the preservation of their own history.

Misinterpretation of Astronomy News Conveyed by Media in Malaysia

The media as in general plays an important role in conveying any type of news to the public. The public becomes dependent especially on mainstream media as it is the easiest way to get information and the most popular source of information. Astronomy is seen as a general topic of science by the media in Malaysia where, even without having a deep understanding about astronomy or having subject matter experts, they can explain to the public. However, when the media misinterpret the news like astronomy related news, this will cause the spread of inaccurate information among the public. This project includes a thorough research of collecting and analyzing astronomy news reported by the media in Malaysia. It includes news reports from mainstream media such as television, radio and newspaper, social media influencers such as instafamous or tiktokers or bloggers and others. Among the inaccurate information that has been spreading was the phenomenon of a huge solar storm hitting Earth and causing aurora to be seen until Malaysia on 14 March 2022. In order to counter back the misinterpretation of astronomy news conveyed by the media, we came up with a solution using an online platform via a website called “Apa Sebenarnya” for the public to get the true information. This platform is a newly published website of 17 months old. Even though it is less than 2 years old, the website gains a high traffic especially when we explain about hoax news. Total views of the website till May 2022 nearly reach 7000 views. It is hoped that this platform will become one of the trusted sources of astronomy information in Malaysia for the public to get the truth. Through this project, participants will get to know the example of misinterpreted astronomy news by the media, the importance of having a subject matter expert in the media organization and learn about the “Apa Sebenarnya” platform which can be a guide for participants.

Mission 2030 Contemporary Opera: a transdisciplinary approach on Mars terraformation

The first manned trip to Mars is planned for the year 2030, and the same year is the deadline for achieving the Sustainable Development Goals. Both tasks require technology, infrastructure and an awareness of our planet. From today's perspective, which is easier: Terraforming Mars or rescuing the Earth?

Under this premise, in the Mission 2030 project, we question from an artistic approach the various problems that humanity will go through to settle on the red planet, making a comparison with the existing problems on earth. With the aim of generating awareness reflections about our responsibility with the environmental impact.

The product of this project is an experimental contemporary opera of four acts and a virtual prologue, based on current scientific data on the Terraforming of Mars. Each act addresses a specific artistic approach that highlights the characteristics and challenges of each stage according to the Martian Terraforming process and in turn with four of the sustainable development Goals. The opera is presented in digital format through a website. In this virtual space the spectator is able to live the immersive experience of being a space crew member and its guided through a science and science fiction narrative, from takeoff to the long journey to the red planet and its four stages of terraforming, through a combination of body movements, real sounds of Mars, fictional soundscapes, corporeal landscapes and reinvented landscapes.

The latter is an interactive platform, in which the spectator obtain upon registration along with his Boarding Pass which allow the participant to become actively involved with the project, before, during and after the staging.

At the end of the experience, the participant answer the question “Are you staying or leaving? We hope that the participant will make an intrinsic reflection on how complex it is to find a habitable world like ours and the relevance of taking care of planet Earth.

NASA's Universe of Learning: A thematic approach to engaging learners in astrophysics

The NASA Science Mission Directorate's "Science Activation" program, established in 2016, is a new approach to help learners engage with NASA science, shifting away from the former mission-by-mission approach to education and public outreach. Competitively-selected teams connect NASA science experts, content, and experiences with communities to activate minds and promote deeper understanding of our world and beyond. Our Science Activation program, NASA's Universe of Learning (NASA's UoL), leverages a new partnership model involving the Space Telescope Science Institute, Caltech/IPAC, Center for Astrophysics | Harvard & Smithsonian, NASA Jet Propulsion Laboratory, and Goodman Research Group to advance NASA's goals for Science Activation.

NASA's UoL efforts focus on translating the cutting-edge science and stories of NASA's Astrophysics missions and research programs into compelling, effective, thematic, informal learning resources and experiences. By combining resources and expertise from across our institutions, the NASA's UoL partners are able to create and disseminate learning resources and opportunities based on scientific discoveries from across NASA's Astrophysics programs. Our products are informed by audience needs, with an emphasis on broadening participation. We developed a thematic Content Development Framework to facilitate cohesive use of NASA Astrophysics assets and to ground our work in best practices in informal science learning. The framework includes a set of Science Content Themes that encompass the breadth of astrophysics science, including the process of science, and evidence-based Strands of Informal Science Learning identified by the National Research Council. NASA's UoL uses this Framework and its direct access to mission science and expertise to create a cohesive portfolio of products and experiences that respond to audience needs in order to engage learners of all ages and backgrounds to explore the universe for themselves.

Nature Astronomy's role in communicating astronomy for a better world

Astronomy and space have much relevance to society, but the main vehicles for the communication and exchange of ideas in our field — academic journals — largely tend to limit themselves to publishing pure research papers. Nature Astronomy is also perhaps best known for publishing astronomy and planetary science research, but it has an active magazine section containing comment, opinion and other community-relevant articles. The editorial team have chosen to leverage this unique platform to address and discuss significant issues within research communities and the wider world, particularly connected to the UN Sustainable Development Goals (SDGs). Since its launch in 2017, Nature Astronomy has published content addressing gender equity (SDG 5, SDG 10); climate change (SDG 13) and its connection to astronomy; orbital pollution (SDG 12); and economic and educational growth in developing regions of the world (SDG 8, SDG 9). Many of these articles and special issues have been very widely read and discussed in the astronomy community and beyond, making their way into the mainstream news media, for example. In this conference contribution, I will give some examples of these articles and their impact, highlight the unique role that Nature Astronomy can play in bringing attention to important topics in the research community and the public sphere, and explain how people in the astronomy community can get involved in communicating their efforts at making a better and more equitable world.

Ohana Stargazing: Bridging Traditional and Modern Astronomy

With Maunakea as its preferred site, the Thirty Meter Telescope International Observatory (TIO) is invested in serving as a conscientious and committed partner with the people of Hawai'i. TIO is listening to and learning from Hawai'i communities, particularly Native Hawaiian communities, and investing in a future together. Native Hawaiians are astronomers. Just as modern astronomy practices observations of celestial objects to learn more about our universe, so do Hawaiian communities practice observational science in order to care for the land and its people.

'Ohana Stargazing brings public stargazing events to Native Hawaiian Communities with the purpose to develop relationships within the communities with public schools, libraries and/or social clubs and later enable them to host their own stargazing events through workshops and trainings. Stargazing events primarily consist of telescope viewings and the sharing of cultural star stories and constellations while remaining adaptable enough to collaborate with and include local community organizations who explore various perspectives of sky knowledge. Understanding Hawai'i Astronomy today, including its traditional and modern methods, allows us to better meet the needs of the many Hawai'i communities and informs the new community-based approach of TIO.

[ORION Astro Lab: Transferring skills and best practices to Aspiring Astro Club Leaders](#)

Over the past decade, a number of astronomy projects and initiatives have been launched to promote and communicate Astronomy in all its aspects in Madagascar. This led to an increased interest in astronomy from the Malagasy youth and the general public. However, there are only two astronomy associations (based in the capital city) that actively run regular outreach initiatives for 22 million people in the country. Such a huge deficit presents major challenges if one wants to make astronomy inclusive and accessible to all. In close collaboration with NOC Senegal and various local and international key stakeholders, NOC Madagascar has recently launched ORION Astro Lab. This is an ambitious project aimed at orienting, transferring skills and best practices to aspiring Astro club leaders coming from various regions of the country. A three-day intensive workshop was held to equip and exchange with the participants on relevant topics such as the role of social media in communicating astronomy with the Public, and using outreach activities to promote Astronomy words in Malagasy (the mother tongue). ORION Astro Lab is an initiative that is expected to help lay the foundation in building a strong network of amateur astronomers who in turn will help the NOC to communicate astronomy with the Public. This talk will present some best practices in public outreach that were developed and discussed during the workshop component of the project.

[Pivoting in the Pandemic: Moving to an online outreach model at the Dunlap Institute](#)

The Dunlap Institute for Astronomy and Astrophysics has a strong commitment to sharing astronomical discoveries with the public, and up until early 2020, had a comprehensive public outreach program consisting mostly of in-person events. These included Astronomy on Tap, Spacetime, the annual Planet Gazing Party, and regular planetarium shows. Once the lockdowns due to the global covid-19 pandemic occurred, the Dunlap Institute pivoted to an entirely online model for Astronomy Outreach. We began hosting lectures streamed live to YouTube, interactive Astro Trivia Nights, live panel discussions, and a Virtual Planet Party, while also publishing videos with higher production quality such as the Cosmos from your Couch series. The challenge of switching to virtual outreach was in maintaining the same level of engagement with our audience as we had with our in-person events. We found that we were able to keep our viewers interested through interactive online activities, live chat, and quality production. In addition, we expanded our reach to audiences who would not normally be able to attend our in-person events. Hosting our events on platforms such as YouTube has also provided us with concrete information about our audience, such as their level of engagement and demographics. We will describe the virtual events hosted over the last two years, how we used online tools to keep our audience engaged, what the audience response was to our activities, and how we plan to continue with online engagement in the future as the pandemic restrictions lift.

[PIXEL - Picture \(of\) the Universe](#)

Game based learning (GBL) studies how games can be used as effective tools for improving engagement with disciplines, but also with their processes, contributing in fostering soft, life and citizenship skills. The ability games have in committing the player with the practices and not only the disciplinary contents, make GBL very effective in sciences. Image resolution is a crucial element in astrophysics, but the intrinsic

complexity and challenges of making an high resolution image of the distant universe are not easily and generally perceivable. Images that may not look aesthetically appealing, are dense of meaning and show the power of the technology used to produce them. We believe a board game like Pixel – Picture (of) the Universe is a very effective tool to fill in this discrepancy and restore the complexity and humanity of scientific processes

The game was co-designed by INAF researchers and professional game designers within the framework of the collaboration in the Game Science Research Centre, The original idea to put image resolution into a board game transformed in a joint effort to give to the players the flavour of the scientific research processes, the passion and the wonder scientists feel for their work when trying to unveil the secrets of the Universe through avant-garde technologies.

The game was tested in the two major Italian game conventions, proving to be very much appreciated by acquainted players, used to commercial games.

The evaluation system developed on purpose, showed a great engagement with the mechanics, besides a strong appreciation for the originality of the theme and the connection with the scientific world.

Promoting Astronomy Education in Ghana through School Visits and Astronomy Clubs

PRAGSAC (Promoting Astronomy in Ghana through School Visits and Astronomy Clubs) is a STEM outreach programme that uses school visits and the formation of astronomy clubs to increase astronomy education and communication in Ghana. The Ghanaian government and other organizations are concerned that only a small number of students are interested in pursuing STEM subjects, such as astronomy. Furthermore, astronomy is not currently taught in Ghanaian schools or colleges, and little is known about the GRAO since its inception in 2017.

After realizing the importance of astronomy to development and the need to communicate astronomy, a group of enthusiastic students founded the PRAGSAC program. The team's goal is to create awareness of Ghana's Radio Astronomy Observatory (GRAO) and promote astronomy education through school visits and outreach programmes. By targeting Junior High Schools (JHS), the PRAGSAC team seeks to motivate students to continue to pursue STEM throughout their academic career.

We piloted an astronomy outreach programme in seven JHS in Ghana, with a trained teacher at each school to run the astronomy clubs. During the astronomy club engagements and the teacher training workshop, an inquiry-based teaching and learning methodology was used, allowing both students and teachers to explore, ask questions, and use hands-on activities to consolidate learning and combine fun with practical inspiration. We performed pre- and post evaluation surveys, in addition to a longitudinal survey. These show that students not only learn a lot from this program, but they are also inspired to continue their STEM education through senior high school. This method is recommended as one of the approaches for promoting STEM in schools and increasing public awareness of astronomy. The purpose of this talk is to highlight the findings and initiatives that were used to raise GRAO awareness and communicate astronomy to the public through astronomy clubs.

Reaching the Unreached: Astronomy for Sahelian Africa

We report on a two weeks mission carried out last February to the Sahelian countries which included Chad and Niger (Mali was dropped due to frontiers closure...). I proposed it as AfAS president to reach out to those neighboring countries to Algeria as part of an AfAS action plan to have all the African countries on the Astronomy bandwagon for GA2024 in Cape Town.

The program success was beyond expectations with 30 activities between Chad and Niger, including five Universities and a number of educational structures at various cities there, as well as action towards the civil society, some social action coupled with some Radio and national TV appearances. This sensitization

and educational campaign to some of the poorest and least developed countries in Africa, could make a lasting impact and arouse vocations in Astronomy.

It could be carried out for other groups of countries in Africa which have some 24 countries completely off the astronomy map as joint actions bringing together AfAS, OAD, OAO and astronomy associations from neighboring countries, and could be the seed for the development of astronomy in those countries. The challenge was to reach in a coordinated way the various stakeholders, at the various universities and the public at large. The contact chain percolated from Presidents of the Universities (though ambassadors of those countries and personal contact), and from there to the physics departments (Physics being the closer to astronomy), and through the faculty members or the deans of Faculty of sciences, to the officials at the Ministry of Higher Education and to the High School directors.

The roles of our colleagues from the Faculty of sciences was crucial in this chain. In addition to seed planting for astronomy and also the awareness it imparts to officials in those countries on the importance of astronomy as a fundamental science, it is a catalyser for science in general in view of the very positive appreciation of the public for astronomy.

Science communication and engagement framework for astronomy development in local communities

This paper will focus on the field of Radio Astronomy and the community engagement process linked specifically to the MeerKAT construction and the preparation for construction of the Square Kilometre Array in South Africa's Northern Cape Province. This paper will share the broad framework that comprise the method in which it is consistently guided by an audience analysis process, the information evaluation process from a multitude of formal, informal, academic and non-academic sources, the dissemination of information and engagement, and the ultimate evaluation and establishment of effectiveness. The paper will then present possible best practices for science engagement and communication in rural communities that are predominantly guided by the collective beliefs of a social structure that tend to be resistant to scientific change and hard facts.

Shadow Theatre Of Milky Way's folklore as the mechanism to create awareness in preserving the night sky.

Starry night sky is one of the magical inspirations for a lot of big names such as Van Gogh, Holst, and Shakespeare. On the contrary, nowadays, the starry night sky really seems expensive due to light pollution. There are a lot of people who are still unaware of this issue since light pollution does not have a direct impact on our daily lives.

Apadilangit; Universe Awareness Malaysia designed a program to amend people's misunderstanding about the night sky, what is actually light pollution, as well as provide explanations on why it is so vital to protect our sky. The main purpose is to mobilize more people to conserve the night sky.

Wayang Kulit is a traditional Malaysian cultural theatre that is known by the shape of a shadow puppet that entertains audiences with various classic stories. Due to the pandemic, we are innovating a virtual shadow theatre to make it closer to the public. We conduct a virtual performance using the concept of Wayang Kulit that includes elements of local culture and astronomy. With the title "Bagaimana Bima Mendapat Sakti (How Bima Got Her Magic)", the story is about a reprint of the battle between Bima and the dragon that was written in Mahabharata manuscript. Cultural values are still being respected. Real visuals, accents, and traditional music are all preserved, making it practically identical to a physical shadow play.

The story is chosen to raise awareness about the beauty of the night sky. With understanding from a wider range of people towards our sky, we believe the community will begin to care. We are also assisting the audience in monitoring local light pollution levels.

From this project, we can learn one of the practical and unique ways for cultural adaptation to astro-tainment. Secondly, we can get to know the impact of society's awareness on conserving the night sky. Finally, we can discover about the integration of astronomical knowledge into Malaysian culture, particularly in Wayang Kulit.

[Sorvegliati Spaziali: an innovative outreach project on Planetary Defense](#)

Planetary Defense stands out among the various topics of space sciences as an endeavour which the general public can more easily understand and appreciate. Despite this, outreach in Planetary Defense is a rather new field worldwide and with few coordinated products. In addition, frequent media false alarms, doomsday predictions, collective imagination biased by apocalyptic movies show that Planetary Defense is currently an area for misinformation. Hence, an accurate and effective public outreach campaign is essential.

Sorvegliati Spaziali – know the Space to protect the Planet– is a project of the Italian National Institute for Astrophysics (INAF) developed in collaboration with external research institutions, web design and theatre companies, and represents one of the first coordinated public outreach initiatives on Planetary Defense by a research body: from near Earth asteroids and comets to space weather, from meteors and meteorites to space debris, as well as prevention/mitigation strategies of their possible effects on the Earth environment.

The core of the project is the Italian entirely graphic and multimedia website sorvegliatispaziali.inaf.it available online since October 2021 (English version is planned), which intends to become a national point of reference for information and in-depth content on Planetary Defense, timely disseminating scientific and cultural knowledge through a variety of original multimedia state-of-the-art INAF information products, meanwhile relaunching news from other national and international research bodies.

INAF original products, all with a coherent visual identity, are: educational video-clips, interviews to scientists, geolocalized map with live satellites tracking, augmented reality and 3D computer graphic content, video-recorded theatrical pills, solar and Near Earth objects bulletins, infographics, a glossary.

The projects is endorsed by the Outreach Office of the NASA Planetary Defense Coordination Office.

[Starwalking in Rome: a Cultural Astronomy Project in the Eternal City](#)

Rome has been at the center of the history of astronomy for centuries, from the Roman empire to the research led by its universities today. Thus, the city is full of landmarks, monuments, artworks and stories connecting the Eternal City with the sky. This vast material and immaterial cultural repository lays inside museums and often in the open air before everybody's eyes, just waiting to be noticed, offering countless possibilities to drive the public attention to science.

Since 2011 I have been cooperating with a local tour guide and art historian to create guided itineraries through the city, engaging the public in an innovative exploration, a reading of its timeless collection of art and history under a peculiar "lens": an astronomical key to Rome.

The Starwalks are guided tours taking place at dusk along different routes, connecting places reminiscent of Rome's astronomical past and present, leading to a selected location – as dark as possible given the intense light pollution – for stargazing with a telescope. Observing from places like the Circus Maximus, Piazza Navona or the Roman Forum does not present ideal astronomical conditions, but combines history, art and science in an inspiring way.

We created more than 45 different Starwalks, based on a variety of thematic links between the city and the stars: among them, the ancient planetary gods and the planets in the sky, the discovery of exoplanets under the statue of Giordano Bruno, the importance of light in art and in astronomy. Observations included eclipses, planetary conjunctions and oppositions, ISS transits, and some deep sky objects.

The Starwalks in Rome have been followed by approximately 2500 participants, in groups of 20 to 60; a typical duration is 2,5 hours. Their format can easily be exported to other locations to emphasize their historical and astronomical heritage. This project was invited as a reference for astrotouristic initiatives at the IAU Chianti Topics Workshop in 2018.

[STI Indicators and the Design of the 2022 Edition of Women and Girls In Astronomy IAU Global Outreach Project](#)

Since 2019 the IAU Global Outreach Project Women and Girls in Astronomy takes place annually between the International Day of Women and Girls in Science on 11 February and the International Women's Day on 8 March with the aim of promoting the inclusive advancement of astronomy. The IAU Office for Astronomy Outreach (OAO) set two overarching goals for the 2022 edition: a) to challenge perceptions, attitudes, behaviours, social norms, and stereotypes towards women in Astronomy, and b) to foment the uptake of astronomy by girls. The project was guided by the findings of the "Gender Gap in Science" project and by UNESCO's STI gender indicators (SAGA project) leading to the implementation of a diverse portfolio of activities that aimed to promote the visibility of women in leadership positions within the astronomical field, highlight diverse profiles of women in astronomy, and mainstream gender perspectives in astronomy outreach. Furthermore, activities avoided gender determinism and the presentation of a limited and stereotypical way of being a female astronomer. The project intently shared the impact of individual and diverse cultural experiences in the astronomical field. Although many challenges continued from previous editions, the 2022 edition of Women and Girls in Astronomy saw an increase in various project KIPs, including the number of outreach events highlighted and online engagement. This session aims to share lessons learned on how to embed gender-sensitive approaches in outreach projects and programmes – all year round.

[Survey of Personas and Audience Interests of Online Astronomical Events among Audience of Nojum Magazine's Webinars in the One Year After the Outbreak of Covid-19](#)

Many countries suspended all public astronomical activities after the outbreak of covid-19. Iran was no exception, and most astronomy activists were not allowed to attend any events.

One month after the official announcement of the outbreak of Covid-19 in Iran, Amateur astronomers used this threat to create new opportunities to keep interacting with the audience and the public, as well as to try to reduce Covid-19's psychological effects during Lockdown; this community also hosts live events, live chats, and promotional and educational webinars. In Iran alone, the Nojum magazine, published for more than three decades as the only public astronomical magazine in the Middle East, held 67 free webinars for promotional and educational purposes one year after the outbreak of Covid-19. Examining these online events shows the effect of the subject's attractiveness, the reputation of the presenters, and the extent to which it is applicable or not on the registrations in the programs. In this article, by examining the registration data in these events, we present results that give us a clearer picture of the audience and their interests; How many people from the capital and other cities and provinces registered in these webinars, and what kind of people the general audience is in different age groups. The results of this study help to show the true face of the audience of online astronomy activities and educational programs in the Middle East so that other online and hybrid extension programs can be more effective.

[Sydney Observatory: Communicating astronomy through the Museum's collection, exhibitions and programs](#)

Sydney Observatory is the premier destination for astronomy in NSW. The Observatory was built in 1858, and operated as a working observatory until 1982, when it was transferred to the Museum of Applied Arts and Sciences, and converted into a public observatory, museum and site for astronomy education.

Our communication activities are multi-faceted, encompassing the historic building and site, exhibitions, public and education programs, and print and online publications. Underpinning the exhibitions is our unique collection of artefacts relating to astronomical observation and discovery (historical and contemporary). We collaborate regularly with professional astronomers and other academics through our research fellowships and residency programs, and frequently provide expert media commentary for astronomical events.

In addition, the observatory has important roles in advocating for protection against light pollution, and in supporting the climate science and action (with Observatory Hill being one of the major weather stations in Sydney with more than 160 years of weather and climate data). As a site of colonial astronomy, we also have a responsibility to recognise the dispossession of the traditional owners that occurred to make way for the Observatory, and to ensure that First Nations voices and science are heard.

Our goal is to make astronomy accessible to all, regardless of age, background, education, or geographic location. We continually work to incorporate new technologies, such as VR/AR into our programs and exhibitions, and utilise social media to better communicate and engage with our audiences. In our education programs, we aim also to develop broader STEM skills to prepare students for future career paths.

In this presentation, we will give an overview of the Museum's astronomy communication portfolio, including the unique opportunities and challenges of working within a museum setting, and discuss how we might increase engagement into the future.

[Taking the planetarium virtual - visiting youth groups during Covid-19](#)

During the pandemic, and particularly during lockdowns, many youth groups have struggled to keep meetings going and to keep their members engaged. Girlguiding in the UK is no exception with many leaders finding it incredibly challenging to adapt to online meetings, and many girls losing interest as a result. The Girlguiding programme recently underwent a major overhaul, with many of the awards and badges being modified, updated and modernised. One of the badges updated, in collaboration with the Royal Astronomical Society, was the new Space interest badge. Earning this badge involves learning how to find north using the stars, learning to recognise at least two constellations, and finding out about other objects in the sky, as well as a couple of other activities.

To help adult leaders struggling to fill their virtual programmes, give girls the opportunity to compete their Space badges, and provide some inspiration (as well as a bit of entertainment!), I began offering virtual planetarium shows to Brownie groups run by a few friends. Realising how effective they could be, I posted on Facebook offering to deliver a virtual planetarium show to any Brownie group in the UK, and was inundated with requests. Over the first six months of 2021 I delivered 42 planetarium shows, roping in a couple of colleagues to cope with demand. Together we delivered 60 shows, reaching more than 1200 Brownies across the country, resulting in a low-cost outreach programme with a much broader geographical reach than we could normally achieve with our fixed-location observatory and planetarium at the university. In this contribution I will discuss the successes and challenges of the programme, the lessons learned, and how we plan to continue the project as the world attempts to return to “normal”.

[Telling astronomical facts and numbers at the right time: The relationship between awareness, dramaturgy and storytelling](#)

Not every single attempt of transporting information falls under the definition of ‘communication’. Distinguishable from expressions like behavior or acting, there is one important parameter to be fulfilled in order to ensure its occurrence: the understanding. Consequently, since the recipient needs to understand what the transmitter wants to express to build this fundament, this is of great importance in science communication especially. However, astronomy seems to be a very special area here, since it is full of non-

imaginable scales for, e.g., time and sizes, either for single planets or the universe as a whole. Therefore, there are two important parameters when preparing communication activities. First, there must be knowledge about focusing on message, audience and medium. This issue can be treated following our 'MAM-principle', which indicates specific starting points of what is known of those and helps creating individual customized contents. Subsequently, the next step is to plan how to transport your messages in case of choosing contents at the right time. Besides key facts, data like numbers or proper names are important to be transported too. This constitutes a challenge for science communicators, as only small amounts of information can be saved at the recipient's side. Addressing this issue, communication strategies like storytelling are of great assistance. However, we state that it is of great significance to transport such data at the right time during an outreach activity, namely depending on used dramaturgy. Using a different one than the commonly known 'three hill'-approach, we clearly transport numerical and difficult facts solely when the excitement and tension is high. In this way, we saw that the audience processed our contents better, more emotions are sparked and a higher immersion into the storyline is given. We would like to show our approaches of both, using the MAM-principle and connecting transport of information to the dramaturgy.

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The ATNF Daily Astronomy Picture

The ATNF Daily Astronomy Picture (ADAP) is a webpage, modelled on the popular Astronomy Picture of the Day (APOD), which aims to present a new image every business day, aimed at a general audience. It may be a picture of one of the Australia Telescope National Facility (ATNF) telescopes, or an image or figure from a scientific paper reporting the results of observations with an ATNF telescope, or some other current, or historical, event. Each image is accompanied by a paragraph of explanatory or background text.

For many years the ATNF produced a Newsletter, initially three times a year, then twice a year, before the Newsletter was ceased in 2015. The ADAP, which started in December 2014, partially fills the vacuum left the cessation of the Newsletter by promoting upcoming events, celebrating the successes of staff and

students, and describing the research being done with ATNF telescopes. ADAPs are archived, providing a lasting and accessible repository of news and information. Selected ADAPs are promoted in posts to social media.

This presentation will describe the history and evolution of the ATNF Daily Astronomy Picture, discuss the lessons learned in curating the ADAP, and consider the usefulness of webpages in communicating astronomy to the public.

[The Convergent Nature of Communicating Astronomy in Africa - From Print Media to Digital](#)

South Africa remains one of the world's most unequal societies with youth unemployment peaking at 75% this year. Unemployment therefore becomes a contributing factor towards poverty. The solution to unemployment has been dubbed as education and access to resources throughout Africa. However, in an unequal society access to resources - particularly online resources can be quite limited and daunting an exercise. African Science Stars magazine is a magazine that was launched at the height of the Covid-19 pandemic as a tool to make Astronomy and Space Science news, events, trends, career guides and more much more accessible. The magazine targets rural areas primarily and uses a relay type of micro-distribution model; a batch of copies is sent to science centres and science educators who then pass on the copies to their immediate communities. To ensure access to all we maintain a 0 cover price. It is free. For content, African Science Stars relies heavily on African Astronomers and researchers who provide guidance and expertise. Whenever the magazine engages with experts it strives to ensure that the content is presented in the simplest manner. In this paper we unpack our content-simplification methodology, narrate some of the challenges we encounter around science journalism and what we believe our role as media is advancing Astronomy in Africa through accessible distribution models.

[The NOVA/AMT Mobile Planetarium: bringing astronomy to \(remote\) schools in Namibia](#)

The Africa Millimeter Telescope (AMT) project will install a radio telescope in Namibia, the first node of the global Event Horizon Telescope (EHT) on African soil. Namibia currently does not have a large astronomy community and it will be necessary to expand this community to secure the future operation of the AMT telescope.

To ensure responsible and sustainable development of astronomy in Namibia in the future, the AMT project includes an ambitious Social Plan. A key element of the Social Plan is a Mobile Planetarium which will visit schools across Namibia.

The Netherlands Research School for Astronomy, NOVA, has more than a decade of experience in the running of Mobile Planetariums. Since the start of the project in 2010 more than 320,000 students across the Netherlands have experienced a planetarium show in one of the three NOVA domes. The success of the project is largely due to the approach. Whilst many planetaria run purchased films, the NOVA Mobile Planetarium shows are fully live and interactive allowing the content to be tailored towards the level and interests of the students and their teachers. Presenters have a good broad astronomy knowledge and are all astronomers or astronomy students. Finally, NOVA uses world class planetarium software customised in-house for the NOVA-requirements by a dedicated planetarium technician.

In early 2019, NOVA took one of its inflatable domes to Namibia to see how such a project would work and be received in practice. The pilot was so successful that the Mobile Planetarium became a key element of the AMT Social Plan. NOVA is providing expertise and initial training to local astronomers and science educators in Namibia with the first training planned for May 2022. The Planetarium will then visit schools across Namibia, coordinated by the Rossing Educational Foundation. NOVA will continue to provide long-term astronomy and technical expertise to ensure the success of the project.

The Role of the Islamic Astronomy Group in Communicating Astronomy with the Public in Thailand

Thailand is a predominantly Buddhist country, with about 5% of a Muslim minority. There has been a longstanding controversy among Thai Muslims over Islamic religious practices related to the astronomical principle, for example, the organization of the lunar calendar, the regulation of the astronomically defined times of prayer, and the determination of the prayer direction. Those conflicts may arise from public ignorance about astronomy and a lack of understanding of astronomy for religious purposes. Therefore, the Islamic Astronomy Group was established in 2015 to communicate astronomy to the general public in an easy-to-understand manner, particularly the Islamic calendar determination and crescent moon observations. The group belongs to everyone, and they can present astronomical knowledge to society through professional astronomer reviews. There are presently 11 Facebook page administrators, 8 professional astronomy specialists, and 48,904 interested individuals in the community (updated in 2022). The group serves to communicate astronomy to Thai society in a variety of ways, covering all target groups like students, youth, teachers, the general public, and amateur astronomers to inspire and create a society devoted to learning astronomy. Most activities published online have taken into account the appropriate content and the needs of the target group, especially those who are interested in astronomy. Nowadays, Thai people are more interested in astronomy. It shows that astronomy has contributed to the cause of interest, raising awareness, and inspiring. It creates widespread awareness of astronomy in Thai society. The group expects that astronomy can be a tool to develop people's rational thinking processes as a foundation for building Thai society to be a learning society. A collaboration between amateur and professional astronomers to disseminate academic knowledge in an easy-to-understand manner can help the youth pay more attention to astronomy.

The SKAO Website: A comprehensive to-do list in executing a complex comm's project, whilst still doing your day job

When it comes to projects, when asked to create a brand new website from the ground up for a mega-science organisation, one does hesitate for a moment. In my many years working at SKAO, I have acted as a custodian for the current SKAO website, but this only required limited effort when it came to adding or removing content. Building a brand new website has been no easy task, and my talk will explore the entire process from start to finish, and to share with the community the various skills, processes and lessons learned if anyone ever had to attempt this themselves in the future. So if you are interested in (to name a few) extensive procurement practices, stakeholder engagement, creative content brainstorming and creativity, team management and project management for web development, then this talk is for you!

The Trials and Tribulations of Building a Social Media Presence for a New Astronomical Organization

Starting a new organization's social media presence is difficult at the best of times, but during COVID the challenge was multiplied. NSF's NOIRLab was established in October 2019 bringing together existing organizations, some with existing social media presences, including the International Gemini Observatory, Kitt Peak National Observatory, Cerro Tololo Inter-American Observatory (known as Programs of NOIRLab). Navigating building the NOIRLab brand while maintaining existing social media challenges with limited dedicated staff and limited expertise was a significant effort that is only coming to fruition nearly three years later. Fractions of several EPO staff formerly from these organizations were drafted into the social media team and together we worked to fulfill our mission of helping to build the NOIRLab brand. Issues quickly emerged such as how best to post to each channel, what to do with the YouTube channels, how to best serve our Spanish-speaking audiences, and what kind of content should we be creating anyway? With time we built a social media strategy and plan, undertook some training, created a workflow and approvals process, and established regular posts and campaigns to reach our public audiences. Challenges remain

including how best to serve our scientific audiences, how to balance the needs of the main brand, NOIRLab, with those of the sub-brands (the Programs), and how to nimbly respond to news and trends.

Tracking and improving visitors' and employees' experiences of the Old Observatory Visitor Center through diary studies and co-creation sessions

In this talk I will present the results of a visitors' engagement research project at the Old Observatory in Leiden. The purpose of our research is to investigate the level of public engagement from both the visitor's perspective as that of the employees and find good practices that lead to high levels of engagement. In order to achieve this, we implement a Diary Studies research method. This method is well suited for examining the daily experiences, behaviors, attitudes and satisfaction levels of both the visitors and employees over a prolonged period of time. Using surveys and predefined questions, we collect data from our facilitators and visitors in order to evaluate the level of engagement each group experienced during a visit. Based on our quantitative data we conduct interviews, focus groups and co-creation sessions to obtain further in depth information on patterns and outliers in this dataset. This combination of qualitative and quantitative data offers us a unique opportunity to thoroughly analyze emerging (behavioral) patterns and implement changes in our current programs. This ensures that the activities and programs we offer stimulate public engagement. In order to gauge whether our current activities encourage engagement with science we use the CAISE case study. This is a framework that makes it possible to distinguish between Public Understanding of Science (PUS) activities and Public Engagement with Science (PES) activities. Based on the CAISE framework and the Diary Studies, we can gain a better understanding of the level of engagement we can reach with our current activities and what changes we must implement in order to ensure a maximum level of public engagement from our visitors in the future. Our preliminary results show that both the visitors and the facilitators are satisfied with the current amount engagement. The two groups interact by mostly asking and answering questions and engaging in discussions.

Traditional Chinese Astronomy Culture Communication

We all have learnt astronomy since the first night we saw stars. It is the same for our ancestors and that is the starting point of astronomy. Today those traditional culture (or knowledge) are probably no longer useful in terms of science research, but it is very helpful for us to understand the history, evolution, culture, and/or the wisdom of our ancestors. Our project focus on traditional Chinese astronomy (there's other traditional astronomy culture as well), as it would be a different system compared to 'modern' astronomy.

In this talk, I will introduce what the traditional Chinese astronomy is and why we need to know it. I will also talk about a series of promotion activities we have done in the past five years, including some outdoor activities for primary school students. The traditional Chinese astronomy is a completely different system compared to modern astronomy, and we aim to have more people to start to know it.

Trials and tribulations of producing your own in-house magazine

Publications are an important part of any organisation's way of communicating, not only with the public but also its own stakeholders to deliver its content and tell its stories. Over the years the SKAO has had a variety of ways in which it shared its key messages and news, mainly in the form of electronic newsletters. However as the organisation matured, so did our thinking around how to evolve our publications into a more accessible, modern and engaging format, and so our digital magazine Contact was born, which has now celebrated its 10th issue.

This talk will explore and share the various considerations our team took when discussing how best to deliver our content, and will provide tips and tricks on how to present and produce your own in-house magazine and optimise your time and resources in a small, busy communications team!

Under other skies: dialogues of different cosmological paradigms

This IAU/OAD funded project focuses on ethno-astronomy, in particular on indigenous astronomy in Brazil. The project is held in a Maxakali Village, in the state of Minas Gerais, and it counts on the collaboration between indigenous researchers of the village, anthropologists and pedagogists of the Federal University of Minas Gerais, and astronomers and

educationists of the University of São Paulo, of the Observatory of Valongo and Nottingham University. The main objective of the project is to collect native narratives, chants and

myths about the sky that have never been written down and recorded, creating a novel scholastic material for primary schools inside and outside the village. We collect and translate Maxakali stories and chants of the sky, narrated by some of the elderly and organised a workshop of illustration of the narrated stories, led by 15 indigenous teachers. The main outcome is a webpage, composed by the narrated stories and their illustrations. The webpage also serve as a living platform of collection of other chants on nature (as water), a virtual library of scholastic material and a channel of virtual classes. This outcome aims to increase the indigenous didactic material, as a right granted by the Federal Law that defends the autonomy of Indigenous Education (Law n.9394/1996). The webpage will be in Maxakali, Portuguese and English, to be accessible in an international level. All materials, including the recording of the chants, will be available in the webpage hosted at

IAG/USP.

Virtual Astronomical Club Jamboree (JANAKA): Indonesian Amateur Astronomer Innovation in a Once-in-a-Century Pandemic

The number of amateur astronomical clubs in Indonesia is multiplying in the last five years. The separated location on several islands generates challenges to communicate and collaborate between the clubs. However, the collaboration astronomical event namely JANAKA (Jambore Nasional Klub Astronomi), was held in 2017. The National Astronomical Club Jamboree was designed as a melting pot of astronomical activities such as public lectures, observations, and workshops. The professional astronomers from LAPAN (Lembaga Penerbangan dan Antariksa) and the universities were also actively involved to bridge the connection and collaboration between the amateur and professional astronomers. The 2017 JANAKA was held at the LAPAN facilities at Watukosek. The amateur astronomers learned how the professional astronomers obtain the research data using the advanced technology of telescopes.

The 2nd JANAKA should be held in 2020. However, during the pandemic era, offline activities are minimal to be held. Hence, the clubs decided to move the 2nd JANAKA after the end of the pandemic. However, to maintain the club's communication and passion, the virtual jamboree is the solution to be chosen. The virtual jamboree consists of 4 sessions. Each session has specific topics and related speakers. The topics were related to the pandemic impact on astronomical outreach. The clubs shared innovative activities during the pandemic by optimizing social media. The virtual jamboree was fully supported by LAPAN and recognized by Himpunan Astronomi Indonesia. The IAU Office for Astronomical Outreach representative was also emphasizing the importance of peer engagement during the pandemic to make astronomy accessible for everyone. The virtual jamboree was attended by 116 clubs across 16 provinces in Indonesia. This number is spectacular when we compare it to the 2017 JANAKA participant. There were 38 clubs across 6 provinces. The next JANAKA hopefully will be held offline with more clubs participated.

Virtual Astronomy Observation: Transforming Astronomy Learning During and After the Covid-19 Pandemic

The telescope is an instrument of science that comes to mind when most people think about astronomy. It is unquestionable, observing celestial objects directly with the eyes through a telescope eyepiece provides

a very deep personal experience, both for scientists and the general public. This practice is identified by the author as one of the traditional and strong characteristics of an astronomical outreach program that is applied by the entire astronomy community, both amateurs and professionals.

The Covid-19 pandemic has made all in-person programs impossible to conduct. The shift of astronomical observation programs to virtual and remote formats such as virtual star parties or virtual night sky observations poses its own challenges. In this talk, the author would like to share how Bosscha Observatory yearn find ways connecting telescopes and virtual observations with the general public to create a positive and thriving learning experience. What lesson did we learn after three years of transferring astronomical observations for the public to a virtual format. How effective is astronomy learning through virtual observation? Is there still potential for virtual observations when in-person programming can be resumed?

Virtually real: outreach and networking in virtual reality

What if you could host an event that was accessible by people from around the world, where attendees could chat to create connections, and that could show-case science through interactive environments that exceed any museum? This is offered by virtual reality, and all that is needed is an internet connection.

Over the last two years, online activities have frequently left people dissatisfied with the interaction experience compared to in-person. Yet the benefits are undeniable, as removing travel requirements greatly enhances accessibility for attendees with limited budget, disabilities, or simply who do not live close to a city. Unless we want to restrict information to those who can reach in-person events, virtual options must be developed that equal the in-person experience.

Virtual reality (VR) is a fully immersive environment where avatars provide a localised presence in an online space. Having a location permits simultaneous and overlapping conversations within the same event, allowing attendees to chat with different people, switch between conversations if they overhear a topic of interest, and explore different areas based on their interest.

Multiple software platforms exist to host virtual events that are free to use, with many design options and cross-platform support that enables people to join with a VR headset or from a desktop. Custom designs are also possible, with the ability to recreate scenes that would be inaccessible for in-person events, such as the surface of a planet or the inside of an observatory.

Here we take a look at two outreach projects hosted in VR. The first was a live talk for students that took place in environments replicating an asteroid and a mythological location. The second was an exhibition with models and videos that was used for a networking event at a conference. The successes and challenges demonstrate how a VR event can be hosted by organisations of all sizes to communicate astronomy in a way never previously possible

Wallal Centenary Celebration - Confirming and Communicating General Relativity

Einstein's general relativity has withstood every test. One hundred years ago scientists predicted that the revolution of ideas that general relativity and quantum physics had brought would change human thinking. In 1922, an expedition to Wallal, in northern Western Australia, provided the best measurement of the deflection of stars by the eclipsed sun, proving Einstein's theory. Today the discovery of gravitational waves is revolutionising astronomy research, revealing a plethora of processes that highlight the transient nature of the universe and the growing graveyard of black holes. Our best understanding of the universe, despite the prediction of a massive shift 100 years ago, is not broadly communicated to the public. Einstein-First is a project that is part of the OzGrav Centre for Gravitational Wave Discovery and is working to train teachers to give them our best understanding of the universe. Using careful evaluation methods Einstein-First uses activities and toy-models to enable easy learning of modern concepts in astronomy and physics. Our latest project aims to draw public attention and widespread interest by using the centenary of the successful

Wallal expedition to tell the human story of discovery and scientific proof, of scientific scepticism, and of research frontiers. Einstein-First activities are used to showcase the different aspects of astrophysics resulting from this expedition. Celebrating 100 years since Wallal, provides a unique opportunity to present modern physics ideas to a broad audience. We present the historical motivation for the expedition, how it almost never happened, the different roles of the people involved and a resource book accessible to everyone so that the story of this discovery is not forgotten. The event will reach into the Perth community and provide a gateway to the university for both students and the general public, and foster community appreciation of a local event that shaped the future of modern physics.

[Who is under the dome? A global demographic survey of planetarians](#)

This talk will provide an overview of the preliminary results from a global survey focussing on planetarians. This study builds on previous work that was geographically limited by extending it countries worldwide. The aim is to provide a detailed overview of diverse profiles of the planetarium operators, the planetaria they work for, the content they present, the approaches they use and how they grow in their profession.

This study used an extensive survey that was developed and translated into 10 different languages. A mixed-methods approach to the analysis allowed for the exploration of the various layers and correlations between different constructs in the survey, which included educational background, the amount and role of interactions during presentations, astronomy content, professional growth, and various others.

[Widespread adoption of astro virtual reality \(VR\) apps afforded by Steam and Viveport](#)

Virtual reality (VR) inherently provides an immersive method for exploring 3D astrophysical data sets. VR goggles and controllers allow users to move wherever they like throughout the data set while looking in any direction they choose, thus giving them complete freedom to explore the data in ways not afforded via movies or other typical outreach products. In this realm, we created “Galactic Center VR,” which explores our hydrodynamic simulations of stellar winds feeding of our galaxy’s supermassive black hole.

This presentation focuses on how to distribute VR outreach products to a wide audience via the Steam and Viveport VR stores. Steam is one of the most popular sites for downloading video games and related applications, including VR-based products, while Viveport is focused specifically on distributing VR content. We are happy to report that “Galactic Center VR” is available for free on both stores, and it has been downloaded in over 60 countries on Steam. Given this reach, we feel that it is an excellent option for other astro-specific VR products, so this presentation will mainly focus on how to release a VR experience on Steam and Viveport. This includes the necessary advertising products (logos and images in a variety of formats, a trailer, and the webpage presence of the app), how to update the app through each stores’ developer interface, and how to communicate with your user base. Best of all, these experiences can be made free for the users, as “Galactic Center VR” is, though there is a moderate cost (around \$100 USD) to the app creator. The end goal of the presentation is for others to be aware of what it takes to get their VR app on Steam and Viveport, which we hope will encourage others to create more astro-focused outreach products and then distribute them in this fashion.

Lastly, we will also briefly discuss how we made “Galactic Center VR”, which involved the game engine Unity and the popular SteamVR interface package.

[Women in Astronomy in Vietnam:](#)

Forgotten Faces or Prominent Determinants?

In the spotlight of astronomy outreach nowadays is the issue of diversity, equity, and inclusion, in which the topic of women and girls in astronomy has received much attention from the IAU and it deserves so. This presentation is about an exploratory research which attempts to look for the womanly face of astronomy and astronomy communication in Vietnam. Through historical analysis, semi-structured interviews, and

other interdisciplinary research methods, the researcher illustrates a collective portrait of Vietnamese women in astronomy public outreach under unequal labour, social, and political situations in this developing country.

Gender-based biases and discriminations affects almost every aspect of life and at all levels in Vietnam; and female astronomers and astronomy communicators in the country are working hard to bring about changes. Whether they are professional or amateur astronomers, whether they are mainly active in astronomy research, education, or outreach, these women are committed to and always find their ways to remove gender stereotypes, social norms, and overcome other obstacles to communicate astronomy for the betterment of science and society in Vietnam. The result shows that Vietnamese women might be have been forgotten in society and in the development of astronomy but they have always been playing significant roles when it comes to astronomy communication.

VietAstro is well aware of the situation and it is proactively engaging everyone to inspire and encourage Vietnamese women and girls to pursue careers in astronomy and science. This effort comes with a great hope that changes in scientific landscape could be translated into other fields and eventually towards the advancement, emancipation, and empowerment of women inside and outside Vietnam."

Panel discussion

Navigating through astronomy outreach and communication careers

How many emails have you written to colleagues and acquaintances inquiring about the availability of astronomy outreach and communication opportunities in a certain city, region or country? And for the less junior ones in the field: how often do you receive emails from students or researchers who wish to switch to the outreach and communication side of things? Or from fellow science communicators who are relocating and looking to start from scratch in a different part of the world? As broad as its range of roles is, the field of astronomy and outreach communication does not offer countless opportunities: they are actually few and far between, and even harder to map in space and time when planning one's career moves. In this panel discussion, panelists will be asked to present the different paths that led them to their current roles in public outreach and communication at major astronomy institutions, focussing on the role of key encounters or special places and events, the opportunities they had and the ones they wish they had, what could have helped them at critical steps of their journey, and tips they give today to more junior colleagues. Our community has grown significantly since the first CAP conference over a decade ago, witnessing (and catalyzing) the birth of global IAU offices and the upward evolution of communication and outreach in many astronomy institutions, large and small, around the planet. But there is still much to be done. With the help of questions from conference participants, we will try to identify what works well (and less well) in the global networking, mentoring and job advertising practices of the astronomy outreach and communication community, formulating guidelines that can be implemented – both locally and globally, individually and as a community – to take the professionalisation of our field of work and inquiry to the next level, making it a viable career choice for anyone who loves astronomy so much they can't stop talking about it.

Using journalism for astronomic reporting amid climate change crisis

Title: Using journalism for astronomic reporting amid climate change crisis.

Research focus: Media based astronomy

Type of presentation: Panel Discussion

Abstract:

Media outlets have been focusing on effects of climate change, yielding its consequences on humanity as the future of the world lies in the balance.

Today's media coverage is based carbon offsets, ozone destruction, global warming, droughts, strong winds, heavy rains, gas emissions, and pollution associated illnesses threatening the world.

However, the world does not exist itself. It has astronomic biodiversity which dwells beyond our eyewitnesses as science has proved.

Therefore, journalist bounds to report deeper up to astronomy science caped stories to shed light on underreported astronomic threats stirred down by human driven activities from the earth.

Should be looked at science reporting, solution or constructive journalism to imminent consequences on stars, planets, or giants clouds of gas and dust referred to as "nebulae".

Does climate change affect astronomy ? How should journalists could cover and present these facts to contribute to global effort to the mysteries of cosmos."

Posters

["How to be a scientist" – An online podcast with scientists to communicate the fields and opportunities in Astronomy and Science.](#)

The podcast "How to be a scientist" is series of discussions with prominent scientists from Sri Lanka. It engages the audience with researchers, CEOs, and pioneers in the fields of Astronomy, Astro Physics, Theoretical Physics, Medical Physics, Geo-physics, Mathematics, Zoology and Evolutionary Biology. The speakers are natives from Sri Lanka, who have excelled in their respective fields. Therefore, they share their journey with the online community, in their native language (Sinhala) to make their experiences more relatable to the young audience. The talks also focus on the topics of interest that they are currently engaged in- ranging from gravitational wave observations with LIGO, to Printed Electronics, and Cancer Research. Topics encourage the youth to step out of the conventional career paths in Sri Lanka, and to expose them to the more niche areas of science research around the world. The podcasts are shared publicly in Youtube, with an open and interactive comments. The guests and speakers were catered following the feedback from the audience. The series spans across 2020 – 2021, with 28 episodes to date. Each video achieves more than a thousand views, some achieving a viewership above 5000.

[29th National Astronomy Week \(NAW\): Ma\(g\)laya\(g\) Tayo Sa Mga Tala](#)

The National Astronomy Week (NAW) is an annual celebration in the Philippines observed every third week of February. The Philippine Atmospheric, Geophysical, and Astronomical Services Administration (PAGASA) held online events for the 29th NAW celebration with the theme ""Ma(g)laya(g) Tayo Sa Mga Tala."" This year's celebration focused on Philippine Ethnoastronomy, a relatively new topic among Filipinos. The NAW celebration aimed to introduce and discuss current developments in Philippine Ethnoastronomy through invited researchers in the field and to connect Filipinos to the Philippines's rich culture and knowledge of astronomy that dates back to the pre-colonial era. During this celebration, we conducted a 2-day webinar session, research symposium, virtual planetarium show, virtual telescope viewing session, and Astro vlog contest. The activities were held via Zoom and posted on the PAGASA Facebook page to reach a wider Filipino audience nationwide. Post-event assessment revealed that the NAW activities garnered an incredible number of participants, views, and responses on social media platforms. This poster is an event report on the conduct of NAW to share how virtual activities held for the celebration served as a powerful tool to popularize and raise astronomy awareness among Filipinos, especially during the pandemic when physical activities are unavailable.

[A critique into the ethics of astrophotography, with a focus on Beth Moon's book: "Ancient Skies, Ancient Trees". A cautionary tale.](#)

This critique investigates ethical issues in relation to astrophotography, and the book "Ancient Skies, Ancient Trees" by Beth Moon. The book features astrophotography of ancient trees around the world. In 2019, a controversy erupted when the legitimacy and accuracy of Beth Moon's images were questioned, when her images appeared on NationalGeographic.com. Serious flaws in the images were detected, and her images were removed from the National Geographic website. The issues are critically assessed, including what was published, acknowledgments, praise for the book, the initial concerns regarding image validity, the ensuing controversy, a critical appraisal of the images, the ethical concerns articulated, the consequences including action by National Geographic and the aftermath response by photographer Beth Moon. The broader implications of ethical issues in astrophotography are examined, with reference to other real-world circumstances. Astrophotography provides a very important resource for the communication, promotion and advancement of astronomy in our community. Such image resources are used in publications, promotions, media, new releases, exhibitions, film productions, online usage in social media and via web sites. It is essential that astrophotography is created and used ethically and lawfully. Key ethical insights are featured via quotes, such as Theodore Roosevelt "Justice consists not in being neutral between right and wrong, but finding out the right and upholding it, wherever found, against the wrong".

[A description of the Talking Planets mobile application and an analysis of the impact of this mobile application on school students](#)

In developing countries like Bangladesh, the scope to learn about astronomy for a school student is very limited. On the other hand, students now spend a significant amount of time on smartphones. With these two issues in mind, we developed an interactive android mobile application which was funded by IAU's Office of Astronomy for Development grant award to increase the knowledge and awareness among school students about astronomy. It's an android application with 12 characters (8 planets of our solar system, Sun, our Moon, Europa, and IO). A user can chat with these characters to know their mass, temperature, size, type, sky color, etc. The characters will behave like chatbots with the user.

We arranged school programs to investigate the effect of our application on students from 4th to 9th grade. In March 2022, we trained 79 school students from 2 schools on our developed mobile application. We investigated whether or not students' knowledge of astronomy increased after the use of the android application. Students' performance was analyzed by providing the same question papers to individual students before and after the training on how to use our application. A significant number of students showed a confirmed increase in their performance. Our study indicates that it is possible to increase the knowledge of astronomy of the school students in an entertaining way using our application. We also conducted an anonymous survey among the students about our mobile application, its effectiveness, and user-friendliness. Overall the students' response was very positive.

We will describe the path and challenges of developing an educational android mobile application on astronomy for school students, its impact on increasing students' knowledge, and students' attitudes toward our mobile application.

[Amateur and professional astrophotography for engaging and promoting researchers with peers, students, media, and the general public.](#)

"Astronomy is a very visual science, but much of the astrophysical research is based on spectra. However, when astronomy research is communicated to the general public beautiful images are requested. David Malin's astrophotography inspired me when I was a kid, so after joining the AAO (now the Australian Astronomical Optics) and became a support astronomer for the Anglo-Australian Telescope (AAT), where observations are mainly spectroscopic, I realised the need of completing research with astrophotography.

I will summarise the most important activities I've conducted during the last decade to approach astronomy research (both spectroscopy and multi-wavelength) and cutting-edge astronomy instrumentation to other astrophysicists, general public, and media while I've been working at the AAO, in 2017-2018 as the AAO Science Communication Officer. This includes astrophotography (using DSLRs and amateur and professional telescopes) and multi-wavelength data to obtain colourful images, preparing time-lapses of instruments (e.g. 2dF or SAMI) or the sky over Siding Spring Observatory, engaging with the public to decide what target to observe at the AAT, using my own astronomy images in both research and outreach presentations, sharing astro-photos and how they were obtained in social media, and encouraging amateur astronomers to participate in ProAm projects.

I've made my material available for the broad astronomical community, enhancing science communication via inspiring astronomical images and time-lapses that have been used in media releases, broadcasted in public TV (e.g. ABC, TVE, BBC), and increased public engagement via social media and science communication events.

I conclude that astrophotography increases the impact of research, particularly when this is not based in imaging data, and that linking amateur and professional astrophotography with research can really inspire and motivate students, media, and the public, increasing the science knowledge of our society."

[Astrobiology online lecture for thousands of elementary and junior-high school students.](#)

An Astrobiology online lecture was held for elementary (grades 4-6) and junior high (grades 1-3) students in Okazaki City, Japan. About 8000 elementary and junior high school students participated, connecting 341 classes in 56 elementary and junior high schools in Okazaki City using Microsoft Teams. The first half of the 90-minute talk about a life in the universe, focusing on liquid water. In the second half, talk about radio telescope observations as a way to search for materials for life in the universe. The lectures were presented with quizzes and live view of the Nobeyama 45m radio telescope to make it easy for elementary and junior high school students to continue watching online for 90 minutes. At the beginning and end of the lecture, a simple question was asked, "Do you think there is life in the universe?" Out of the three choices of "yes," "don't know," and "no," 76% answered "yes" before the lecture. And after the lecture, the "yes" response rate increased to 82%. This increase is thought to be a shift from students who answered "don't know."

After the online lecture, 3533 comments were collected. Based on these comments, a morphological analysis was conducted using "KH coder" text analysis software. As a result, we were able to find differences of understanding based on their grade level from the comments. Specifically, elementary school students gave more emotional comments, while junior high school students gave more comments on the research and scientific content. As a result, even in the lecture on the cutting-edge and interdisciplinary field of astrobiology, elementary school students were still highly interested, while junior high school students were able to understand that it is a new field of research.

[AstroEcotourism in Mozambique \(AET@MOZ\)](#)

AET@MOZ is an outreach project, which aim to use astronomy as a tool to promote local ecotourism and sustainable development in unprivileged areas of Mozambique, adding the observations of the night sky using amateur telescopes into the common tourism package, in order that after the tourists had enjoyed the beaches and other day leisure time activities, they would be guided in observing the night sky. Its first implementation was carried out in 2018, in Ponta D' Ouro, in Maputo province, in partnership with two renowned lodges, Kaya Kweru and Underwater Explorer. During three months, we prepared classes and other relevant material and delivered an astronomical training to 14 "astroguides", which included young students and jobless people from Ponta D' ouro. The training covered topics as basic concepts of astronomy and astronomical telescopes. They were also trained in identification and observation of the celestial objects through telescopes, binoculars and naked eyes, and to use astronomical softwares. This

training was intended to provide to the “astroguides” the necessary tools and the ability to point to the celestial object and show the wonder of the cosmos for tourists and local community. Beside the training, the now astroguides conducted night sky observations with locals and tourists which were very enthusiastic and competitive. A close collaboration between the astroguides and local lodges was set in order to the astroguides deliver astro-tourism during the night guiding tourists in the observations of the beauty of the Southern Hemisphere night sky. They would be paid in accordance with the local lodges for their work. In other hand, it was intended that this first group of astroguides would train other locals in order to spread the acquired knowledge and enlarge the group of astroguides to work with other local lodges. This project was funded by the Development in Africa with Radio Astronomy (DARA) and Office of Astronomy for Development (OAD).

AstroElves: an experience of outdoor education

We often use the term 'outdoor education' to refer to organized activities that take place in predominantly outdoor environments. In our conception, this term should be applied as a synonymous of “education outside the classroom”, a change of perspective/point of view, which leads us to perceive external spaces as potential places for learning through practical and experiential activities. In this sense, the outdoor education assumes a pedagogical line that looks outer space as the context of learning process, regardless of the nature of the proposed content.

In the framework of a larger inclusion project, INAF-Cagliari Astronomical Observatory has been experimenting for about a year with an outdoor education project called AstroElves. This project stems from the collaboration with a Sardinian Cultural Association (“Punti di Vista”), very active in proposing outdoor education projects and environmental awareness activities. The AstroElves project is a two days outdoor campus dedicated to the study of the sky and the discovery of uncontaminated places from which to observe the sunny and starry sky. The main objective of the project is to show the intimate connection between the natural environment and the sky and to discover the special role played by astronomy in everyday life. During the day, participants could explore beautiful places, woods and hills far from the city lights, discuss about light pollution, and “play” with the Sun, experimenting its apparent movement in the sky, discovering the concept of “true” noon and building a simple solar meridian. During the night they could observe stars and constellations guided by professional and amateur astronomers. We here present the organization and the results of the first two AstroElves camps (April 2018 in the I area of Gerrei surrounding the Sardinia Radio Telescope and in April 2019 at Lanusei), and their evolution in the project Mizar, realized in spring 2022.

Astronomical phenomena affecting the earth as the “Hardest choice” for humankind as a whole to think

The “hardest choice”, which has a great impact and conflict no matter which option is selected, exists in various fields such as humanitarian intervention, infectious disease control, and so on. How humans behave against astronomical phenomena that affect the Earth, such as large-scale solar flares and meteorite impacts, is one of the “hardest choices.” At public events, the research group has attempted to present extreme but actually possible options to the general public for consideration. It is common for people to think about issues such as “whether to use nuclear bombs to avoid asteroid impacts” or “whether to request to stop power when solar flares occur at a stage where the expected predictive value is not necessarily low”. These questions make citizens inform the public of the existence of the problem and encourage participants to develop their thinking. A pandemic occurred after the research group had discussions with the citizens, and there were more opportunities to actually think about the “ultimate choice” such as triage. Also, currently (2022/5/31) Japan is conducting public comments on space weather policy, and the report describes how society should respond to the giant solar flare that can occur about

once every 100-1000 years. It is an opportunity for citizens to think positively. Our attempt is a valuable test case with the opportunity to think before things actually happen.

Astronomy Communication with All

While communicating astronomy, we can categorize them as students from schools and colleges from various stages, teachers, parents, amateurs, and the public with less exposure and education. Our outreach activities cover them as follows. Like, under the theme of "Going Back to School Program", our PhD scholars visited several Schools in and around Bangalore. The Activities included are Basic Astronomy talks, Telescope making sessions, Hands-on Astronomy Kits, Astronomy Role play and Interactive sessions. Under the OAD funded project in 2019, we also conducted Teacher Training Program to teach the teachers. We have also exposed all the international mega projects to the public under the event called Vigyan samagam. We organized all the amateur astronomers under one umbrella through social media and talks. We also organized the workshop under "Public Engagement in Astronomy in the Pandemic Era'. Through which, again, we strengthened the group and reached all the astronomy enthusiasts. We could use public attention on the last two eclipses that occurred in India. One is before the COVID-19 on 26th December 2019, and the other is during the COVID-19 on 21st June 2020. For the second one, we could perform an online live stream of the eclipse from all our three stations. We could reach 3.5 million views on our YouTube channel and more subscribers for all our social media pages. Through this we could reach the public with scientific awareness about the eclipse and break the myth behind it, which was very bad here with wrong beliefs about it. This same live cast has been re-telecasted in other countries like Dubai and other institutions and further engaged with online events and videos through our YouTube channels and social media pages. In future, with a more structured approach, the institute will be more proactive in promoting outreach efforts, a broad reach and collaboration with other science organizations and institutions.

Astronomy development in Sudan opportunities and challenges

Recently Astronomy in Africa has taken a giant leap forward with many efforts done across Africa to develop the field of astronomy science as well as to reap benefit from astronomy for African people. This presentation will discuss the current status of astronomy in Sudan and the role of the Institute of space research and aerospace (ISRA) in the development of astronomy in Sudan.

Sudan has an excellent opportunities for astronomy developing such has unique location for Astronomical observations(a clear sky, vast spaces for facilities), human resource, although of all these opportunities there are many challenges that disserve the astronomy development such as lack of fund according to the economic situations regarding to not a clear vision of the role of astronomy in human and socio-economic development, education and research problems (lack of trained instructors, teaching materials, lake of instrumentation) all this opportunities and challenges will be discussed. Also, this presentation will present a development plan for Astronomy in Sudan. This plan has been drawn up beginning with education and research capacity; Public Understanding of Science; Partnerships.

Astronomy through the window – discovering the Universe in Lockdown

Created during the first semester of 2020, Astronomy Through the Window (ATW) was entirely constructed to give the necessary attention to some of the biggest issues faced by the Communication Department of the Astronomy course at UFRJ throughout this period, and also to improve how to communicate with the public. Before the Covid-19 pandemic, the communication projects at the Valongo Observatory of UFRJ were fulfilled completely in person, welcoming the public to the University Campus. With the sudden necessity of severe quarantine, for an indeterminate period, this project was created, aiming the abidance of our communication about astronomy with the most abrangent public possible - this time remotely. The project was, therefore, created to solve problems such as: How could we communicate effectively with the public during a lockdown? How to make astronomy more accessible for everyone? How to raise public

interest in this subject? How can the public interact with the project in an active way? How could we raise the public participation in academic projects in astronomy?

By listening to the public demand, the project was able to apply successful strategies to make the best connection possible with them. ATW includes online material with tips on how to watch the sky through one's window, curiosities about seasonal celestial phenomena and a useful discussion on light pollution. All the material and LIVE stream activities aim at public interaction: to motivate people to use what they learnt and send us images of astronomical scenes captured by themselves through their window or backyard.

We are receiving a great number of images and several positive feedback from all around Brazil. These images are published and used in the social media of Valongo Observatory. Through the use of astrophotography and online interactivity ATW promotes first interest in astronomy, as well as the urgency of science dissemination in our time.

Broadcasting radio waves on astronomy and art from the north and south of Europe

Broadcasting radio waves on astronomy and art from the north and south of Europe

For more than 20 years, professional astronomers J. A. Caballero and M. Sundin have talked about astronomy on different national radio stations in Spain [1] and Sweden [2] aiming to reach a wide audience. In this publication we address the problem that we face when trying to reach more people than those already interested in astronomy or science. One method that we have tried is using interdisciplinary aspects of astronomy, such as art in general and music in particular; we will give several concrete examples. When it comes to radio, impact is usually measured by the numbers of listeners, awards, peer recognition and perhaps feedback on social media. Being allowed, or even required to talk, about astronomy in an unexpected context could also be regarded as a significant impact of outreach. The longevity of a collaboration with a certain radio program could also be considered as a measure of success. For the moment we reach on the order of 2 million listeners altogether. The purpose of this publication is to share what we have done, and to reach out and find other astronomers working at the radio or inspire others to start.

Three things to learn

1. Being an astronomer does not imply that one knows nothing on culture and art. Being an artist or a radio presenter does not imply that one knows nothing on science. It is actually feasible being an astronomer and a radio presenter.
2. A few concrete examples of how we have worked to dissolve the barriers and open horizons when transmitting science through art [3].
3. We are starting a network to share knowledge for astronomers working with radio.

References:

[1] <https://www.rtve.es/radio/>

[2] <https://sverigesradio.se/>

[3] Gorman, M.J., 2014, Nature, 510, p. 216

AstroTalk project: A new challenge within the COVID-19 pandemic

In 2020, and within the COVID-19 pandemic and the lockdown in several countries, many persons have been suffering from isolation and the cancellation of most meetings, and in some cases the closing of schools, universities and the prohibition of public events. During this pandemic, the NOC office in Tunisia and in collaboration with several national and international astronomical communities remoted an online

project that was based on weekly online lectures for the public and amateur astronomers. This project was initiated in order to keep the science communication and the practices in communicating astronomy to your community in a very difficult time that was facing the global planet. The Astrotalk project displays the ability to communicate science and astronomy not only on a national scale but also international scale since the project was extended afterward to reach many NOCs and astronomers in diverse continents and many countries.

The Astrotalk project is still in progress, and we are aiming to reach and collaborate with all the OAO National Outreach Coordinators, to promote bridges of science communication and future projects in the near future and help connect the diverse astronomical groups over the world. Moreover, we will demonstrate the role of the AstroTalk project in providing one of the OAO objectives in linking the different NOCs and helping construct a multi-cultural and multi-aspect working environment. The project have been initiated in 2020, and it has been selected for the third Award within the Astronomy@Home Awards 2020 context it has been classified as the first Outstanding Online Event.

Case Study : Astronomy Communication in Malawi

Astronomy studies, let alone talking about it, is not a norm in Malawi. I was once told that it was unattainable because “we dont have a space centre here”, “where will you work?”, “Be realistic”. See, the problem is how astronomy and its importance is viewed in my country. To a child, they are able to look up and with curiosity they want to understand what is beyond us. This project aims at harnessing this interest and starting conversations all over on astronomy and its significance.

Code-Switching: The Promise and Peril of Astronomy Communication in Two Different Cultures

I have been engaged in regular astronomy communication in two very different cultural contexts: Religiously conservative Pakistan and the liberal enclave of Western Massachusetts. I will talk about code-switching in presentations for science communication as well as the impact of a rapidly shrinking world where everything is available to everyone (probably this very talk as well).

As astronomy communicator, there are things that we can control and there are things that can't. Your identity is something that is beyond your control, but it may be a crucial aspect for your audience. However, you can control your message based upon your target audience. This latter part is becoming harder in a deeply inter-connected world. While we have to be thoughtful about our presentations, it risks science/astronomy communication to be more bland - missing out all audiences.

I will talk about both the promise and peril of astronomy communication in different cultural contexts, and what it can say about the future of science communication.

Challenges of Conducting Astronomy Outreach in Malaysia during Endemic Phase of Covid-19

The outbreak of Covid-19 pandemic has made difficulties towards astronomy outreach organizers to organize physical events. However, they become creative and make it online outreach and the reach can obtain more than a one hour physical outreach event could achieve. But now, as Malaysia is moving towards the endemic phase, physical activities are now allowed and many SOPs are loosen. This situation has made the public not pay attention anymore to online activities. However, part of the society feels hesitant to join physical programmes. Even to organize online programmes, the reach is no longer as high as during the pandemic and lock down where people most of them stayed at home. This is among the challenges that outreach organizers face during this endemic phase. One of the solutions to this challenge is to organize hybrid programmes. This allows people to attend either online or physical programmes according to their preference. Through this project, a few things can be learned such as the challenges for

conducting astronomy outreach in Malaysia during the endemic phase of Covid-19, the possible solutions to overcome the challenges and the public view regarding attending public astronomy outreach.

Combatting Fake Science Online

It is a time of unprecedented assault on facts. While most disinformation centers on politics and culture, collateral damage to science is substantial. Civic discourse suffers from increasing disagreement about facts and data, a blurring of the line between opinion and fact, a rising volume and influence of opinion over fact, and declining trust in formerly respected sources of factual information. This poster gives an update on development of a novel artificial intelligence system designed to detect science misinformation online. Neural networks are being trained with curated sets of non-technical scientific articles, comprised of equal numbers of legitimate and misleading or “fake” articles. In testbeds on climate change and evolution, the neural networks achieved 90% accuracy in classifying articles as real or fake. This testbed is being expanded to topics of more direct interest to astronomers, such as astrology and UFOs. After the training phase, the machine learning is being applied to hundreds of thousands of articles drawn from the Common Crawl of the entire world wide web. The technology will be deployed in two tools aimed at helping the public navigate science information online. The first is a web browser extension to judge the veracity of a science source in real time, giving a color-coded Bayesian probability that the article is legitimate, and if it is not, referring users to legitimate sources of information on that topic. The second is a smartphone app that will gamify the technology to let users classify articles as “real” or “fake,” competing with friends and family in this task. This second approach will allow the crowdsourcing of the neural network training using citizen scientists.

Communicating Science worldwide with UNESCO's International Day of Light (IDL)

UNESCO's International Day of Light (IDL) is a global initiative that provides an annual focal point to light and the role it plays in science, technology, art and culture, education, and sustainable development, and in fields as diverse as medicine, communications, and energy. The four IDL celebrations held since 2018 reached a global audience estimated at over a million, with more than 1500 events taking place in over 70 countries. The cross-cutting theme of light allows us to collaborate with many different sectors of society and scientific communities. For instance, IDL's partnership with the International Astronomical Union (IAU) played a crucial role in engaging a wider audience during the pandemic through diverse astronomy-related programmes. For 2022 events include linking with the IAU Office of Astronomy Outreach (OAO) Dark & Quiet Skies Programme, Astrophotography exhibition at Old Observatory Leiden, citizen science activities, astronomical spectroscopy lectures, lunar eclipse observations and more [1].

The pandemic saw many IDL events adopt online formats. While this facilitated easier international participation, the statistics of events held in the last four years still reveal a lack of participation in some countries. Our focus this year is to understand the challenges faced by the outreach network in these regions.

This contribution aims to demonstrate the significance of a global celebration like IDL in furthering collaborations to engage a wider audience in science, the role of astronomy in achieving wider reach and impact, and the lessons learnt during the pandemic on our societal responsibilities as scientists and educators to communicate to broader audiences to build their trust in science. "We've arranged a society based on science and technology in which nobody understands anything about science and technology. And this combustible mixture of ignorance and power sooner or later is going to blow up in our faces."~ Carl Sagan. [1]lightday.org

Communication with a new and broader audience of astronomy players: from points of view of religion and astrotourism

Research group on space tourism and astrotourism at Wakayama University, Japan, has held a symposium every year since 2016. In particular, in 2020, we held it with the theme, Space, Tourism, and Religion, and in 2021, with the theme, the Past and Future of Astrotourism, and discussed about new exchanges with a wide range of people about astronomy. Since both years were under the COVID-19 pandemic, we decided to deliver the symposium online, and we were able to deliver the 2020 symposium from a World Heritage Buddhist temple, Daigoji Temple, Kyoto City. Background for the 2020 discussion is civilian space travel in the near future. In the era of space exploration as an advanced national project, specially trained and specialized people would have gone to space on various missions, but the time will come when ordinary people will go to Earth orbit as space tourists, and it will not be that far in the future. However, such a new expedition would be fraught with life-threatening risks. We welcomed a prominent Buddhist monk to discuss how we can have peace of mind even in an expedition that is fraught with danger, and what specific actions we can take. For the 2021 discussion, we invited a key person who has established a star guide in Tekapo, New Zealand, and has been growing it into one of national industries and discussed how astronomy tourism appeals to a wide variety of people, far beyond the traditional astronomy enthusiast. Both discussions considered communication with a new and broader audience beyond the community of astronomy enthusiasts. This is a positive thing, with new and greater possibilities for astronomical communication, but it also creates new problems of cultural and inter-community friction. This will be an important point for future discussion.

DECOLONIAL EDUCATIONAL MATERIAL AS ONE OF THE PATHS TO DIVERSITY IN THE NATURAL SCIENCES CLASSROOM

The monoculture of knowledge and rigor established in this universalizing mold carries with it two premises: the first is that the plurality and richness of human agency outside Western standards is unwanted, invalidated, and even denied; and the second is that the only really valid rigorous knowledge is scientific knowledge; therefore, other knowledges such as popular, indigenous, peasant, and urban knowledges are disregarded because, for the monoculture of knowledge, they are not credible, do not exist, or are not visible. Coloniality means that the colonized himself incorporates the colonizer's worldview, language, and way of thinking, and thus becomes the colonizer of himself. Given the urgent need for the history of subalternized peoples, in this case indigenous knowledge, and seeing the prevalence of an official historiography that has inferiorized and oppressed them, we need to suppress our narratives and experiences. Thinking about diversity and the recognition of Brazil as a multicultural territory, an astronomy educational production in a confluence with art, a decolonial didactic material for science teaching, for elementary school classes, which can be extended to all people, in order to promote astronomy knowledge into the classroom and analyze educational aspects related to the development of the educational proposal.

Discovering the Universe with AstroTours

AstroTours is a monthly outreach event organized by early career researchers at the University of Toronto in Canada. Our events feature a public talk followed by demos and telescope tours. We are a volunteer team composed of graduate students, undergraduates, and postdoctoral fellows from the David A. Dunlap Department of Astronomy and Astrophysics, the Dunlap Institute, and the Canadian Institute for Theoretical Astrophysics. Our events are free and open to the public which cultivates a consistent (typically 100+ attendees per talk) but varied audience of students, professionals, enthusiasts, families, and even occasionally school groups. We design for our activities and talks to be appealing and approachable for a variety of demographics. During the Covid-19 pandemic we switched to a fully virtual setup for our events which allowed folks from outside of Toronto to join in both synchronously and asynchronously. We will be discussing what contributes to AstroTour's success as a monthly outreach event and the strong framework

that has been developed over the past 20+ years of operation. We will also highlight new ideas and approaches that AstroTours has brought to astronomy outreach in Toronto and how we continue to make astronomy fun, and exciting for all.

[Disseminating a global project, The Southern Wide-field Gamma-ray Observatory \(SWGGO\).](#)

The video communication project of the Southern Wide-field Gamma-ray Observatory (SWGGO) aims to inform the great public of the progress, objectives, and purposes of a global project, dependent on dozens of scientific institutions from 12 countries from four continents.

The SWGGO videos will inform the great public but will also target science and engineering students, children, and the communities that will be neighboring the project.

This last aspect is important to avoid the rejection of the communities near the possible construction sites of the SWGGO and not suffer the problems that other projects have had, for example the Thirty Meter Telescope in Hawaii.

[Exploring the Frontiers of Space in 3D](#)

An immersive, virtual exhibit of large telescopes and space missions is described. The exhibit overcomes the difficulty members of the public have in appreciating the scale and complexity of modern, astronomical research facilities. Using very detailed 3D models, ground- and space-based telescopes that are impossible to visit in person can be explored by moving through a virtual space. The exhibit was created using Unreal Engine, a tool developed by Epic Games. Users wear Oculus Quest virtual reality headsets and traverse the 3D exhibit using Xbox game controllers. CAD models were gathered from open access sources and with the help of staff of major observatories. The first version of the exhibit highlights telescopes and planetary missions with major involvement of the University of Arizona, but it can be customized to include any major telescope or space mission. Visitors can experience the 6.5-meter MMT, the twin 8.4-meter LBT, the 24.5-meter GMT, the 15-meter Kitt Peak radio dish, NASA's Hubble Space Telescope and James Webb Space Telescope, the Phoenix Mars lander, and the OSIRIS-Rex spacecraft alongside a 3D model of the asteroid Bennu. The exhibit was successfully debuted at an outreach event in Washington, DC, and at the SXSW 2022 Festival in Austin, Texas.

[From precision pendulum clocks to meridian circles: sharing online educational practices with MAST's astronomical historical scientific instruments](#)

The project "Popularization of Science and Technology from Historical Scientific Instruments of MAST's Collection", developed, since 2017, in the Museum of Astronomy and Related Sciences (MAST), in Rio de Janeiro (Brazil), aims to propose principles of science communication and museum education based on historical scientific instruments (HSI). In this presentation, we will share references to develop educational activities with HSI in Astronomy-related museums or science centers. We also intend to present a visit executed in November 2021 at "MAST Education", our facebook page, as a solution to social distance context. The creation of the visit follows four main theoretical references: models and modeling, interactivity (hands-on, minds-on, hearts-on), online museum education and progressive pedagogical tendencies, focusing on a critical look at the historical background behind the HSIs. The mediated visit theme was the Brazilian Legal Hour Service (BLHS) and it explored HSIs from MAST, such as precision pendulum clocks, meridian telescopes and a Gautier Meridian Circle. For didactic transposition, we used a pendulum experiment, a hand-made model of meridian passage of a star and historical approaches of the National Observatory (institution responsible for BLHS) and the period that these instruments were used. The visit was broadcast live from the museum through our facebook page and the communication with the public was made by chat and stimulated by motivational questions. Concerned with the accessibility, the team did audio descriptions. The application of these best practices allows some considerations. First, we realized that complex HSIs demands in its didactic transposition a focus in its main concepts before the

exploration of itself. Secondly, participation in online activities are made in chat, so it is important to stimulate dialogical communication. Finally, historical information plays a main role to promote critical reflections of scientific culture.

Hear the Sky

AISA is a comprehensive communication platform that, in addition to meeting all the communication needs of DHL (Deaf and Hearing Loss) people, also provides much more capabilities for communication, improving life and behavioral skills to reduce anxiety, and promoting educational justice.

Because DHL people with hearing problems can not participate in various events, especially space events, the AISA platform intends to consider a unique dictionary for this area due to specific words in this field. When aerospace and astronomy dictionaries were added, deaf people did not need any remarkable aerospace sign language translators. The Speech-to-text conversion system in the AISA smart glasses can help them improve their confidence and attend all the events independently.

So for the observatory feature, we decided to pass the boundaries and think out of the box by adding a unique ability that makes it different from other platforms, especially for the people with this disability. A thing that makes every observation session more enjoyable and remembering is the narration and story that the operator will tell about each constellation in the night sky. However, unfortunately, deaf people could not enjoy those beautiful stories. So we decided to add the ability of narration to our observatory feature so every kind of person could have an enjoyable moment by just reading every unique story about the night sky.

Integrating Stellarium with Audio-Visual Presentations for the Best Virtual Planetarium Experience

The DOST-PAGASA's Space Science and Astronomy Section team designed and converted the traditional planetarium experience (face-to-face) to a virtual one. Dubbed as 3T, we aim to present the tools, techniques and the transfer of knowledge used in creating astronomy-related videos online. This project was initialized in 2021 and is in progress of continuous improvement in order to keep the general public informed of the astronomical events they are not aware of. The first stellarium presentation video to ever grace the facebook page of DOST-PAGASA (our institution) was posted in February of 2021. Today, about 30 audio-visual presentations were uploaded and this project has a wider audience, which has become increasingly central to the public dissemination. In this poster, we will discuss our ways how we can use different online tools to reach new audiences with astronomical content. We aim to continue posting consistently to reach more people and counter misinformation.

JIVE and the European VLBI Network: challenges and lessons learnt from communication/outreach initiatives in the framework of global radio astronomy networks

The Joint Institute for VLBI ERIC (JIVE) is the central organisation in the European VLBI Network (EVN) - a network composed of radio telescopes around the world. VLBI (Very Long Baseline Interferometry) is a radio astronomy technique whereby multiple telescopes can focus on a single source at the same time to improve the resolution of the resulting image.

JIVE implements the core data processing and user services that turn the EVN network of distributed telescopes into a single observatory to study the radio sky at the highest possible angular resolution for cm wavelengths. JIVE's main mission is to promote and implement the use of VLBI and other radio astronomical techniques.

Due to both the international nature of its consortium and the different audiences targeted (astronomers, general public, policy makers), JIVE communication and outreach initiatives rely on a multi-channel strategy

with targeted messages and actions to reach the identified audiences that is optimised to maximise dissemination efforts at local/national, European and international level to maximise impact.

This endeavour present several challenges, namely:

- Provide a central coordination that can ensure the individual needs of the different partners as well as to build consistent interactions within the network provide momentum for the different nodes to work together;
- Establish an interesting programme of activities to reach out different audiences with limited resources;
- Build a recognisable communication identity in a field including larger organisations with more resources for communications.

In this talk, we will present the on-going efforts related to JIVE/EVN communications and outreach and we will discuss the challenges and lessons learnt so far.

Let the sky fall: of meteorites and dogs

On January 1st 2020, at 19:26 local time, a huge fireball appeared in the skies of mainland Italy. Dozens of people soon reported seeing it. And also eight all-sky cameras of the PRISMA project recorded its trail crossing the sky. Within a few hours the INAF astronomer Albino Carbognani had been able to estimate that probably some fragments of the original meteoroid managed to reach the ground, and to delimit an area of $2,2 \times 1,5$ km near the small village of Disvetro (Cavezzo, Modena), in the Po Valley, as the most likely “impact zone”, with a 95% confidence interval.

Next morning the news was already mentioned both on social networks and on local and national newspapers. Astronomers invited citizens, should they find a small stone covered with a dark patina and with rounded corners, to report it to the PRISMA project by sending a photo. They also provided instructions to follow in case of a finding. The news had enormous coverage throughout the national territory. On the INAF website alone, on January 3rd, it had been read over 400.000 times.

The next day, January 4th, was a Saturday. A pleasant and unusually sunny winter Saturday. A 48-year-old warehouse keeper, Davide Gaddi, passionate about cycling, was walking along the bank of the Secchia river that runs through the Cavezzo area when his dog – an adorable little creature named Pimpa – sniffed something strange, forcing him to stop. It was an unusual pebble. A small stone covered with a dark patina and with rounded corners...

The New Year's meteorite – now renamed Cavezzo meteorite – had sparked a frenzy, in Italy, during the first week of 2020. People talked about it in social media, in the newspapers, on the radio, on TV... The 48-year-old finder was even a guest in the most popular prime-time quiz game on Italian public television. In our poster we present an analysis of the communication of the event and its reception by the public, illustrating what we believe were the keys to their success.

Meet the IAU Astronomers! Programme

The “Meet the IAU Astronomers!” programme connects teachers, informal educators and amateur astronomer groups with IAU-members for meet-up (events) where professional astronomers have the chance to share their research, the importance of astronomy for society, and why following astronomy as a career is a viable and rewarding choice. The Meet the IAU Astronomers! programme goal is to “facilitate international communication through exchanges” and “encourage communication of science and critical thinking through IAU member public engagement”. A relaunch in spring 2022 was set to align the programme objectives and event structure with new evaluation instruments, and to provide astronomers and organisers with tools that allow them to deliver inclusive events. Presented in comprehensive handbooks, the proposed structure and methodology widen the scope of the events and aim to facilitate

events that strive to create lasting personal and social impact on the communities, participants and the astronomers themselves. The handbooks also encourages astronomers to consciously incorporate inclusive outreach practices, and strategies that will encourage critical thinking, for example by including opportunities for participants to identify, analyse, and evaluate the content shared. In this presentation, we will introduce the programme and describe best practices gathered from other projects such as STEM Ambassadors that reflect inclusive practices and inform the Meet the IAU Astronomers! programme.

[New Activities for BVI Audience at Coquimbo, Chile](#)

During 2021 Las Campanas Observatory and Dedoscopio worked together in two mainly online activities for BVI people in different places of Chile. The first one, named “A Tactile Trip with LCO”, was an online and presencial activity in Coquimbo with the aim BVI people meet the observatory and understand how the telescopes work. For this we created a package with 3 tactile models (two home-made and one 3D printed) of the Magellan telescopes. We delivered 47 packages and connected via zoom for the tactile-talk with 35 people, and in person with the rest 12.

The second activity was “One Night at LCO”, an online talk for Biblio-blind community in Santiago de Chile. The reading was a story describing a trip from Santiago to the observatory. As the people got involved with the different adventures of the imaginary trip, we used different material to illustrate the components of the telescopes, and how they operate, as well as narrating some of the history of the observatory.

During this year, LCO is managing the LabMovil project in collaboration with GMT and EcoScience, which brings, among other experiments, a model of the solar system with Braille labels for inclusive activities that we are implementing in 2022.

It has been two years of a working collaboration on an inclusive astronomical project with the LCO observatory, which will continue for the rest of this year and hopefully further more.

[Observe the Moon - Separated by the Pandemic, United by the Satellite](#)

The project “Observe the Moon” was hosted in Sri Lanka by Nalanda College Astronomical Society in aligned with the NASA International Observe the Moon Night on 16/10/2021. Although public gatherings are restricted in Sri Lanka due to the current pandemic situation, we were able to carryout the program virtually on Zoom platform. The program was focused on the Sri Lankan school students who are between 10-18 years of age. We announced the program to countrywide educational communities using our well widespread social media channels. Over 2000 students with different ethnicities were registered in the event. Around 450 students actively participated in the program through the host platform. The program comprised on three sections. Initially an introduction session on moon and its origins was held to spark the interest of participants towards moon observation. Then an instructional session on moon mapping was carried out followed by a hands-on session to map the virtual moon that was used for the session. All the students were provided with a soft copy of a blank moon map which they were instructed to print and use in the hands-on moon mapping session. All the students were excited to use the virtual moon for mapping and some of the participants displayed a great skill in extracting the fine details of the moon on to a map. All the submitted moon maps were evaluated by the organizing committee and generated “International Observe the Moon Night” certificate was given to every participant. Overall, the session was able to encourage the young dreamers of Sri Lanka to pay attention to minute details of objects in the everyday sky.

[Ramifications of isolating pseudoscience in future communities by communicating astronomy](#)

This workshop will be based on a talk with presentation and episodes of interactive discussion. For that, We need a room with a projector for at least 20 people to sit and discuss.

Reaching further with astronomy: tales of the unexpected

The Royal Astronomical Society turned two hundred years old in 2020. Our planned public celebratory events and projects had to suddenly change for the lockdown. We were forced to do things we have never done before to continue to interact with the public. We will share the changes we made, lessons learned and the fortuitous outcomes that we have had, so far.

Bicentenary Timeline - using Instagram to reach a new audience

National Astronomy Week - public events to remote practical astronomers, four corners of the UK

Phosphines on Venus - simulcast Cardiff, England and MIT with the world

Remote observations - NAM2020 cancellation created new possibilities

National Astronomy Meeting 2021 - virtual spaces

Created new YouTube content - BHLS, the Moon and physics, new collaborations

Reached new speakers and audiences - Japan, Sri Lanka, Mexico

Recruiting Volunteers for Enhancing Astronomy in Bangladesh

Bangladesh is a country, where due to the absence of any infrastructure regarding astronomy education, suffers through a vicious circle - no astronomy research, hence no funds; since no funds, hence no astronomy teaching / research / activity - a positive feedback loop. The National Outreach Coordinator office (under the Office of Astronomy Outreach, IAU) in Bangladesh (NOC-BD) has been installed since 2017. In order to facilitate country-wide outreach activities / programs, the NOC-BD office recruited some university students as “national volunteers” to work for it. The responsibility is absolutely voluntary and the tenure is annual, or biennial depending on dedicated service. Since 2019, there have been a total of 36 volunteers recruited on a yearly basis. Some were given a second-term based on dedication. These students helped NOC-BD to disseminate astronomical ideas, write reports, organize local youth and school students, coordinate events such as designing school activity programs for children, primary and general astronomy workshops, naming exoplanet campaign, arranging press meetings, writing short intro for the press, exhibiting IAU100 Above and Beyond posters at various schools, run virtual seminars, streaming and social media activities, running Facebook pages on behalf of the NOC, and other events. All these were made possible without any external funding. Hence, it could be an example of “good practices” to involve and engage young people for societal benefits, at the same time ensuring capacity building in astronomy, teaching lower-secondary students, science popularizing, report writing and time-bound activities among them. For the exchange of a certificate and a letter of recommendation, one could get the best use of human resources at hand.

Reflection of the Cosmos at the Prado National Museum

In a perfect symbiosis with Science, painting Art has recorded, transmitted and even transformed our perception of the Universe over the centuries. The educational itinerary “Reflections of the Cosmos” consists of a tour of 23 works from the permanent collection of the Prado National Museum (Madrid, Spain) that reveal the profound and wonderful exchange of views between Astronomy and Art. A book with the same title as the itinerary is also being published both in Spanish and English.

The Prado National Museum is one of the most important Art museums in the world, with 3 million annual visitors and an online presence that exceeds 10 million. “Reflections of the Cosmos” is framed within the ambitious endeavor of this museum to promote new approaches to their permanent collection.

Spaghettification Podcast: bridging the gap between Australia's professional and amateur astronomers

Australia is home to a thriving amateur astronomy community, comprising dedicated stargazers, solar observers, astrophotographers and even radio astronomers. One thing that many amateur astronomy societies want is greater exposure to the wider Australian research community, where contact is usually made through guest talks or attendance at star parties. Spaghettification provides another avenue for astronomy enthusiasts to gain access to knowledge from professional astronomers through interviews with members of the Australian astrophysics community. So, we're looking for you! If you want to explain your research in audio format, or jump on a livestream for a question and answer session, contact us during the CAP2022 or via email.

The "Unveiling Skies" project for the IAU 100 Hours program – A Island wide project to give hand to those who curious about learning astronomy in Sri Lanka

Abstract: The project "Unveiling Skies" for the IAU 100 hours program, was carried out on an online platform to deliver basic astronomy knowledge to those who are curious about learning astronomy in Sri Lanka. The project included the History of astronomy, observation astronomy, rocket science, telescope handling, and cosmology. We used social media platforms to engage with the public and we were able to reach more than 1200 registrations from all the 9 different provinces in Sri Lanka. These online lecture series were conducted by our undergraduate and graduate students who are representing leading government, private and foreign universities. More than 250+ public audiences participated in every session conducted using the Zoom platform. There, we shared presentations, notes, and observation reports that we prepared for the public. The recorded lectures were uploaded to our YouTube channel as it was beneficial to those who were unable to attend those valuable sessions. This project included five sessions that are very useful to broaden the knowledge of astronomy and gave an idea about the tools used in space exploration and their practical uses. Specially, we were able to cover the important topics which will be helpful to Astronomy Olympiads. During the global pandemic of Covid 19 situation, the volunteering "Unveiling Skies" project that we organized was helped to give the opportunity for students, teachers, young scientists, and organizers to use astronomy and science to share knowledge and to overcome bridge between cultures, social distances, and other external factors.

The Current Status and Potential of Astro-tourism - A Case Study of the Movement in Japan

Astro-tourism is becoming more and more popular in Japan, and in 2017, the national organization "Sora Tourism Promotion Council" was established with support from the Japan Tourism Agency. It also contributes to the prevention of light pollution in cooperation with the Ministry of the Environment.

<https://soratourism.com/language/en/>

The Sora Tourism Promotion Council conducted a marketing survey on tourist needs and regional characteristics and issues related to stargazing tourism (astro-tourism) and other forms of tourism. The survey was first conducted on September 7-27, 2018, with a primary survey of 10,391 men and women (Group A), aged 15-69, residing in Japan. Then, from that population, 500 people with spontaneous astronomy and space experience (excluding school experience) (Group B) and 500 people with no experience but expressing interest (Group C) were selected, respectively. Groups B and C were the secondary survey sample population. The results of the primary survey revealed that there are approximately 8.5 million people who have experienced astronomy and space, including planetarium visits, and approximately 40 million people who are expected to participate in such experiences in the future. In other words, about half of the Japanese population can be considered to have some interest in astronomy and space, and the estimated number of people expected to "participate in trips to see the starry sky" in the future in Group C is about 15 million per year.

The event to encourage female students to choose a career in STEM by astrophysics researcher

The realization of a diversity-inclusive society is one of the critical challenges in Japan today. In addition, the promotion of female participation is also an important issue. The rates of female students in science and engineering faculties in Japan are 27.8% and 15.7%, respectively. The rate of female students in STEM (Science, Technology, Engineering, and Mathematics) is low compared to the average of OECD countries. There is an urgent need to promote the activities of female researchers and engineers in Japan. However, the number of female students studying in STEM fields, which form the population of such researchers and engineers, is low.

We held an online talk event to show role models and encourage female students to choose a career path in STEM. We organized the event focused on nuclear astrophysics to coincide with the publication of the Japanese edition of "Women Scientists Who Made Nuclear Astrophysics," a calendar produced by Dr. Maria Lugaro, Vice-Chair of COST Action ChETEC, and others. The Japanese version was translated mainly by the Japan Forum of Nuclear Astrophysics. One of the calendar's authors, a female nuclear astrophysics researcher, gave a lecture at the event. The event was also navigated and talked together by one of the calendar's translated members, a female astrophysicist.

The participants were 28 females and 25 males in the event, and 28 people filled out questionnaires. As a result, all respondents answered "enjoyable" and "easy to understand." They also would like to participate again if such a talk event hold. In addition, they commented that they enjoyed the dialogue between female researchers and that they would like to learn more about astrophysics. The results indicate that the event was effective in increasing interest in astrophysics. In the future, we would like to conduct a follow-up survey to determine whether the event led to choosing a career in STEM.

The Position of Studying Space Sciences in Africa: Opportunities and Potentials

Introduction:

The Moon, the Stars, the Sun and other celestial bodies including the Clouds as well as Lightning in the Sky are regarded as sacred objects or even gods by some African traditional religions which are at present in control of approximately 25% of the entire African population of approximately 1 billion people. In this respect the followers of these traditional religions are there for restricted from studying the Moon, Sun, Lightning, thunders or any other object, being or thing existing above the atmosphere. However the religion of Islam and Christianity which are collectively in control of 70% of the African population have not restricted their followers from studying the Moon, Sun, thunders, Stars, Astronomy, Space sciences and others but however due to the presence of the elements of astrology in the space sciences generally, which is a branch of studies many Africans use locally through studying the movements of Stars and signs of thunders in the prediction of future events or in fortune telling businesses made the Space Sciences generally to be less attractive to both the Muslims and the Christians in Africa.

CHALLENGES AND THE WAY FORWARD:

In view of the roles of the cultural, traditional and religious beliefs in Africa, keeps creating situations making many of the young African promising future potential space scientists and technologists such as astronauts, astronomers, aerospace engineers, climatologist, metrologies, astrologists and others in their early stage or level of education (Primary and High Schools levels) to end up studying other non space related science courses in their University levels in order to pleased their traditions and beliefs or even elders in their societies .

The Set-up and Implementation of the Philippine Atmospheric, Geophysical and Astronomical Services Administration's First Virtual Telescoping Session

With the entire globe adjusting to the new normal brought on by the epidemic, astronomy communication found itself in a bind, as most activities related to it are done face to face. The organizers of the Philippines' 29th National Astronomy Week were forced to come up

with a fresh approach of promoting astronomy in the country. A virtual telescoping session was born as a result of this. The virtual telescoping session took place during the week of the NAW celebration and was broadcasted live on the PAGASA's Facebook page. It included entertaining facts and trivia about how our forefathers viewed the night sky as well as the way they named heavenly objects as opposed to how they are normally labeled, in keeping with the celebration's theme of ethnoastronomy. In this paper, we will discuss the planning, execution, and feedback in the conduct of the first virtual telescoping activity of the agency.

Under the same Moon: building bridges through sky and astronomy

Since the dawn of time, man has cultivated a special relationship with the sky. With its regular motion, it represents a perfect reference system for measuring the passage of time. Particularly in Islamic culture, the Moon and the direct sighting of the first waxing Moon play a fundamental role in determining the end and the beginning of the new month. The missed sighting means that the month ends with one or more days of delay generating multiple critical issues in the various communities. Building on this, and in agreement with the then-Imam of Trieste, in 2017 the INAF Observatory of Padua organized an event, attended by 18 Imams, to observe the first crescent moon and start the holy month of Ramadan. The success of this event among the Islamic community led in 2020 to the signing of a MoU between the INAF and the CICI, aimed to create a new relational development model through the intercultural dialogue for a wider scientific dissemination of astronomy in the national Islamic community.

Five years after the first meeting, the project goes on and is growing stronger. A community of astronomers and amateur astronomers was created for the sighting of the Moon in the critical days of the beginning of the month of Ramadan and other lunar months, in order to provide the scientific elements necessary for the correct interpretation of the motions of the Moon on which the Islamic calendar is based. Finally, in order to promote the dissemination of scientific culture, we have held a first workshop on fundamentals of astronomy and lunar sightings at the Great Mosque of Rome and we are developing astronomical teaching and outreach activities for schools and society with contents aimed at the Italian Islamic Community.

In this talk we will present the intercultural perspectives of this project, the best practice, the difficulty, and the next steps in order to work together for a new model of sustainable relational development through dialogue, culture and science.

Understanding Sense of Place: How to be an Effective Communicator in Hawai'i

The Hawaiian Islands are steeped in cultural reverence, natural beauty, and diverse communities, but are backdropped by a long history of challenges for the native Hawaiian population. The impact of past events are felt across generations, playing a significant role in shaping modern Hawai'i's social dynamics and political landscape. These circumstances underscore the necessity of developing a "sense of place" - to understand a place's history, its people, and cultural values. Effective science communication in Hawai'i requires this understanding, and a unique set of skills, to be successful in engaging with local audiences.

The origin of astronomy in Hawai'i begins with the discovery of Hawai'i itself. Polynesian voyagers were champions of the night sky, utilizing celestial navigation to launch trans-Pacific voyages to settle Hawai'i. Today, Hawai'i is a global leader for ground-based observatories and other astronomical activity, which has become an increasingly contested topic throughout the islands.

Understanding a sense of place is critical to science communications and being able to successfully engage with local communities to foster relationships. Its elements are essential to crafting an organization's brand, voice, identity, and delivering core messages that are transparent and resonant with the public.

As a kama'āina (Hawai'i-born resident without Hawaiian ancestry) and science communicator, I will highlight my experiences growing in Hawai'i and our unique best practices. Sub-topics include the value in hiring and integrating local talent to your organization's education and public outreach teams, the importance of public outreach in establishing a community presence, and the benefits of interacting with educational institutions to inspire the next generation of Hawai'i astronomers.

Webinars and Other Online Activities to Virtually Communicate Astronomy in times of Pandemic

During the pandemic outbreak, on-site astronomy activities were halted. New innovations and development should be taken into consideration to continue promoting astronomy with the public. Even with the government-implemented restrictions to allow visitors in the Observatory & Planetarium, we still have the opportunities to organize purely online activities and webinars to increase the interest and awareness of the public to astronomy. Social Media became one of the most useful ways to reach out to the public, with this, we use our Facebook page to promote these events by posting "catchy" creative event posters and infographics. We used Google Meet and Zoom, a video conference platform, to virtually meet and engage with the public.

The events conducted can be categorized as major and minor events. A major event is a week-long event which includes activities such as webinars, special contests, and virtual planetarium or telescope session, while a minor event is a one-day event that only includes a webinar session. Each event covers a different theme that is specifically aligned to the theme of a national and or international celebrations in astronomy.

This pandemic has brought us collaboration with different professionals, national and international astronomy communities to conduct these events, and 2021 has been the starting point of this endeavor - and with this, we will share how in the span of 17 months, we conducted three (3) major and seven (7) minor events, and reached almost 1,400 participants from different regions of our country with overwhelming positive feedback and unique requests from the public to conduct more webinar sessions and activities.

Workshopping Art/Science Activities for an Astro-Animation Guerilla STEM Exhibition

For several years our students at the Maryland Institute College of Art have worked with NASA astronomers to produce animations inspired by cutting-edge research. The results can be whimsical or poetic, but are nevertheless constrained by scientific rigour. The animations have been used for scientific outreach and educational purposes in a wide variety of ways. Based on the success of this program, we are developing a travelling pop-up astro-animation exhibition to be used for informal STEM learning in unusual locations such as train stations, marketplaces, or music festivals. We aim to meet and attract teenagers from underrepresented communities who may not have been exposed to astronomy or consider STEM as a potential option for study. "Science anxiety" has been reported to be a significant barrier to learning for some students. By mixing animation with astronomy, our project has the capability to reach out and stimulate interest in STEM, making science engaging in an unconventional way. An important component of the exhibition will be hands-on activities where participants will be invited to create their own artistic responses to the science with the help of a facilitator. To perform an initial test of these and evaluate their effectiveness we will be carrying out a workshop at the Baltimore School for the Arts, a top performing arts high school, in coordination with animation teachers and students there. Our results from this will be used to inform our next steps in developing the exhibition.

This work is supported by the Maryland Space Business Roundtable, the MICA Animation Department, and NASA under award number 80GSFC21M0002.

YouTube as a tool to propagate research in astronomy

Astronomy has found its way into almost every pop culture. The subject began with humankind's curiosity about the stars but, unfortunately, got entangled with the pseudo-science of Astrology. Myths relating stars to the lives of humans have made their way through stories in every corner of the world. Even in the current times, we see an increasing population, primarily youngsters, showing interest in the latter, and untangling the two remains one of the significant challenges of Astronomy communication.

The knowledge of the scientific process of understanding physics behind objects which are multiple light-years away from us is not yet widespread. A large population still believes that astronomy is only about using an optical telescope to look at the night sky. Social media equips us to reach and engage people limitlessly without any boundaries and update them with the new research in Astronomy, and debunk myths. This non-formal science education provides a medium for educators to teach science without dwelling on research and the platform for people to get closer to scientific discoveries.

With the advent of new telescopes and global facilities like JWST and SKA, it is necessary to make the audience aware of the new opportunities. My motivation is to engage young minds, especially the underrepresented minorities like women, in this field and spark their scientific and questioning mindset. Such an initiative will also increase the diversity of international groups and contribute in a meaningful manner. Our initiative primarily uses YouTube to host videos discussing research papers, scientific topics, astrophotography, and the scientific methodology behind the research. We have hosted the IAU Women and Girls in Astronomy project event and organised an interview podcast series with women in different stages of their careers in Astronomy. We provide this platform to other science professionals to aid them in outstretching their research to the public."

Workshops

ASTRO DIGITAL LIBRARY (ADL)

Astro Digital Library (ADL), by Open Space Foundation is a decentralized, community-owned digital library, which is loaded with curated astronomy contents that can be accessed without internet. ADL act as an off-grid technology platform targeted at geographically/ socially/ economically underserved communities with limited or no internet access. It is designed inline with the idea of community owned second chance education platforms - a feasible solution to bridge the inaccessibility of quality educational resources. ADL implemented in diverse local communities has proven to create an inclusive platform for effective astronomy outreach. ADL consist of the local wireless mesh network constructed using the wireless router which are connected to the centralized server. The server will deliver the astronomy and STEAM contents within the digital hotspot range. The content specifications are up to the communicator to decide, allowing for support to text/audio/visual modes without any linguistic barriers. The network range can also be customised based on population density and other community requirements. ADL thus tries to address the challenges of high cost of internet and inaccessibility of quality astronomy educational resources through the community lens. Astronomy, is an ever-evolving, but culture bound science. If the medium of astronomy communication does not consider the local flavour, the learning curve continues to exist. It is also a subject directly linked with technology and instrumentation, which are structurally unaffordable for the majority of the global population. Exposure to digitalised astronomy boost participation in scientific learning process and invoke curiosity among learners, who are historically deprived of educational resources. Thus, by interlinking decentralised technology and localised astronomy communication practices, ADL empowers local actors and communicators to lead the change. For more details - <https://minkeni.com/>

Astronomy Communication for development

The relevance, or, importance of astronomy in relation to the community at large is often questioned. It is therefore important to identify the role that astronomy communication can play in development. The aim of this workshop is thus to apply the skills of astronomers and astronomy communicators toward contributing to development. The workshop will focus on how astronomy communication can be used as an economic driver within communities, groups, or by individuals. The workshop will consist of introductory talks on development, as well as the presentation of various case studies detailing projects which have been able to successfully make use of astronomy communication to promote economic growth amongst groups / communities. During the second half of the workshop, participants will be split into groups and will take part in a design thinking task around projects which would have social impact. With the aid of facilitators, as well as resource materials, groups will build a project / business model which makes use of astronomy communication for development. As an outcome of the workshop, participants should be able to identify opportunities for development projects involving astronomy communication and have the resource materials necessary to go about implementing such projects.

Biocosmography: linking personal stories with astronomical phenomena through theater.

The objective of the workshop is to use the concept of biocosmography, the story that is formed by accessing a memory of an astronomical phenomenon of the past, in order to recognize that there is a link between our biography and the astronomical phenomena we have observed.

This workshop proposes theater as an activating mechanism through a dramatic expression session, a methodology derived from theatrical pedagogy that uses play (“innate way of learning and the capacity of human beings to experience and appropriate what surrounds them in a pleasant way”, Boquete (2011)), to achieve educational objectives in a didactic and entertaining way.

The dramatic expression session will be divided into four stages: preliminary, sensitization, experimentation and evaluation. These stages allow a progressive dynamic of play that allows access to a collective and collaborative social space. The main activity is experimentation, which through dramatic play the groups will write and socialize their biocosmographies, to be later represented.

This biocosmography inextricably intertwined with personal history. This story is of a personal nature and, being produced from the activation of memory, it is constructed from the following axes: emotion (what it produced in the spectator), space (where it was) and narrative (how the story is constructed, which is related to its context and culture). From that place, the action of observing the sky is recognized as a cultural process linked to our life and culture.

The socialization of these biocosmographies allows the recognition of individuality in a larger and collective context where, although the contexts, the ways of telling, the emotions, the places, etc., are diverse, the phenomena are common and the action of looking at the sky is present.

Creating Astronomy Videos For YouTube

Video is a powerful medium. We are now surrounded by screens that can provide access to hundreds of millions of videos. Similarly, creating a video is now as easy as ever. As a result, more than 300 hundred hours of videos are uploaded to YouTube (the most popular video platform) every minute and more than a few billion videos are watched each day. In this crowded environment, how can you stand out without compromising your science?

In this workshop, we will focus on some of the basics required to create and sustain a successful astronomy/science YouTube channel. We will look at some successful astronomy channels on YouTube and discuss various styles of presentation styles and associated promises and challenges. We will assume that the participants are not video professionals, but are somewhat familiar with really basic video editing skills,

such as using editing tools on their phones or using iMovie. We will start with science story-telling on videos and the ability to tailor your topic for a specific audience. In particular, how do we incorporate local cultural elements to enrich a video for the target audience. We will then learn basic story-boarding and incorporate the use of green screen effects (if appropriate) and simple animations. The participants may be asked to create a 1-2 minute video and upload it on YouTube.

The last part of the workshop will focus on strategies to create and maintain a successful YouTube channel. This will include guidance on the creation of thumbnails, style and frequency of videos, and suggestions for audience engagement.

[Dedoscopio's Book: Fun and Easy Hand-made Material for Astronomic Tactile Talks](#)

Since 2018, Dedoscopio has been developing tactile talks around Chile. During the pandemic there was a hard time for in-person talks so we had to change to online version modality and continue with our inclusive project. We have done more than 50 talks during the past 5 years and participated in multiple stands explaining different astronomical phenomena through hand-made tactile models reaching Blind and Visually Impaired (BVI) participants and no BVI audience of all ages. We prove that our material is a good way to bring astronomy closer to everyone.

Thus, to share our experience and reach every corner of the country, we write an instructive book with 4 talks explaining the models we had created. This book is available in Spanish and English for every person who wants to recreate them to work with the BVI community, children at school or to participate in a scientific fair in a fun way.

During the workshop we would present this book, show the participants the models of the AGN, the trojan asteroids and put our hands on to build a tactile part of the sky model where an asteroid is passing. The main goal is that the participants learn how to create this specific model but using very low cost material, and also that they can transform it and use it in as many ways as possible.

At the end of the workshop we would show that with a little bit of ingenuity and passion to innovate the way of doing outreach, can generate great changes in the community, to finally incorporate a real inclusion within the planned activities.

[Identifying Indigenous Astronomy Knowledge Systems in “westernised” indigenous communities](#)

This workshop will be aimed at Communication and Science Engagement professionals working in indigenous communities. Some indigenous communities like the San decedents living in the towns surrounding the SKA observatory site in South Africa is no longer organised as a specific San group. These San Decedents form part of a larger group referred to by the South African Government as “Coloured” people. These communities are westernised to a large extent. Therefore, the Indigenous Knowledge systems on Astronomy and Cosmology is not clear and to most people from outside these communities it might seem that the Indigenous Astronomy and Cosmology is forgotten. When working in and with these communities it quickly becomes apparent that this is not the case. Community members have a very unique way of interacting with Knowledge provided during the construction of Scientific infrastructure development, like that of the SKA. If one is not sensitive towards Indigenous Knowledge systems It might be perceived as strange. The more isolated the communities the more apparent this becomes. The reason for this is that these communities have very strong oral and cultural practices that has been developed over thousands of years, stories of the stars, mythical creatures and the birth of the cosmos are shared through Art, Song Dance and storytelling.

This workshop will demonstrate a possible method to:

1. Show participants a possible way to sensitize themselves as communication professionals to worldviews and Indigenous Knowledge systems.
2. Guide Participants through a possible process of Identifying “dormant” or “un known” concepts.
3. Documenting Indigenous knowledge Systems with local communities
4. Understanding how Astronomy is used in communities
5. Using Indigenous Astronomy in Communicating Modern Astronomy
6. Acknowledging Indigenous Knowledge systems with respect

Interactive Virtual and Mixed Reality for Astronomy Outreach

Immersive technologies such as virtual, augmented, and mixed reality (XR, collectively) offer promise when used for outreach and education delivery. In this workshop, we introduce developing and implementing highly successful virtual and mixed reality astronomy outreach programs. Participants will step through the different experiences and engage with outreach experts who develop the programs, discussing the choices made in both content and hardware to ensure the experiences are engaging and relevant for participants and cost effective for all involved. Then after a review of results from studies on participant engagement with these programs, we will introduce a proposed conceptual framework for engagement with VR at public outreach events, focusing on four components of participant activity: immersion, facilitation, collaboration, and visualisation. Participants will be guided in using this framework to create ideas to optimise their existing immersive outreach content or to incorporate our freely available content to meet their outreach goals.

OzGrav and The Centre for Astrophysics and Supercomputing at Swinburne University are dedicated to bringing inspiration to diverse audiences. Through the efforts of both teams multiple VR and MR astronomy outreach tools have been developed. We will highlight a free interactive VR app developed to allow users to explore and interact with the universe as well as a guided VR group tour and MR science museum display focusing on the detection of gravitational waves. Additionally, we will introduce newly developed no-touch interactive projections developed in response to Covid safety concerns.

By combining our experiences in scientific knowledge, cutting-edge visualisation, and meaningful patron engagement, this workshop will give participants the tools needed to thoughtfully explore immersive technologies for astronomy outreach.

Let's light up the constellations!

The proposed maker experience brings students closer to Electronics using Astronomy as a common thread to create a final product with a great visual impact: a paper circuit in which the constellations light up, reproducing the brightness of the stars in the sky. By creating a paper circuit, students will learn easily and intuitively the basics of electricity and how circuits work. In the first part of the laboratory, students will familiarise themselves with the constellations. In the second part of the lesson, they will create their paper circuit, that is a low-voltage electronic circuit created on a sheet of paper using a conductive copper tape, LEDs and a small 3V button battery. The description of the lab is outlined here: <https://play.inaf.it/en/light-up-the-constellations/>

Pivoting PULSE@Parkes to the Public and Online, Live Radio Astronomy

PULSE@Parkes <https://research.csiro.au/pulseatparkes/> is a successful education program run by CSIRO's Space and Astronomy unit in Australia. Participants use the the CSIRO 64m Parkes radio telescope, Murriyang live but remotely to observe pulsars then analyse their data whilst interacting with our staff. Initially an education program designed for high school students in-person over recent years it has expanded its reach with the public through events such as Perth Astrofest and observatory open days. As such it gives the public a unique opportunity to experience a live observing experience with an iconic scientific instrument and learn about radio astronomy.

The introduction of COVID19 lockdowns in Australia in March 2020 meant that almost overnight we had to modify our program to run fully online instead of in-person. Whilst potentially a major problem we explain how, due to recent changes to telescope operations and control interfaces combined with the spread of video conferencing tools, we were successfully able to pivot to a fully online delivery mode. Benefits included a much greater reach, allowing participants from across Australia, including those in regional and remote locations to actively participate. We can also include many more participants in a typical session. Special sessions have been run for external partners and events.

We discuss the challenges and what we have learnt from these changes and outline possibilities for future developments. We will also discuss common issues encountered when engaging the public in radio astronomy and observing.

In this workshop we have been allocated telescope time so participants will be able to control the telescope and participate in a live, remote session. We encourage discussion from participants as to how we can improve our program whilst also considering how they may be able to develop their own programs using their facilities. The workshop is suitable for in-person and online participants.

Re-imagining community engagement for astronomical observatories with the Maunakea Community Engagement program leads

The Maunakea Observatories (MKO) – the collection of observatories with existing facilities – directly employ more than 500 members of the Hawai'i Island community. Their 50-year history of innovation and discovery has led global astronomy and created a long-standing presence for the sector in Hawai'i. The relationships that connect these institutions to the communities they are a part of have been, in some cases, complicated. Astronomy was invited to Maunakea as an economic engine and an unparalleled opportunity to bring academic prestige to the state of Hawai'i, both of which continue to flourish today. But with few exceptions, benefit to the general public on the level of personal impact is not commonly felt. The MKOs are in the midst of a deep reset of community relations strategy and implementation, based on the understanding that a broad, near-term shift toward a more collaborative dynamic on the ground in Hawai'i — one of mutual investment in the community's interests — is of critical importance to ensuring a healthy future for astronomy on Maunakea. Additionally, the release of long range plans in the United States and Canada emphasize the need for community based astronomy models and authentic engagement with Indigenous communities. Priorities for this work include:

- Dedicating concerted effort to authentic, personal engagement at all levels of community, leading with relationship-building and listening.
- Proactively seeking out real needs and collaboration opportunities identified as community priorities; offer meaningful support (time, labor, skill and funding) without prioritizing self-interest.

The Astrophysical Cody Maze

The Astrophysical Cody Maze is a virtual labyrinth in the real world which proposes coding challenges and quizzes about astronomy, astrophysics and space exploration. The Cody Maze helps participants develop computational thinking and problem-solving skills while promoting scientific dissemination. It guarantees the public engagement of a very wide audience, from children to adults. Players can move on a 5 x 5 board whose cells contain large-scale QR codes printed on beautiful astronomical images. Apparently participants can move freely across the board; however, interacting with the QR codes via a Telegram bot, they receive challenges to move and follow different paths through the maze. The game starts by scanning any of the QR codes at the board edge. The player physically moves on the board following the instructions of the bot and scanning the QR code on which they arrive at each stage, to verify that he/she has correctly executed the sequence of instructions. During the various stages of the game, different instruction sequences of increasing complexity are proposed, which introduce all the basic concepts of programming. Cody Maze is a

“square coding tool” that challenges visitors to move like robots on a chessboard, interpreting and executing instructions. Inaf, the Italian National Institute for Astrophysics, has made it an even more powerful educational tool and a more appealing game, combining coding with the charm of astrophysics. To receive the sequence of instructions leading to the next QR code, participants must correctly answer an astronomy quiz with different themes depending on each box in the maze. In total, 250 astronomy quizzes have been prepared. The game is freely available and downloadable here (currently only in Italian; English version under development): <https://play.inaf.it/cody-maze-astrofisico/>

[SciComm Design Workshop: General tips and tricks to producing your own in-house designs](#)

With tight communications budgets globally, we have to constantly look further at how we can optimise our own costs, especially when it comes to producing content for public communications. This workshop designed for sole communicators will be a hands on approach on where to start and how best to produce your own graphic design content, with a series of tips and tricks that SKAO has developed over many years, whilst looking at how to reduce costs, improve in-house capabilities, and even reduce our overall carbon footprint!